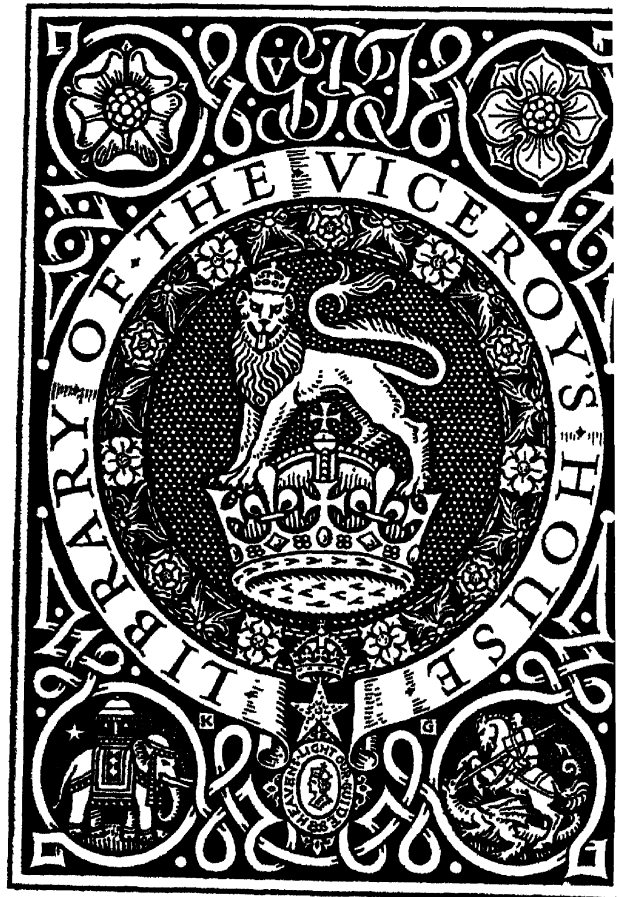


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CHAMBERS'S ENCYCLOPÆDIA

A DICTIONARY OF UNIVERSAL KNOWLEDGE

NEW EDITION

Edited by

DAVID PATRICK, M.A., LL.D.

AND

WILLIAM GEDDIE, M.A., B.Sc.

VOLUME VIII

PENOBSCOT TO SACO

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PROVENÇAL.....	A. P. GONDY.		

A great many of the articles named above are new; others written for earlier issues of this Encyclopædia have been so thoroughly revised by their authors as to be virtually new. In addition to these many other revisers have taken part, including Professor J. A. S. WATSON (Agriculture), Professor DAVID HEPBURN (Anatomy), Dr DRINKWATER (Chemistry), Dr R. CAMPBELL (Geology), Mr G. E. SHEPHERD (India), Dr THOMAS ASHBY (Italy), Mr W. A. FLEMING, Advocate, and Mr NORMAN MACDONALD, Advocate (Law), Dr J. D. COMBIE (Medicine), Admiral Sir REGINALD TUPPER (Navy), Dr ALFRED DANIELL (Physics), the editor and staff of the *Railway Gazette* (art. RAILWAYS), Professor A. BERRIEDALE KEITH (Sanskrit), Dr S. A. COOK and Mr HERBERT LOWE (Semitic Subjects), Dr F. E. BEDDARD and Professor J. ARTHUR THOMSON (Zoology). Thanks are due for the reading of proofs to Lord POLWARTH (art. PRISONS), Dr C. S. MYERS (art. PSYCHOLOGY), and Miss M. A. MURRAY (art. PYRAMID); and to many town-clerks and others for information and corrections.



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Penobscot, a river of Maine. The West Branch rises near the Canadian frontier, and flows east and south-east to where it meets the East Branch or Sebago River. Afterwards its course is south-south-west to Penobscot Bay, a broad and sheltered inlet of the Atlantic Ocean, 35 miles long and 20 wide, with numerous islands. It is tidal and navigable for large vessels to Bangor, 60 miles from its mouth. The chief trade is in lumber.

Penrhyu. See CARNARVONSHIRE, BANGOR, BETHESDA, and SLATE.

Penrith, a market-town of Cumberland, in a picturesque and fertile valley, on the outskirts of the Lake District (q.v.), 18 miles SSE. of Carlisle. It has a fine old ruined castle, where Richard III. (then Duke of Gloucester) is said to have resided, and a grammar-school (1395; refounded 1564). In the churchyard are two ancient monuments, the 'Giant's Grave' and the 'Giant's Thumb,' often visited by Sir Walter Scott; and north-east of the town is the wooded Beacon (937 feet). Pop. 8300.

Penryn (Corn., 'head of the river'), a town of Cornwall, at the head of a creek of Falmouth harbour, 3 miles NW. of Falmouth, with which till 1918 it returned one member to parliament (till 1885 two). Scarce a trace remains of Glasney College, founded in 1264 for thirteen Black Augustinian Canons; and none of a palace of the bishops of Exeter. Neighbouring quarries supply the famous Penryn granite—the material of Chatham Docks and other great public works; and the town has besides some flour and timber milling and manufactures of chemicals. Incorporated by James I., it was taken by Fairfax in 1646. Pop. 3000.

Pensacola, a port of entry and the capital of Escambia county, Florida, is 244 miles by rail ENE. of New Orleans, on the west shore of a deep bay opening into the Gulf of Mexico. The entrance is defended by Fort McRee and Fort Pickens, the latter on Santa Rosa Island; and near by is the

principal American naval air-station. Pensacola contains saw and planing mills, and ships large quantities of yellow pine. It was settled by the Spaniards before 1700, occupied by the British from 1763 to 1781, and afterwards during the wars with Napoleon, taken by Andrew Jackson from the British in 1814 and the Spaniards in 1818, and passed with the rest of Florida to the United States in 1819. Pop. (1880) 6845; (1910) 22,982; (1920) 31,035; (1925) 25,305.

Penshurst, a village of Kent, 5½ miles SW. of Tonbridge. Penshurst Place, rich in literary associations, was Sir Philip Sidney's birthplace.

Pensionary is the name formerly given to the syndic or legal adviser in every important town of Holland.—During the republic of the United Netherlands, the first minister of the province of Holland was called *Raadspensionaris*—Englished by State Pensionary, or, more commonly, Grand Pensionary. The Grand Pensionary had no vote in the assembly of the States, and could only bring forward the subjects of discussion. He, however, collected the votes, wrote the decrees, read the letters addressed to the States, conducted negotiations with foreign ambassadors and ministers, and took charge of the revenues of the province, and whatever else pertained to its welfare. The office was abolished in 1795, after the conquest of Holland by the French revolutionists. Olden Barneveldt, De Witt, and Heinsius were its most celebrated holders.

Pensioners. See GENTLEMEN-AT-ARMS.

Pensions may be broadly divided into superannuation allowances and rewards for special services. Great sums are required for superannuation in the various departments of state, including the consular, diplomatic, and colonial services, and in the fighting services. The pensions granted from the Civil List (q.v.) to persons in straitened circumstances who have merited special distinction by their discoveries in science or their attainments in literature or in arts, are altogether on a different footing from those in the civil service, which last are part of the condition of employment, and are thus in the

nature of deferred pay. Of the same nature is the retired pay of officers in Navy, Army, and Air Force, as well as the service pensions of other ranks. The enormous character of the burden of the non-effective services has given occasion for much discussion, and has called forth many suggestions. Thus, in the session of 1888 a motion was carried in the House of Commons, the effect of which is to restrict the system of compulsory retirement on pension of civil servants. The principle has been laid down that officials no longer required in their own departments who are still able and willing to render service for the public money should be provided with employment in other departments, instead of being forced to become useless burdens upon the country. Perpetual pensions must be regarded as somewhat of an abuse of the principle upon which a state rewards good and faithful servants. The matter became the subject of a parliamentary inquiry on the initiation of Mr Bradlaugh in 1887. A select committee was appointed, which, after taking evidence of a curious and interesting kind, recommended that no more pensions or allowances should be granted in perpetuity. This committee also reported in favour of the abolition of all sinecure offices with salaries but no duties, and recommended that all existing perpetual pensions, allowances, and payments, and all hereditary offices, should be determined and abolished. In commuting such pensions it has been laid down as necessary to differentiate cases of grants for actual services by the original grantees, and cases of mere gratuity. Where no service or merely nominal service was rendered either by the present holder or the original grantee it was proposed that the payment should in no case continue beyond the life of the present holder. In former commutations of perpetual pensions a scale of twenty-seven years' purchase was usually adopted. On or about this scale there were, between 1881 and 1887, 330 pensions and allowances of the annual value of £18,957 commuted for a sum total of £527,933. The rate was reported to be too high, and in the session of 1888 a motion was passed for giving effect to the recommendation of the select committee, and for a return in detail of all outstanding hereditary pensions and the circumstances in which they were granted. Pensions such as those of £4000 per annum to the Duke of Marlborough, and of £5000 to Earl Nelson, and to their heirs in perpetuity, are, of course, well understood as in return for 'value received' in special services to the state. In 1925 a pension of £2000 held by a great-great-grandson of the distinguished admiral Lord Rodney was commuted for £42,000, and the only pension of this kind then remaining was that enjoyed by the descendant of Earl Nelson. The objection to the principle of such pensions is that it is a burdening of posterity with payment for services rendered to one generation. The rewards for distinguished services should be defrayed by the generation receiving the benefit of them, and should be conferred upon the persons who actually render them, either in the form of a capital sum down, or of a life-pension only.

There are, again, a number of hereditary pensions conferred not for services, but as *solatium* for the loss of the fees of abolished offices. Thus, when the offices of Custos Brevium and Clerk of the Juries were abolished in 1837 the holders were compensated with hereditary pensions of £786 each. These were commuted on a basis of twenty-seven years' purchase. One of the numerous perquisites conferred by Charles II. on his illegitimate son, the Duke of Grafton, was that of Officer of the Pipe, or Remembrancer of First Fruits and Tenths of the Clergy in the Court of Exchequer. This office was sold by the duke in 1765, and when the fees were abolished the holder was compensated with a per-

petual pension of £62, 9s. 8d. A still more remarkable case was that of the hereditary office of Master of the Hawks, granted by James II. to the Duke of St Albans and his heirs for ever. The emoluments consisted of £391, 1s. 3d. as salary, £200 for four falconers, £600 for provision of hawks, and £182, 10s. for other provisions—together, £1373, 11s. 3d. This total was subsequently reduced to £965, at which it stood until commuted, in 1891, for £18,335, although there had been neither hawks nor falconers for many generations. A pension of £4000 per annum granted in 1779 to William Penn, the founder of Pennsylvania, and his heirs for ever, was in 1884 commuted for a ten years' annuity of £12,796, considered equivalent to twenty-seven years' purchase. In 1876 Charles II. granted to the Duke of Richmond and his heirs for ever a duty of one shilling per ton on all coals exported from the Tyne for consumption in England. One hundred years later that charge was converted into a perpetual pension of £19,000 (chargeable on the Consolidated Fund), which, again, was afterwards redeemed for £633,333, and invested in lands settled upon the duke and his heirs. The Duke of Hamilton, as Hereditary Keeper of Holyrood, has an hereditary pension of £45, 10s., and the descendants of the Heritable Usher of Scotland enjoy one of £242, 15s. These are a few of the examples of a wholly indefensible system. There are also limited hereditary pensions granted for a certain number of lives, which are not so unjustifiable, as, for instance, the pension of £4000 to the Duke of Wellington and two successors, and the pension of £2000 to Lord Napier of Magdala and one successor. In 1925 there was only one of these limited hereditary pensions in existence, namely, that held by Lord Senton, and this will terminate on the death of the present beneficiary. This system of reward for military service has not been adopted in recent years, the grant usually taking the form of a lump sum. Thus a grant of £30,000 was made to Earl Kitchener after the relief of Khartum. Earl Roberts received a sum of £100,000 on the conclusion of the South African war, an additional £50,000 being awarded to Earl Kitchener. After the Great War grants of £100,000 were made to Earl Beatty and Earl Haig, smaller sums being given to several other distinguished officers.

A minister of the crown who has held office (not necessarily continuously) for a specified period of service may claim a pension if his income from other sources is insufficient to maintain him adequately. The amount of pension is £2000, £1200, or £800, according to the office held; the number of such pensions is limited by statute to twelve. Similarly a Lord Chancellor of England is granted on retirement from office a pension of £5000, and judges of the Supreme Court are entitled to receive pensions equal to two-thirds of salary after fifteen years' service or on becoming permanently incapacitated from duty; county court judges and certain other officers of the courts are also granted analogous benefits. In the case of an established civil servant a pension calculated at one-eightieth of his final salary (or in certain circumstances the average salary of the last three years) for each year's service is granted on retirement at age sixty or over, or earlier if he has broken down in health, after not less than ten years' service; in addition a lump sum equal to one-thirtieth of salary for each year is paid on retirement. If death occurs during service a year's salary is payable to the officer's estate. The foregoing scales apply to male officers and are subject to qualifying conditions and limitations laid down in the Superannuation Act 1909; the benefits of women and of entrants before that act are somewhat different. The whole of the cost of the pensions of civil servants

is met out of public funds. The superannuation rights of elementary school teachers (and certain other classes of teachers) are prescribed in the Teachers' Superannuation Act, 1925; part of the cost is derived from the joint contributions of the teachers and the education authorities, and the balance from the Exchequer. Similarly the police are required to contribute towards the cost of their pensions.

The rules governing the award of pensions to officers and men in the Navy, Army, and Air Force are somewhat complicated and are varied from time to time owing, *inter alia*, to changes in the cost of living; for precise information, therefore, reference should be made to the official regulations applicable to the particular arm of the service. After the Great War the scales and conditions were extensively modified, and, as far as possible, the arrangements applicable to Navy, Army, and Air Force respectively were brought into line. Broadly speaking, pensions granted on retirement from service are based both on the rank of the officer or man and on his period of service. Navy pensions were first instituted in the reign of William and Mary. Those for officers may be classed as follows: good service pensions, Greenwich Hospital pensions, pensions for wounds, and the ordinary pension to which an officer may be entitled on retirement, now known as retired pay. No officer is entitled to a retiring pension until he is forty years of age; should he retire earlier he receives merely the half-pay of his rank, except in the case of junior officers who are invalided, when a further allowance is made. The maximum retired pay of an admiral of the fleet is £1800, admiral £1425, vice-admiral £1195, rear-admiral £1010; in these cases thirty years' sea service as a commissioned officer is requisite; in addition a good service pension of £300 may be held. The maximum retired pay of a captain is £900, commander £600, lieutenant-commander or lieutenant £450, the normal age at retirement being fifty-five, fifty, and forty-five respectively. The good service pensions, so-called, consist of ten of £300 a year for admirals, which may be held after retirement, and of eighteen of £150 a year for captains, those last are conferred on captains on the active list, and are relinquished when their holders are promoted to rear-admiral or retire. Seamen and marines are entitled to a pension after twenty-two and twenty-one years' service respectively (disregarding any period before attainment of age eighteen); the basic rate is 1½d. per day for each year's service, plus additions for 'very good character,' good conduct medal or badges. On attainment of age fifty-five an addition of 5d. a day is made, with a further increase of 4d. when age sixty-five is reached. Petty officers receive the seamen's rates, plus a rank allowance varying with length of service in that capacity. Greenwich Hospital pensions, which may be held in addition to ordinary pensions, date from the reign of William III., when Queen Mary established the hospital for infirm and aged seamen. These pensions range from £150 for flag officers to £30 for warrant officers; they are limited in number, and are divided into numerous classes. There are also pensions for wounds, varying with the rank of the officer or man and with the nature of the injury; and special pensions may be given to men unable to contribute materially to their support. Pensions are also given to the widows of officers in certain circumstances, and compassionate allowances made to their children or other dependants.

In the case of the Army the retired pay of an officer consists of a sum depending on his length of service (£150 after fifteen years, with an addition of £15 for each year in excess), plus an allowance for rank (e.g. £12 for each year

of service as a major); there are, however, over-riding maxima of £300 for a subaltern or captain, £450 for a major, rising to £1400 for a general. Non-commissioned officers and soldiers receive pensions similar to those granted to seamen; in their case too the basic rate is 1½d. a day for each year's service (21 years or over), plus rank allowance, and the increases at age fifty-five and sixty-five apply also. Formerly these age additions were granted only to naval pensioners, but the different branches of the service were brought in line after the Great War. In the Air Force the retired pay of an officer is similar to that of an Army officer of corresponding rank, but is further complicated by regard being had to whether he was employed on general duties (e.g. flying) or in the stores branch. Owing to the need for young flying officers a considerable proportion are granted short service commissions and on retirement receive only a gratuity. For other ranks the rates and conditions are generally similar to those applicable to soldiers, save that the normal period of qualifying service is twenty-four years instead of twenty-one years. Holders of the Victoria Cross and others who have been rewarded for gallant conduct receive additional allowances. The awards to officers and men invalided from the service on account of wounds or other injury depend, *inter alia*, upon the degree of incapacity.

GREAT WAR PENSIONS.—Soon after the outbreak of the Great War it was apparent that the pension schemes for disabled men and for widows during previous wars were unsuited to a war in which the whole nation took up arms. Revised scales were adopted by the Admiralty and the War Office which are set out in Parliamentary Paper Cd 7662 together with the superseded scales; the whole question was, however, referred to a Select Committee of the House of Commons, appointed in November 1914, which recommended further substantial increases. For example, the widow of a private soldier without children who in previous wars would have received a pension of 5s. a week, was granted a pension of 10s. (increasing to 12s. 6d. at age thirty-five and 15s. at age forty-five); and a widow with four children 22s. 6d. (or more if the mother was over thirty-five), in place of 11s. hitherto in force. In the case of men totally disabled, a private received a pension of 25s. (with an additional allowance of 2s. 6d. for each child); if the man was partially disabled he received such proportion of the above sum as would, with the wages he was capable of earning, amount to 25s., but in no case less than 10s. 6d. for the loss of a limb or an eye. Separate scales were laid down for various classes of officers, nurses, and non-commissioned officers, and also for dependants other than widows and children. During the early years of the war the award and payment of pensions to naval ratings was normally vested in the Admiralty, the corresponding functions in regard to soldiers being exercised by the Army Council. But with increase in the number of pensioners and the consequent administrative strain on the fighting departments the work was transferred to a new *ad hoc* department, the Ministry of Pensions, which became responsible from 1917 onwards for all war pensions payable to soldiers and seamen or their dependants; later, when the Air Force was constituted as a separate unit, the functions of the Ministry of Pensions were expanded. In 1917 the pensions warrants were revised in the light of experience in various directions [Cd 8485].

The principal changes were (1) to increase the pensions of disabled men, especially if they had children; (2) to apply the standard scales to men disabled in the highest degree, proportionately

smaller pensions being granted according to the prescribed degree (measured in tenths) of physical impairment, but irrespective of future earning power; (3) to grant supplementary pensions to disabled men or widows in addition to the normal scales where the man's status, judged by his pre-war earnings, indicated that the normal pension would be inadequate. A further revision was found necessary in 1918, largely owing to the increased cost of living due to the depressed purchasing power of money, and for the same reason it was found necessary to give further assistance to persons receiving pensions in respect of service in previous wars. After the armistice the whole position was reviewed by a Select Committee of the House of Commons set up to inquire and report upon the past method of administering the pensions acts and warrants and what steps, if any, were necessary for the removal and prevention of legitimate grievances. The committee recommended that special tribunals should be set up for the hearing of appeals as to title to, or amount of, pensions, such tribunals to be independent of the Ministry of Pensions, and their decision to be final and binding on both the Ministry and the appellant. With regard to the scales of pensions the committee recommended that these should be increased to meet the high prices then obtaining, and that power should be taken to increase or decrease the scales periodically as the cost of living rose or fell. The plan was adopted in a new warrant [Cmd 457 of 1919], but though the cost of living dropped very materially in subsequent years no adjustment of pensions was made. The following specimen rates taken from the warrant of 1919 represent the minimum weekly pensions applicable to a soldier whose disability is of the highest degree (e.g. loss of two or more limbs, total loss of sight, &c.): 40s. if single, 50s. if married, with an addition of 7s. 6d. for the first child, and 6s. for each subsequent child. The widow of such a man receives 20s. if not over forty and without children eligible for an allowance, or 26s. 8d. if over forty or with children, the allowances for children being 10s. for the first, 7s. 6d. for the second, and 6s. for each additional child. On remarriage the widow's pension ceases, but the children's allowances continue, and the widow is given a lump sum equivalent to one year's pension.

The arrangements referred to above, under which alternative pensions based on the disabled, or deceased, soldier's pre-war earnings could be claimed, were continued in the new warrant, with the necessary adjustments appropriate to the increased cost of living. In the case of N.C.O.'s, warrant-officers, &c., additions based on the man's rank are made to the scales applicable to privates. For officers the same general principles are involved, but there are important differences in their application. Stated briefly, a disabled officer of the rank of captain or under, whose disablement is of the highest degree, receives a pension of £210 per annum under the warrant of 1920; but where he would be entitled to more under earlier warrants because, for example, he was an officer in the regular army, his case is dealt with according to the more favourable scale. In cases of pecuniary need, additional allowances towards the cost of educating children are granted. Officers of higher rank are granted larger pensions, and proportionately reduced sums are payable to officers whose degree of disablement is less than the maximum. The pensions awarded to the widows of deceased officers are graded according to the rank of the husband and the number of children; for example, the widow of a captain receives £140 per annum, plus £36 for each child.

A disablement pension is at the outset generally a temporary award for twelve months, based on a

medical board's assessment of disablement arising out of injury or disease due to war service; it is reviewed periodically until the man's position has become stabilised, and a final award under the War Pensions Act of 1921 can be made.

The number of claims for pensions grew steadily during the war, until in the year 1919 the Ministry of Pensions had to deal with nearly 700,000 new cases. Up to March 1925 the aggregate number of awards (exclusive of allowances and gratuities for minor disablements) was over 2 millions, and the aggregate number of beneficiaries to whom compensation had been paid was 4½ millions. Owing to deaths, remarriages of widows, attainment by children of the maximum pensionable age of 16, and improvement in the health of pensioners, the number who were in receipt of pension or allowance at that date had fallen to 1,900,000.

Up to March 1925 the total expenditure for war pensions provided out of the Exchequer had amounted to about 600 millions, the cost in the maximum year, 1920, being over 106 millions. In 1923 the annual burden had fallen to 72½ millions, the corresponding figure in 1924 being 69 millions (of which less than 5 per cent. was absorbed in administrative expenses). The cost will diminish year by year as pensions terminate; and it has been estimated that the annual cost will drop to about 52 millions in 1930, 37 millions in 1940, and that it will not fall below 10 millions until after 1965.

NATIONAL OLD AGE PENSIONS belong to a different category, and may to some extent be considered as falling under the treatment of the poor (see POOR-LAW), but dissociated from the stigma and the disabilities of pauperism or workhouse conditions. The problem of the provision of suitable assistance for the aged poor is one which has attracted the attention of the governments of most civilised communities during the last half-century; so far as the United Kingdom is concerned, the question assumed a definite shape in the last decade of the 19th century, public opinion being especially drawn to the matter through Mr Charles Booth's investigations into the causes of the high rate of pauperism in old age. As a consequence, a Royal Commission was appointed to examine this subject in 1895, and was followed by further committees, but nothing was achieved until the Old Age Pensions Act of 1908. Under this scheme, which was admitted by the government spokesman on its introduction to be only a beginning and necessarily experimental, old age pensions at the rate of 5s. a week were granted to all persons (subject to the undermentioned exceptions) aged 70 or over whose yearly means did not exceed £21 (approximately 8s. a week), persons whose yearly means were between this amount and £31, 10s. receiving smaller pensions ranging from 4s. to 1s. a week, and those whose means exceeded £31, 10s. being disentitled to any pension. The scheme was limited to persons who had been British subjects for at least the last twenty years, and who had been resident in the United Kingdom during that period. Persons in receipt of Poor-law relief (other than medical or surgical relief) were excluded from the scheme, and also persons who before becoming entitled to a pension had habitually failed to work according to their ability for their maintenance and that of their dependants—a criterion which in practice has been found difficult to administer. Pensions were withheld also from pauper or criminal lunatics, and from persons convicted to be imprisoned without the option of a fine, while in prison and for a further period of ten years. Under the Act of 1908 the whole cost of the scheme is provided out of the Exchequer; the burden in the first complete financial year was 8½ millions sterling, which by 1916 had grown to 12½ millions. In 1916, owing to

the high cost of living due to the Great War, additional allowances not exceeding 2s. 6d. a week were granted to pensioners who were suffering special hardship through the war; and in 1917 these supplementary payments were made general, the standard rate of pension being increased from 5s. to 7s. 6d. At the close of the war a Departmental Committee was appointed to consider what alterations as regards rates of pension or qualification should be made in the existing scheme; the committee recommended that the standard rate of pension should be increased to 10s., and that the pension age of 70 should be retained, the cost of a non-contributory pension commencing at an earlier age being in their opinion prohibitive, the effect of substituting age 65 for age 70 being nearly to double the cost. The majority of the committee thought that pensions should be universal, all qualifications as to means being abolished; the minority, however, recommending that the existing means scale should be doubled. By the Act of 1919 the standard rate of pension was increased to 10s., and as regards qualification, the recommendation of the minority was adopted. The means test was further eased by an amending act in 1924; the full scale is granted where, in the case of a married man or woman, the combined means of a married couple do not exceed £139, 10s., or, in other cases, the means do not exceed £65, 5s., but is subject to reduction if the income of a pensioner includes earnings of more than £39. Proportionately reduced pensions are payable where the means are larger, until in the limiting case a married couple with a combined income of £177, 15s., or a single person with an income of £88, 17s. 6d., receives no pension.

The extension of the non-contributory pension schemes since its commencement in 1908 until 1924 had thus been substantial, being hastened by the changed value of money brought about by the Great War; and in view of the financial position of the country, the government decided that further developments, including the reduction of the pension age, for which there had long been advocates, should be financed on a contributory basis. The Widows', Orphans', and Old Age Contributory Pensions Act of 1925 extends the social services provided for the working population by adding to the existing schemes of health insurance, unemployment insurance, and workmen's compensation (see INSURANCE), a scheme of pensions for widows and dependent children, and old age pensions commencing at the age of 65 instead of 70, and passing, on the attainment of the latter age, into pensions under the Old Age Pensions Acts, freed, however, from the restrictions and disqualifications hitherto applied to such pensions. The Act of 1925, which extends to Great Britain, established the new scheme on a contributory and compulsory basis, interlocked with the existing scheme of National Health Insurance, and at its commencement in 1926 there were about 15 million contributors in Great Britain. The rate of contribution is ordinarily 9d. a week in the case of a man, equally divided between the workman and his employer, and 4½d. in the case of a woman, of which 2d. is payable by the employee and the balance by her employer; in addition, the Exchequer makes a substantial contribution, as explained below. The above scales of contributions apply to the first ten years of the scheme (1926-1935), in the following decennium a further 2d. (men), 1d. (women), equally divided between the workman and his employer, will be charged, the scale rising again by similar additions in 1946 and also in 1956; the weekly rate of contributions will thus be 1s. 3d. for a man and 7½d. for a woman from January 1956 onwards. The contributions are collected under the health insurance machinery, a combined stamp

being employed, covering the contribution payable under that scheme and also that under the new scheme; by this arrangement the troublesome complication which would have arisen had an insured person had to carry an additional contribution card and his employers to stamp it weekly was avoided. Persons who, after a specified period of compulsory insurance, cease to be employed contributors on becoming, for example, their own masters, are permitted to continue as voluntary contributors, and this privilege was extended to certain classes who had passed out of compulsory health insurance before the new scheme started, provided that they exercised their option to contribute within the first six months of the scheme; persons are not, however, permitted to be voluntary contributors under the pension scheme alone, but must pay the combined contribution for health and pensions.

Subject to certain qualifying conditions, the benefits provided for contributors are as follows:

- (a) *Widows' Pensions.*—10s. a week for the widow of an insured person, with an additional allowance for children up to the age of 14 (with extension to 16 if undergoing full-time instruction in a day-school) at the rate of 5s. a week for the eldest child, and 3s. a week for each of the other children. In the event of the widow remarrying the children's allowances continue, but her pension ceases.
- (b) *Orphans' Pensions.*—7s. 6d. a week for each child of an insured man, being a married man or a widower, or of an insured widow.
- (c) *Old Age Pensions.*—10s. a week to insured men and insured women between the ages of 65 and 70, and 10s. a week to the wives, aged 65 or over, of insured men who are themselves entitled to pensions. From 70 onwards the pension is continued under the Old Age Pensions Acts, but without the application of the means, residence, and nationality tests.

In addition pensions were given to women who had been left widows before the commencement of the act, if, broadly speaking, their husbands would have been insured persons at the date of death had the contributory scheme then been in existence; but no pension is given to a woman in this class unless she has dependent children, and the pension ceases when the youngest child attains the age of 14½. Similarly pensions are provided for children left orphans before the commencement of the scheme. The widows' and orphans' pensions began in January 1926; for old age pensions at 65 the date of commencement is January 1928; but in the transitional period pensions are provided from July 1926 for certain persons qualified by virtue of past insurable employment, over the age of 70, and for their wives or widows under the Old Age Pensions Acts, but without the requirements of those acts as to means, residence, and nationality.

The act provides for the scheme to be administered by the Minister of Health in England and Wales, and by the Scottish Board of Health in Scotland. A claimant for a pension who is dissatisfied with the decision of the Minister or the Board has ordinarily a right of appeal. Pensions are payable weekly by the Post-Office, and charged to a central pension account, to which the contributions and Exchequer grants are carried, the latter being fixed at four millions per annum for the first ten years of the scheme. Consequent upon the reduction of the pension age to 65 it was necessary to amend the National Health Insurance Act (see INSURANCE), the right to sickness and disablement benefits between the ages 65 and 70 being with-

drawn; in view of this adjustment of benefit rights the weekly rate of contribution payable under that scheme was reduced by 1d. (men), 3d. (women). Consequential amendments of a similar character were made in the Unemployment Insurance scheme.

The financial basis of the scheme is complicated and is fully explained in the Report of the Government Actuary on the Financial Provisions of the Bill (Command Paper 2406). Briefly it may be said that the joint-contribution on the ultimate scale payable after 1955 (1s. 3d. man, 7½d. woman) represents the appropriate contribution required from the age of 16 to 65 in the case of a young person entering into employment at the commencement of his career to provide for his old-age pension from the age of 65 to the end of life, and for a pension to his widow—that is to say, the benefits flowing from both the Contributory Pensions Act of 1925 and the Old Age Pensions Acts of 1908 to 1924.

In the case of persons of all ages entering between commencement of the scheme and 1955, and of persons over the age of 16 entering after that year, the contributions are not sufficient to support the benefits, for older entrants indeed they suffice to cover only a small fraction of the benefits. Following the plan adopted for health insurance in 1911, the flat rate of contribution is charged in respect of all insured persons irrespective of age, and the whole of the burden of 'making everybody sixteen' is assumed by the state, the cost of pensions year by year in excess of the contributions collected being defrayed out of the Exchequer. It will be seen from the figures given below that the state charge for pensions, including those payable under the Old Age Pensions Acts, 1908 to 1924, will be very substantial. The capital value of the liability assumed by the Exchequer in respect of persons brought within the scheme at the outset was estimated at 750 millions sterling.

The estimated annual charges on the Exchequer arising under the Contributory Pensions Act of 1925 and the Old Age Pensions Acts, 1908 to 1924, are shown below at decennial intervals:

	YEAR.			
	1930.	1940.	1950.	1960.
Pensions to:				
Widows and children	15*	26	84	38
Persons aged 65 to 70	14	20	21	21
Persons aged 70 and over	85	46	58	63
Total pensions	64	92	118	122
Contributions	28	30	36	42
Excess of pensions over contributions	41	62	77	80

* Figures in millions of pounds.

It will be observed that the cost is estimated to mount steadily during the next generation. As indicated above, the burden of war pensions is a decreasing charge, the estimated expenditure in 1930 being 52 millions, dropping to 37 millions in 1940, 27 millions in 1950, and 16 millions in 1960. The increase in the cost for civilian pensions thus tends to balance the decrease for war pensions. In a speech of great vision the Chancellor of the Exchequer, when outlining the contributory pensions scheme in his Budget speech, referred in the following words to the association of the new scheme with the wreck left by the Great War: 'I like to think that the sorrow and sacrifice and the suffering have been the seed from which a strong tree will grow, under which perhaps many generations of British people may find shelter against some of the storms of life. It is by far the finest war memorial you can set up to those who gave their lives, their limbs, their blood, and who lost their health or dear ones in their country's cause.'

Summary of Exchequer Cost.—The following

statistics (taken from an official return [Cmd. 2613] presented to parliament in 1926) indicate the cost to the Exchequer in respect of pension services of all kinds, and the increase of such charges since 1914:

	YEAR.	
	1914.	1925.
Pensions charged on Defence Votes	£6,906,000	£16,140,000
Pensions charged on Revenue Votes	1,516,000	3,622,000
Civil Service Pensions (including Consolidated Fund Pensions)...	866,000	1,530,000
Total for State Employees.....	9,348,000	21,290,000
State payments in respect of:		
School Teachers.....	244,000	4,522,000
Police Pensions.....	340,000	2,135,000
Total for State Employees, Teachers, and Police.....	9,932,000	27,956,000
Old Age Pensions.....	10,111,000	26,784,000*
War Pensions.....	..	66,494,000
Grand Total.....	20,043,000	121,244,000

* Due to rise by £5,700,000 in the following year owing to the new Widows and Orphans Scheme.

Pentacle, or **PENTAGRAM**, a stellate pentagon found on old Greek coins, used as a symbol of mystery, perfection, or of the universe by Pythagoreans, Neoplatonists, and Gnostics. It occurs on Abraxas Stones (q.v.), and was used as the device of various secret societies, some of them masonic, and hence appears in ecclesiastical architecture (as at Rouen). The 'wizard pentagram' was, in the middle ages, a symbol powerful in repelling evil spirits, and is familiar to readers of Goethe's *Faust*. On the doors of cow-houses it was held to keep off witches.

The pentacle, also called *pentalpha*, is often confused with the hexagram, a stellate hexagon, also used as a magic symbol in astrology, alchemy, and cabalistic lore. See **CIRCLE (MAGIC)**.

Pentacrinus. See **CRINOIDEA**.

Pentadesma. See **GUTTIFERÆ**.

Pentamerone, a famous collection of fifty folk-tales (Naples, 1637), written in the Neapolitan dialect, by Giambattista Basile, which are supposed to be told during five days by ten old women for the entertainment of a Moorish slave who has usurped the place of the rightful princess. Sir Richard Burton printed a complete English translation in 1893 (2 vols.). The *Pentamerone* stories are of the greatest value to the student of folk-tales.

Pentamerus Beds, in Geology, a name formerly applied to the upper and lower Llandovery rocks, owing to the abundance of the brachiopods called *Pentamerus*. See **SILURIAN SYSTEM**.

Pentameter. See **DISTICH**.

Pentapolis. See **CYRENAICA**.

Pentateuch, a Greek word (*pentateuchos*) meaning 'the five-volumed (book)', used by Origen (3d century A.D.) to denote what the Jews of his time called 'the law' (*Torah*). The same word was adopted into Latin. 'The five books of Moses' as a designation of the Pentateuch was first made current in the Western Church at a considerably later period; but the Jewish writer Josephus had long before stated that the first five books of the Old Testament canon 'belong to Moses.' The Greek names by which the five books are now known—Genesis, Exodus, Leviticus, Numbers (Arithmoi), Deuteronomy—have come to us from the Septuagint through the Vulgate Latin. The Mosaic authorship is nowhere affirmed in the books themselves, but it is suggested by certain obvious phenomena in various parts of them, though contradicted by others; and it had begun to be held before the Jewish canon was closed ('the law of

Moses,' Dan. ix. 11, 13; 'the book of Moses,' 2 Chron. xxv. 4, xxxv. 12). It soon became a fixed ecclesiastical tradition and a tacitly established point of Christian orthodoxy, and those who doubted or denied it were generally held to be hostile to Christianity. The facts which have led scholars to a contrary conclusion have already been indicated; see BIBLE, BIBLICAL CRITICISM (vol. ii. p. 121, col. 2; and p. 134). It is there seen that the Hexateuch (i.e. Pentateuch and Joshua) is of composite origin; that, *in their present form*, D (Deuteronomy) is commonly ascribed to a date not earlier than the 7th century B.C., and P (the 'Priestly' narrative and legislation) to the 5th, while the remaining sources J and E ('Yahwist' and 'Elohistic') are regarded as undoubtedly very much earlier, but several centuries later than the events they describe. This important conclusion, dating from about the seventies of the last century, is bound up with an entire reconsideration of the ordinary view of the Old Testament, and, though attacked from time to time, has never been seriously shaken.

Such are the many inconsistencies, and the differences of historical, social, ethical, and religious standpoint, that the composite character of the Hexateuch is undeniable. D and P can be pretty easily recognised and approximately dated, but the problems of JE are more intricate. On the one hand it has been found necessary to regard both J and E as themselves composite, or to postulate a third source. On the other hand some writers urge that the divine names, by reason of their different nature (Elohim, 'God' in general; Yahweh, the national God of Israel) and the variant renderings in the Greek MSS., are no sound criteria of diversity of source. Against this, however, it must be observed that the divine names, a very conspicuous clue in the early days of biblical criticism (from 1758), led to the discovery of other clues, the superior importance of which is proved by—to mention only one fact—the subsequent recognition (1853) that there were two distinct 'Elohistic' sources, the later being that which is now styled 'P'. It is true that the theory of the main sources J E D P and of their relative dates is by no means to be considered as final in all its details; but it provides a starting-point. So numerous and striking are the indications of diversity of authorship, milieu, and date that some adequate hypothesis is imperatively demanded; and no other has as yet made its appearance. It may be added that if, as is sometimes conjectured, some portion (at least) of the Old Testament was originally in cuneiform (Babylonian or Assyrian), the internal peculiarities would still require explanation, alike whether they are supposed to be due to the translator from cuneiform into Hebrew, or were already present in the presumed cuneiform original. Finally, since conservative writers generally allow that the Pentateuch, though 'substantially Mosaic,' has received some late alterations, and since one ancient tradition even ascribed to Ezra (5th century B.C.), the rewriting of the Law, the Pentateuch *in its present form*, is obviously the safest starting-point, although on the antiquity and value of its several contents there will naturally be wide divergence of opinion.

Modern research in the 'lands of the Bible' has thrown remarkable light upon the position of Palestine amid its highly developed neighbours, the antiquity of its own civilisation, and the extremely close relationship between the beliefs and practices of the Hebrews or Israelites (the latter a narrower term) and those of other peoples. In Babylonia and Egypt there were Psalms before David and Proverbs before Solomon. There were ethical ideas and elaborate laws before Moses, and the code of the Babylonian king Hammurabi (c. 21st century B.C.) finds many parallels in the Old Testament. Jerusalem itself had an interesting religious history before the Temple was built, and the Amarna Tablets (c. 1400-1350 B.C.) testify to well-organised religious ideas in Palestine before the entrance of Israel. There are numerous traces in the Old Testament of external influence, but the borrowers set their stamp upon all they received; and the more closely Palestine is linked by external evidence with other lands the more conspicuous becomes the independence of the Old Testament. Of the Hyksos kings in Egypt, their expulsion, and the numerous Egyptian campaigns in Palestine (see vol. iv. p. 241), the Old Testament writers have no certain knowledge; the few traces that have been conjectured (e.g. associating the patriarchs with the Hyksos) would, at the most, only emphasise the gulf between the facts revealed by ancient or contemporary evidence and the writers' recollection of them. No one can deny the probability of invasions like that described in Gen. xiv., but, as the chapter now reads, there are details which make it untrustworthy as a historical document. It is still difficult to find external evidence for the Exodus, though no one doubts that the Egyptians employed Semitic slaves, and that tribes could enter Egypt and return to Palestine. But since the incisive criticism of Bishop Colenso the untrustworthy nature of the biblical record has been increasingly recognised, and recent excavations in Palestine have refuted the sweeping conquests ascribed to Joshua. The

indubitable antiquity of writing does not prove the antiquity of our records, and the Pentateuch simply does not reproduce the history and conditions of the second millennium B.C. as we now know it from independent sources. The Old Testament has its own way of describing the past, and although it has undoubtedly preserved many genuine facts, its point of view stands as much in need of explanation as do the internal inconsistencies.

The religious uniqueness of the Old Testament, which gives it its permanent value, begins with the opening chapters of Genesis; that is to say, it characterises the *description* of the earliest history. It is a *religious* account of beginnings, due to the writers, and the problem of the Pentateuch turns on the study of this standpoint. There are remarkable differences between the account of the monarchy in Samuel-Kings and that in Chronicles, between the patriarchal stories and what is said in the late Book of Jubilees and Testament of the Twelve Patriarchs (c. 1st century A.C.), and equally between JE and E, and, finally, even between J and E. These differences are bound up with the internal history of Israel, and to understand them attention must be directed primarily, not so much to the question of the ultimate facts of history, as to the evident interests, aims, and scope of the writers. The later writings alone suffice to prove that certain names and details may be very much older than the context in which they now appear (e.g. the accounts of the patriarchs in Jubilees); and 'literary-historical criticism,' or the analytical study of the descriptions of the past, throws no little light upon the developments of life and thought at the time when, as it would seem, the narratives were taking shape.

The problem of the growth of the Pentateuch is intertwined with that of the teaching of the great pre-exilic prophets and with post-exilic Judaism. With Deuteronomy is connected both the account of the discovery of the Law-book in the reign of Josiah (c. 621 B.C.) and a characteristic 'Deuteronomic' treatment of the following books (Joshua-Kings). Not only is the latter of the 6th century (if not, in parts, later), but Deuteronomy itself is composite, and should probably, as some scholars think, be assigned as a whole to the 6th rather than the 7th century. Now, while behind D can be seen the influence of the prophets, we reach later a specifically 'priestly' tendency (5th century) with which are associated the P portions of the Pentateuch. P as a whole comes after D and before the age of Chronicles, where, in contrast to Samuel-Kings—and also to JE—there is a very striking priestly and levitical tendency. Finally, the 'priestly' phase precedes the 'wisdom' literature (e.g. Proverbs, Ecclesiastes), which reflects the Greek age. Consequently, the Pentateuch cannot be viewed apart from other portions of the Old Testament which, though they deal with other periods of history, date from the periods vital for its growth; and the historical and religious development of Palestine and the stages in the rise of the Old Testament form a single problem.

The middle centuries of the first millennium B.C. constitute the really great creative age in Palestine—and elsewhere. In history we pass from the fall of the Northern Kingdom (c. 722 B.C.) and that of the South (586), over the Exile, to the Return permitted by Cyrus the Persian (537). The rebuilding of the Temple under Zerubbabel (520-516) is followed by a strange blank, until we reach the reorganisation under Ezra and Nehemiah (the latter [c. 445] probably preceding the former), and finally the Samaritan schism. Meanwhile, we pass from the great condemnatory and rather iconoclastic prophets and the striking individualistic tendencies of Ezekiel—and more especially Jeremiah—to the unamed prophet of consolation and reconstruction (Is. xl. sqq.) and at length reach a distinctively priestly régime. From threat, confusion, and national decay we pass to a new nationalism. Yahweh, Israel's God, no longer punishes a disobedient people, but is Israel's Redeemer. Jerusalem and the Temple, no longer the centre of an unspiritual cult, are the seat of Israel's universal religion, and the more ethical and anti-ritual tone of the early reforming prophets gives way to one more priestly and ritualistic. What at first seems to be a reaction, after the teaching of the prophets,

can now be recognised as the transition from individualistic ethico-religious teaching to the establishment of a more national and systematised type of religion. So, while the earlier prophets taught the character and demands of Yahweh, the later step was the education of the people, and D already reflects the tendency to a 'book religion' which ultimately made Israel, under the law, the 'people of the book.' Unfortunately it is impossible to sketch the development save in the broadest outlines. Place has to be found for the fact that in the 'Second Isaiah,' and notably in the idea of the suffering 'Servant of the Lord,' the religion of Israel reached its high-water mark, a clear sign of internal (though as yet unknown) vicissitudes obviously of supreme significance. Further, in the little-known figure of Zerubbabel there is, as is shown by the contemporary prophets Haggai and Zechariah, a 'Messianic' figure (see MESSIAH), and a new monarchical movement, which, however, collapsed. It is noteworthy that in various passages, independently ascribed to about the 6th century, the monarchical idea recedes into the background, and it appears to be viewed with suspicion (note the subsequent allegation against Nehemiah, vi. 7). On the other hand the priestly idea gains in strength, and ultimately the high-priest, as regards dress, function, and position, is virtually the successor of the former kings, and the priestly religion of the Pentateuch presupposes a prior monarchical régime.

Along with these sweeping changes must be noticed the far-reaching importance of the same centuries for the world's history and religion. Great religious founders and movements of permanent significance can be traced in China (Lao-tse and Confucius), India (Buddha and Mahavira), Persia (Zoroaster), and Greece. Palestine has the 'Second Isaiah.' It was a new stage in the history of religion, especially marked by the appeal to the individual rather than to the tribe or nation. The map, too, was being redrawn. No longer Babylonia, Assyria, and Egypt hold the field; it is the age of Persia, Greece, and Rome that now dawns. The old Egypto-Semitic world was breaking up, and only in Palestine can an effective continuity be traced. It prepared the way for Christianity. So, while Assyria fell (612 B.C.), with amazing swiftness, and in Egypt and Babylonia there was a strange and sterile reversion to the past, Israel underwent a successful reorganisation, and the inauguration of post-exilic Judaism associated with the work of Nehemiah and Ezra throws into clearest relief the fundamental problem of the Pentateuch. Either it is (on the traditional view) a reassertion of the Mosaic of many centuries previously, the reintroduction of ancient writings, more or less untouched by the epoch-making changes which had intervened—even as Josiah is supposed to reintroduce the long-lost book of Deuteronomy (2 Kings, xxii. sq.); or (on the critical view) we have a combination of new and old, a reshaping of older law and tradition, with the addition of new regulations, a composition the precise character of which is slowly being determined.

Thus, on the modern view, the Pentateuch covers the close of one chapter of religion and history and the beginning of another, the break-up of one era and the dawn of a second. Such were the internal, social, and political vicissitudes that it becomes increasingly difficult to determine how much dates from the distant pre-monarchical age of Moses, Joshua, and the Judges. It is easier to understand the stages *after* the Pentateuch was once complete than the prior steps. Although all critics agree that the older portions (JE) date several centuries after the events they relate, it now becomes questionable whether as a whole they may safely be dated even as early as the 9th and 8th centuries

—that is, before the great changes began. The prophets, it is true, refer to the early history of Israel, but it does not follow that they knew the traditions in their present form; on the contrary, they presuppose the existence of an unspiritual religion, gross and cruel cults, and ideas and usages more in harmony with the surrounding religions, and with what external evidence would lead us to expect, than with the general religious conditions as described (in Genesis-Judges), or with the ideas which evidently actuated the writers. Indeed, JE, although it has popular, naive, and primitive ideas, represents a Yahwism which stands in contrast to the old religion both of the people and (as Josiah's reforms show) of the state. The features which seem to be below the spirituality of the prophets do not necessarily imply that the writers lived before the age of the great reforming prophets; they can be best explained as due to the usual compromise between 'higher' and 'lower' religion, and to the adjustment of the lofty teaching of the prophets to the masses—as can be paralleled elsewhere. Primitive ideas are in themselves no proof of antiquity, and the disintegration and confusion in and about the 6th century B.C. account for many features which otherwise seem to be a sign of early date.

In spite of various striking differences between JE, D, and P, the Pentateuch has a unity, a religious unity. A very close relationship between JE and P was recognised in the early days of Old Testament criticism, when P was dated *before* the other sources (vol. i. p. 134, col. 1). Conservative writers, too, justifiably emphasise the probability of a 'practical contemporaneity of authorship,' a 'co-operation between different writers'—though at an impossibly early date. In fact, if the different sources are more nearly contemporary, and JE *in its present form* does not precede the great prophets, JE may be regarded as one of the bridges between the reforming individualistic uncompromising prophets and the post-exilic priestly régime (P). Without P the teaching of the prophets would hardly have been preserved. But some bridge there must have been, and the higher religious ideas that are worked into JE do not lead up to the prophets but, rather, flow from them. The ethical reformers succeeded in purifying the gross and unspiritual religion which they constantly condemn and which has left its traces in the Old Testament, and the Pentateuch, as a whole, is the result. The Pentateuch in its present form represents only the last stage in a very intricate process of growth, although the non-canonical Jubilees and Twelve Patriarchs survive to prove that the patriarchal and other traditions continued to be further developed and reshaped.

The Pentateuch was the first part of the Old Testament to become canonical and to be translated into Greek. It is inextricably connected with the books that follow, and Genesis-Kings find, to a certain extent, a parallel in Chronicles-Ezra-Nehemiah. With Ezra-Nehemiah placed, contrary to the historical order, *before* Chronicles, the Jewish bible ended, not with a hint of the Samaritan schism (Nah. xiii.), but with the idea of the restoration of the Jews (2 Chron. xxxvi. 23), a far more inspiring finale for a scattered people. The connected narrative 2 Samuel ix.-xx. and 1 Kings i. sq. has been broken by 2 Samuel xxi.-xxiv., and both Josephus and the Lucianic recension make the main division at 1 Kings ii. 12. The end of Joshua and the beginning of Judges overlap (Josh. xxiv. 29, Judg. ii. 8), and although the books of Deuteronomy and Joshua are most closely related, the break is made after the death of Moses. Joshua ends with a meeting of all the tribes at Shechem, the ancient Samaritan holy city and with a solemn covenant and law-giving there (Josh. xxiv.); but although the north is prominent in Deuteronomy (cf. xi. 26, xxvii.), it is the single central sanctuary at Jerusalem to which D as a whole now points, and the Pentateuch, in a sense, less 'Samaritan' than the Hexateuch. Relations between Judah and Samaria were variable. An anti-northern spirit appears in the account of the rise of the monarchy, where Saul is rejected in favour of David, and in the attitude in Kings and Chronicles to the schismatic Jeroboam and his successors—although the Yahwism at Jerusalem prior to Josiah's reformation could scarcely

afford to throw stones. It reappears, perhaps, in the slight attention in Joshua to the cities of the central tribes, also in the attack upon Shechem (Gen. xxxiv.), and in the view that Jacob left his idols there before journeying to Bethel (xxv. 4). In Gen. there is a greater interest in Judean and S. Palestinian matters, and little is told of the northern tribes. Again, although Judah is reckoned one of the 'sons' of Israel, and the passage in Deuteronomy xxxiii. 7 regards him as severed from his 'brethren', the Judean history characteristically emphasises the fall of the northern kingdom (Judah and Israel being rival states) and the exile of the ten tribes, as though Judah was the sole representative of the true Israel; whereas to both Jeremiah and Ezekiel the north was as truly Yahweh's as was Judah, if not less sinful (Ezek. xxiii.). Unless the north had accepted Deuteronomy it would hardly have taken, as it ultimately did, the whole Pentateuch—the Samaritans have their own traditions of the heroic Joshua—but the Pentateuch seems to have undergone a special revision after it was separated from the book of Joshua and before it was received by the Samaritans, and consequently the fluctuating relations between north and south, although extremely difficult to trace historically, are very important for the literary history of the Pentateuch and the rest of the Old Testament.

The centre of the Pentateuchal problems lies in Exodus, xxxii.-xxxiv. (JE). Here Moses, descending from Sinai (Horeb) with the Decalogue, incensed at the worship of the golden calf, breaks the tables of stone; but later, after interceding successfully on behalf of the people, returns to the mount in order that the Decalogue may be rewritten. But (a) in Exodus xxiv. 10-28 we have, instead, another series of laws, with parallels in Exodus xxi.-xxiii. and partly of a more ritual, more primitive and less ethical character. (b) The JE section is separated by P from other JE passages, viz. Numbers x. 29-36, xi. sqq. (the journey from Sinai, the election of elders to relieve Moses) and Exodus xxiv. (the elders at the solemn meeting on Sinai), with both of which it is closely connected (in Exodus xxxiii. 12 Moses seeks help, cf. chap. iv. where the Levite Aaron is appointed). (c) The tent of meeting, at which the elders receive the divine spirit (Num. xi.) is, as described in Exodus xxxiii. 7-11, a simple structure, entirely different from the elaborate tabernacle that characterises P. The account of the latter (which replaces some earlier and fuller account of the tent), is given in Exodus xxxv.-xl. which supplement the instructions to Moses in xxv.-xxxi. (continued in Leviticus viii.-x.). (d) As for the rest of P, Leviticus i.-vii. (sacrificial ritual) and xi.-xvi. (laws of uncleanness, &c.) are characterised by the idea of Yahweh's 'holiness', and in xvii.-xxvi. a distinctive body of laws has as its central idea the holiness of the people to conform with Yahweh's holiness. The latter section is styled by critics H (the Law of Holiness), and may be said to contain the theory of the 'holy' relationship between Yahweh and Israel and all it implied. (e) Corresponding to this in JE is the insistence upon Yahweh's holiness, against which not even Moses and Aaron might offend (Num. xx. 12, 24), and the idea of Israel as a kingdom of priests and a holy people (Exodus xix. 6): note in Numbers xi. 29 Israel as a nation of prophets. But there are strange stories of jealousy and privilege in Numbers xii., and in the markedly composite xvi. where P deals with a strife (1) between Levites and non-Levites, and (2) between Aaronite Levites and other Levites. The insistence upon spiritual prerogatives is noteworthy, and (f) P in Numbers i.-x. (regulations for Levites to assist in the priestly offices) regards the Levites as a bulwark (Numbers i. 58) to protect the people from offending against the divine majesty (cf. J's idea in Exodus xix. 21-26). P thus leads up to the journey from Sinai (described by both JE and P, Numbers xi. sqq.). (g) The selection of the Levites comes, according to JE, after the worship of the golden calf (contrary to the Decalogue, Exodus xx. 3 sq.); with their fierce zeal may be compared the reforms of John and the Rechabites (2 Kings x.). But the calf-cult, here associated with Aaron, and elsewhere with the first king of the schismatic north (cf. 1 Kings xi. 28 with Exodus xxxii. 4), was once as orthodox as must have been the brazen serpent which so long remained in the temple of Jerusalem (2 Kings xviii. 4). (h) Moreover, elsewhere the selection of the Levites is associated with the very place where both Moses and Aaron incurred Yahweh's wrath for their failure to respect his holiness (Deut. xxxii. 51, xxxiii. 8 sq.). The place, it would seem, was Kadesh, the original scene of the older traditions. (i) The present narratives of the journey to Sinai (Exodus xvi.-xviii.) belong, on internal grounds, to the stage after Sinai; the subject-matter is related to the account of the journey from Sinai to Kadesh (Num. xi. sqq.), and such is the original importance of Kadesh that the present prominence of Sinai (Horeb) and the Decalogue belongs to quite a later stage in the development of the traditions.

(j) There are traces of the description of a separate journey of Israel from Kadesh northwards to Palestine (the victory, Num. xxi. 1-3). With this can be connected an important group of traditions associating Judah and south Palestine. All have been mutilated, and adjusted to the account of the circuitous journey which culminates in Joshua's invasion and in the appearance, in the south, of the tribes of Judah and Simeon (Judges i.). For this detour the defeat of Israel at Hormah (Num. xiv. 45) prepares the way, and, among other adjustments, Caleb, an independent figure of semi-Edomite origin, afterwards found at Hebron, is subordinated to both Judah (Judges i.) and Joshua (Josh. xiv.). Further (k), there are certain striking parallels between the account of the entrance of the tribes of Israel under Joshua and traces of a tradition of the entry of the

sons of Israel (Jacob) and their settlement (cf. Jacob's conquest of Shechem, Gen. xlviii. 22). Finally (l) The story of Joseph seems to link together the traditions of a conquest and settlement (almost wholly lost) with those of a descent and a re-entry after the exodus from Egypt. On a variety of grounds it is clear that not all Israel left Palestine and returned, but the Joseph-tribes (central Palestine) seem, to judge from the story, to be specially connected with Egypt; and whereas the Israelites could leave Egypt to bury Jacob and return again, the removal of Joseph's bones is one of the motifs of the exodus (Gen. i. 25, Josh. xiv. 32).

The account of the patriarchs, the descent into Egypt, the exodus, the law-giving at Sinai, and, finally, the conquest of Palestine by Joshua has been seen to represent only a relatively late view of the early history. Behind the Pentateuch are traces of lost traditions of quite another stamp. Something was known of the Nephilim, a Titan-like race (Gen. vi. 4; Num. xiii. 33), a tradition of a familiar type, but quite out of place in Gen. i.-xi. Like the accounts of Cain and Abel, and the beginnings of civilisation, it virtually ignores the story of the Deluge; while, behind the story of Lot, the destruction of Sodom and Gomorrah, and the origin of Moab and Ammon (Gen. xix.), there is another tradition of widespread destruction, but differing in spirit and ethnological interest from that of the Deluge. That the worship of Yahweh began with Enosh ('man'), the grandson of Adam (Gen. iv. 26), could only belong to some curiously independent tradition, and if, as some data suggest, Yahweh was closely associated with the Kenites (Cain), the clan of Moses' father-in-law, and with the Midianite and other peoples of South Palestine, the question arises whether the Kenites and related clans actually introduced the worship of Yahweh into Palestine, or (more probably) were responsible for a new stage in the history of Yahwism. New religious influences were due to the clans from the desert no less than to the prophets, but even after the age of Elijah (note his visit to Horeb, the mount of God, 1 Kings, xix.) such influences upon the religion may be expected both when Sargon introduced nomad tribes (partly Midianite) into Samaria in 715 B.C., and later, from the references to active movements among desert tribes in and about the 6th cent.

The Pentateuch as a whole, with its descent into Egypt and its exodus, quite ignores the standpoint of those who remained behind in the land. The true Israel went down as 'sons' and re-entered as 'tribes' (Gen. xlvii.; cf. Num. xxvi.). Similarly the history of the fall of Jerusalem and the Return from exile in the 6th century is indifferent to the standpoint of those who did not participate in it, and Ezra ii. purports to be the list of men who returned 'to Jerusalem and Judah, each man to his city.' But the value of this list is doubtful, and critics tend to the view that the native population was not negligible, and may even have built the temple under Zerubbabel. The most important return of exiles came later, in the age of Nehemiah and Ezra. Moreover, not only is the anticipated return of exiles regarded as almost a second exodus (Is. xl. sqq.), but the Pentateuch had not yet received its present form, and the traditions of the exodus itself must have been in a fluid state. The Pentateuch gains immeasurably in significance when its growth is associated with those middle centuries of the first millennium B.C. during which a people, amid great political and social confusion, were moving towards a 'Promised Land,' and the unknown prophet of Is. xl. sqq. was heralding a new age. Some stages in the development can perhaps be recognised. Instead of the laws of the old kingdom, with all its commercial and military interests, we have those of a simple agricultural life. There is, notably in D, a striking appeal to religious and humanitarian feelings. A new public opinion is in course of formation, a new era is

inaugurated by special covenants. The popular stories (JE) point to a people who are being instructed in their place in history, in the origins of their race, their institutions, and their sanctuaries. Ideas of divine care and providence and the inculcation of kindness and hospitality are set forth in stories behind which can be discerned the traces of an obsolete culture. The God of Israel was directly interested in his own people; no people ever had such a God, nowhere else was the link so intimate. Israel was his own treasure (Exod. xix. 5). But there were duties as well as privileges, and Israel's destiny entailed discipline. Democratic in its spirit as the older religious standpoint is, we become conscious of another note when men must not put their God to the test (Deut. vi. 16), as, for example, a Gideon and even an Abraham had done (Judges vi. 36; Gen. xv. 8). People and leaders alike must respect God's holiness; and Israel, theoretically a holy people and a nation of priests (Exod. xix. 6; cf. Num. xi. 29), needs the mediation of the priesthood, and there is a representative sacred caste to keep the people from the sacred altar. There is a perceptible transition from confidence and joyousness (JE) to a certain restraint, if not timidity (P). The sense of sin and the need for atonement become very striking. The priest atones and performs the necessary ritual for the removal of guilt. The priestly ritual expressed the new consciousness of sin, but did not create it; and the highly developed sacrificial system, with its atoning value, seems to come after Is. liii., if it is not powerfully influenced by the circumstances behind that chapter. In the Second Isaiah (ch. xl. *sqq.*) extravagant hopes of a new age give way to disillusionment; and Is. liii., with its mysterious allusion to the atoning death of some human victim, is the echo of some shock, though the historical background (? c. 500) is quite unknown. Moreover, men told of the world-wide Deluge, the result of man's wickedness, and the confident attempt to storm the heavens (Gen. xi.); Yahweh's sanctity was attacked (as in the story of Eden, Gen. iii. 5), and mankind was scattered, and the history of the chosen people begins with Abraham (Gen. xii.). Men had sinned, and the Deluge swept the earth; but God would no more destroy life (Gen. viii. 21 *sqq.*), even as he would no more forsake, as he had forsaken, his people Israel (Is. liv. 7-10; Jer. xxxi. 35 *sqq.*). Ideas of this sort, suggestive of some false start after an age of turmoil, and woven into the history of an exclusive Israel, dwelling amid heathen Canaanites and possessing an elaborate priestly system, point indubitably to definite historical vicissitudes, though at present they can hardly be conjectured.

The Persian age was cosmopolitan and syncretistic, and the inauguration of Judaism was the victory of the narrower and more exclusive Jews to whom Persian tolerance, and the tempting identification of the Israelite Yahweh and the highly ethical Persian god Ahura-Mazda—in the Greek age it was to be Zeus—would be anathema. There might be a world-wide Yahweh, a religious universalism (Mal. i. 11), but Jerusalem must be the centre (Is. ii. 8), and extreme intensive steps were the road to any extension of the new Judaism. There are signs of different sorts of exclusiveness in the later parts of the Pentateuch, and in the steps taken by Nehemiah (xlii. 1) and Ezra (x.) to purge the community. There are also hints of priestly rivalries (e.g. Moses and Aaronites), though the elevation of the Jerusalem Zadokites over other Levites, as ordained in Ezekiel xlii., and as represented in the account of the rise of Solomon (I Kings i.), was complete before the Pentateuch was finished. But there are traces of compromise among the priests; and the Pentateuch, like the Old Testament itself, with its varied contents and differing points of view, is no less a compromise. It shows by its composite character that it has passed through several hands; and, although the last were priestly, it combines the popular and the priestly, the homiletic and the legalistic, like the Midrashic and Mishnaic elements in the Talmud. It contained, at least in germ, all that Israel needed: a canonical history (cf. Neh. ix; Ps. cvi.); it was the source of its theology and (in Alexandria) of its philosophy. Men idealised the temple (Ps. lxxxiv. 10), the sacrificing priest (Ecclus. i.), and the Torah itself (Ps. cxix.). The Law (Torah)

gave Israel a norm. There was freedom within it when it was approached through the prophets, but when the emphasis was laid upon the letter and the prophets were forgotten, it could be and was deadening. So, in the age of Greek syncretism, when Zeus was the rival of Yahweh, the Maccabean revolt, animated by the spirit of the Torah, gave a fresh impulse to Judaism, but deteriorated as it passed from fiery enthusiasm to fanatical zeal.

Accordingly, the genius of Israel manifests itself not only in the prophets of Israel—and especially the writers of Isaiah xl. *sqq.* and the unknown figure behind Isaiah liii.—but also in the authors of the imperishable charming narratives of the Pentateuch, and in the fine constructive work which marks the Pentateuchal history as a whole. Not as some pre-monarchical epic of the 14th and 13th century B.C., but as the outcome of a period of immense significance for ancient history and religion (7th to 5th century B.C.), it embodies some profound developments which, however, cannot as yet be clearly traced. The pregnant ideas which live in its narratives were the living experiences of a fateful period; and just as the prophets had implied that men already knew of themselves the Law of Yahweh, so, when the Torah was composed and promulgated, it presents itself as ostensibly of ancient origin. But it was so fundamental a reshaping of the old that it gave new life to an old land in a way that an authentic work of bygone centuries could never have done. Thus it came to pass that in striking contrast to Egypt and Babylonia, with their conscious archaism, in Israel alone we find continuity and reconstruction, and (in the words of the chief founder of the modern position in Old Testament criticism), 'The Mosaic history is not the starting-point for the history of ancient Israel, but for the history of Judaism' (Wellhausen).

The Pentateuch holds the central place in the study of the Old Testament; see the literature, vol. i. p. 129. Besides the 'introductions' by Driver (9th ed. 1913), Cornill (1907), Sellin (1923), and the special works on the Pentateuch by A. T. Chapman (1911) and D. C. Simpson (1924), see especially the annotated translations by Addis (1892-98), Kent (1904), and especially Carpenter and Harford-Battersby (1900). The best conservative work is J. Orr, *Problem of the Old Testament* (1905). Among special studies are those of Meyer and Luther (1906) and Smend (1912), both in German; for special points see S. A. Cook in *Camb. Anc. History* (vol. ii. chap. 14; vol. iii. chap. 20).

Pentecost (Gr. *pentēkostē*, 'fiftieth') was the name given to the Jewish feast held on the fiftieth day after the Passover, in celebration of the 'ingathering,' and in thanksgiving for the harvest (see **FESTIVALS**). From the Jewish use it was introduced into the Christian, and with special solemnity, as being the day of the descent of the Holy Ghost on the apostles, and of the first solemn preaching of the Christian religion. From early times pentecost has been regarded as one of the great festivals of the Christian year, and it was chosen as one of the times for the solemn administration of baptism; and the English name of the festival, *Whit-Sunday*, is derived from the *white* robes in which the newly-baptised were clad. It is regarded as specially sacred to the Third Person of the Blessed Trinity. Many curious usages were anciently connected with the celebration. The figure of a dove (an emblem of the Holy Ghost) suspended by a cord from the ceiling was in some churches lowered so as to alight on the high altar during the service; in others figures of cloven tongues were similarly introduced. In some places in the East, and in the West too, the practice prevails of decorating the churches with evergreens and flowers, as is done in England at Christmas.

Pentelicus. See **ATHENS**, and **MARBLE**.

Pentland Firth, a channel between the Atlantic and German Oceans, separating the main-

land of Scotland from the Orkney Islands. It is 14 miles long and 6½ miles broad at the narrowest. The Pentland Skerries, 5 miles north-east of Duncansby Head, consist of two islets and of several contiguous rocks. The navigation of the Pentland Firth is more dangerous than that of any other portion of the Scottish seas, a current from west to east flowing through it with a velocity of from 3 to 10 miles an hour, and causing numerous eddies and whirlpools.

Pentland Hills, in the Lowlands of Scotland, extend 16 miles south-westward from within the burgh boundary of Edinburgh, through the counties of Midlothian, Peebles, and Lanark, have a breadth of 4 to 6 miles, and attain a maximum height in Carnethy (1890 feet) and Scald Law (1898). In the battle of the Pentlands or Rullion Green, 2 miles N.W. of Penicuik, Sir Thomas Dalrymple routed 900 westland Covenanters, 28th November 1666.

Pentonville, a populous district in London in the borough of Finsbury, the first buildings in which were erected in 1773 on fields belonging to Henry Penton. The name has since been extended to part of Islington, in which in 1840-42 *Pentonville Prison* was built on the radiating principle, so as to admit of thorough inspection.

Pentremites, fossil Crinoids common in the Carboniferous System (q.v.).

Pentstemon, an American genus of Scrophulariaceae, consisting of herbaceous or sub-shrubby species mostly yielding flowers of great beauty. Few of them are hardy enough to endure the winter climate of Britain, where consequently they are propagated annually by cuttings, which are protected in frames during winter and planted in the flower-garden in March or April. The numerous garden varieties of *P. gentianoides*, *P. Hartwegii*, and others are among the most popular of garden flowers. But there are many species even more beautiful than these, which are occasionally to be met in collections of rare plants. Of such may be mentioned *P. azureus*, *P. secundiflorus*, *P. Murrayanus*, *P. miniatus*. *P. levigatus*, found from Florida to Pennsylvania, deserves to be planted by beekeepers wherever it would grow.

Penumbra. See ECLIPSES.

Penza, a large rural town of Russia, 330 miles by rail S.E. of Moscow, has a cathedral (17th century), a botanical garden, and manufactures of paper, soap, &c.; pop. 80,000.

Penzance, a town of Cornwall, the most westerly in England, at the head of Mount's Bay, 10 miles E.N.E. of Land's End. Standing on a finely-curved shore surrounded by rocky eminences, it is famous for its mild, equable climate, though the annual rainfall is heavy (43 inches). Its fine esplanade commands splendid land and sea views; and its chief buildings, constructed largely of granite, include a market-hall (1837) with a statue before it of Sir Humphry Davy (q.v.), an infirmary (1874), a post-office (1883), and public rooms (1867), Italian Renaissance in style, and comprising a guildhall, museum, library, &c. The harbour has two piers (1772-1845) half a mile long, forming a tidal basin of 21 acres; and docks. Mackerel and pilchard fisheries, market-gardening and flower-growing are important industries. Much in favour as a watering-place, Penzance has regular sailings to the Scilly Islands. Burned by Spaniards in 1595, and sacked by Fairfax in 1646, it was incorporated in 1614, and from 1663 to 1838 was one of the five 'coinage towns.' Pop. 12,000.

Peonage, a system of agricultural servitude common in Mexico (q.v.) and some other parts of Spanish America. The peón in debt to his employer was by the Spanish colonial system bound to labour for his employer till the debt was paid.

Peonage in New Mexico was abolished by act of congress in 1867. Formally abolished elsewhere, it survives in effect in remote regions.

Peony (*Paeonia*) a genus of Ranunculaceae, with large showy flowers composed of five leafy herbaceous sepals, 5 to 10 petals, numerous stamens, and 2 to 5 carpels, each with numerous round, black, shining seeds. The leaves are compound, the leaflets variously and irregularly divided. The fibres of the root are often thickened into tubers. The species are large herbaceous perennials, or rarely half-shrubby, natives of Europe, Asia, and the north-west of America. None of them are truly indigenous in Britain, although one (*P. corallina*) is undoubtedly naturalised on Steep Holme Island in the Severn. On account of the beauty of their flowers, some of them are much cultivated in gardens, particularly the Common Peony (*P. officinalis*), a native of the mountain-woods of the south of Europe, with carmine or blood-red flowers. A variety with double flowers is common. The White Peony (*P. albiflora*) is another favourite species, of which there are now many beautiful varieties which have originated in French and Belgian gardens. It is a native of the central parts of Asia. Its flowers are fragrant. The Tree Peony, Chinese Peony, or Mountain Peony (*P. Moutan*), is a half-shrubby plant, a native of China and Japan. In favourable circumstances it attains a very large size, and a height of 12 feet or more. It has long been cultivated in China and Japan; and is now also a favourite ornamental plant in the south of Europe, but is too tender to endure the climate of Britain, except in the most favoured parts; it is, however, often to be met with in conservatories, being of a very distinct and ornamental character when in flower. It flowers in spring. The varieties in cultivation are numerous. It is propagated by cuttings and also by grafting. The roots of most of the peonies have a nauseous smell when fresh, and those of the Common Peony were in high repute among the ancients as an antispasmodic—hence the name Peony, from *Paion*, a Greek name of Apollo, the god of medicine; but their medicinal properties are now utterly disregarded.

Peoria, capital of Peoria county, Illinois, on the west bank of the Illinois River, at the outlet of Peoria Lake, 160 miles S.W. of Chicago. It is an important railway centre, and is connected by steam navigation with the Mississippi and by canal with Lake Michigan. It contains a Roman Catholic cathedral, colleges, and hospitals. The streets are wide, and there are many parks, the largest Jefferson (35 acres). Mines of bituminous coal supply the city's numerous and varied manufactories. Much grain is shipped. In the lower city are large stockyards. Pop. 76,000.

Peperino, a variety of tuff, met with in the Alban Hills near Rome. It is dirty grayish brown to white, earthy, and granular, and contains crystals of mica, leucite, augite, &c., with fragments of limestone, basalt, leucite-basalt, &c.

Peperomia. See PIPERACEÆ.

Pepin, or PIPPIN, surnamed 'the Short,' king of the Franks, was the son of Charles Martel and the father of Charlemagne, and founder of the Frankish dynasty of the Carolingians (q.v.). Charles Martel shortly before he died divided his kingdom between his two sons, Carloman and Pepin, Carloman taking the German part, and Pepin the Neustrian or territories in northern France; still they were only rulers (dukes) in the name of the Merovingian king. Carloman, after six years of office or rule, was persuaded by the English monk Boniface to enter (747) the monastery of Monte Cassino; his duchy passed over to Pepin. St

Boniface in 751 crowned Pepin king of the Franks at Soissons, Childeric, the last of the *fainéant* Merovingians, having been deposed and his very able substitute chosen king in his stead. Pepin rested his power in great part upon the bishops and monks; accordingly, when Pope Stephen III. was hard pressed by the Longobards (Lombards) under Aistulf, he came (754) to France to solicit help from the new king of the Franks. Pepin led an army into Italy, compelled Aistulf to become his vassal, gave to the pope the title of exarch (of Ravenna), a title of the Roman empire, and so, by this 'Donation of Pepin,' laid the foundation of the temporal sovereignty of the popes; himself he made 'patrician of the city of Rome'—all this in 756. The church in his own dominions he placed under the supremacy of the pope. The rest of his life was spent in semi-crusading wars. Before going to Italy he had already attempted to convert the heathen Saxons at the sword's point; he went on with the 'holy' work in 757. Then he drove the Saracens back over the Pyrenees (758) and made (760-768) repeated incursions into Aquitania, though he never permanently conquered it. He died in 768, and his sons Carloman and Charlemagne divided his territories between them.—There were other rulers of this name amongst the Carolingians. PEPIN OF LANDEN (died 639), with the help of Bishop Arnulph of Metz, was appointed *major domus* or viceroy of Austrasia under Lothair II.—PEPIN OF HERISTAL (died 714), his grandson, succeeded as mayor of the palace in Austrasia, to this added after 687 the similar viceroyalties of Neustria and Burgundy, and called himself 'Duke and Prince of the Franks.' He was their real ruler during the reigns of the puppet kings Theodoric, Ludwig III., Childbert III., and Dagobert III., and fought successfully against the Frisians, the Alemanni, and the Bavarians.—PEPIN, the son of Charlemagne, who was born in 778, was crowned king of Italy in 781, fought against the Avars, the Slavs, and the Saxons, drove the Saracens out of Corsica, and conquered Venice (810). He died in 810.—PEPIN, son of Louis the Pious, was made king of Aquitania, revolted twice against his father and deposed him, but finally restored him, and protected him until he himself died (838). See CARLOVINGIANS, FRANCE.

Pepper (*Piper*), a genus of Piperaceæ (q.v.),



Black Pepper (*Piper nigrum*).

which once included the whole family, but, as now limited, consists of plants with woody stems, solitary spikes opposite to the leaves, and flowers on all sides, the flowers mostly hermaphrodite. The most important species is Common or Black Pepper (*P. nigrum*), a native of the East Indies, now cultivated also in many tropical countries; its berry or drupe being the most common and largely used

leaves. The fruit is about the size of a pea, of a bright-red colour when ripe, not crowded on the spike. In cultivation the pepper plant is supported by poles, or by small trees planted for the purpose, as it loves a certain degree of shade, and different kinds of trees are often planted for this purpose in India. It is propagated by cuttings or suckers, comes into bearing in three or four years after it is planted, and yields two crops annually for about twelve years. When any of the 'berries' of a spike begin to change from green to red all are gathered, as when more fully ripe they are less pungent, besides being apt to drop off. They are spread on mats to dry in the sun, and separated from the spikes by rubbing with the hands or by treading with the feet, after which they are cleaned by winnowing. The Black Pepper of commerce consists of the berries thus dried, which become wrinkled and black; White Pepper is the seed freed from the skin and fleshy part of the fruit, to effect which the dried fruit is soaked in water and then rubbed. White pepper thus prepared is of a whitish-gray colour, but not unfrequently undergoes a bleaching by chlorine, which improves its appearance at the expense of its quality. Black pepper is much more pungent than white pepper, the essential constituents of the spice being more abundant in the outer parts of the fruit than in the seed. Pepper depends for its properties chiefly on an acrid resin and volatile oil; it contains also a crystalline substance called *Piperin*. The fruits of other species of Piperaceæ are used as pepper in their native countries. That of *Piper longum* yields the Long Pepper of commerce. It has woody climbing stems, solitary spikes opposite to the leaves, dioecious flowers, and the fruits so close together on the spikes as in ripening to become a compact mass. The spikes are gathered when unripe, and dried in the sun. They are used in pickling and for culinary purposes, also in medicine for the same purposes as common pepper. They are generally reputed to be more pungent than common pepper. Benin pepper is *Piper Clusii*. *Peperomia Koenigii* is cultivated in eastern India, Ceylon, and Java. The root and thickest part of its stem are extensively used in India as a stimulant medicine. See also BETEL, CUBEBS.

Pepper acts on the skin as a rubefacient and vesicant, and is often used for this purpose in a powdered state, moistened with some kind of alcoholic spirit. It is also employed as a local stimulant in relaxation of the uvula, and is applied in the form of an ointment to ringworm. Taken into the stomach in small quantities it is a pleasant stimulant, but in large doses it produces great pain and irritation. The quantity used, however, by the natives of hot climates much exceeds anything known among Europeans, and the effects are evidently beneficial rather than injurious. The chief use of pepper is as a spice and condiment.

Pepper was known to the ancients; Hippocrates employed it as a medicine, and Pliny expresses his surprise that it should have come into general use, considering its want of flavour. In the middle ages pepper was one of the most costly spices.

The name pepper is popularly given to substances possessing a pungency resembling that of pepper, although produced by very different plants. Thus, Cayenne Pepper is the produce of species of *Capicum* (q.v.), of the family Solanaceæ; Jamaica Pepper, or Pimento (q.v.), of species of *Eugenia*, of the Myrtaceæ; Guinea Pepper (q.v.), or Maleguetta Pepper, is *Anomum*, Ethiopian Pepper *Xylopia aethiopica*.

Pepper, JOHN HENRY, chemist and mechanical inventor, was born in Westminster on 17th June 1821, and in 1848 was appointed analytical chemist at the Royal Polytechnic, and wrote

several handbooks of popular science. But he is best known as the improver and exhibitor of 'Pepper's Ghost,' in its earliest form the invention of Henry Dircks (q.v.), a device for associating on the same stage living persons and phantoms to act together. The phantom is produced by a large sheet of unsilvered glass on the stage, practically invisible to the spectators, which reflects to them, along with a visible actor or actors, the appearance of another actor on an understage, himself invisible. Pepper travelled with this show in America and Australia, and became public analyst in Brisbane, Queensland. He died in 1900.

Peppercorn Rent, a nominal rent of one peppercorn a year, to be paid on demand; an acknowledgment of tenancy when lands or houses are let virtually free of rent.

Peppermint. See MINT.

Pepper-pot, a celebrated West Indian dish, of which Casareep (q.v.) is a principal ingredient; and along with it flesh or dried fish, vegetables, chiefly the unripe pods of the ochro (a Hibiscus, q.v.), and chillies (see CAPSICUM).

Pepper-root (*Cardamine diphylla*), a perennial herbaceous plant, of the Cruciferae, a native of North America, with pairs of ternate leaves, and racemes of white flowers. The root, of pungent mustard-like taste, is used as a condiment.

Pepsin is the characteristic digestive enzyme of the gastric juice of all vertebrate animals (see DIGESTION), and a similar enzyme is found in flesh-eating plants (such as the sundew, &c.). It is only active in the presence of acid, and requires such a concentration of acid as rapidly inhibits the action of all other enzymes. Commercial pepsin is made by digesting the mucus membrane of the stomach of the pig with dilute hydrochloric acid for twenty-four hours, filtering and evaporating the clear filtrate in a vacuum at a low temperature, the residue being obtained in the form of a powder or of brown scales. It is largely used in medicine as a remedy for digestive troubles.

Peptones. See DIGESTION.

Pepys, SAMUEL, the celebrated diarist, son of John and Margaret Pepys, was born on 23d February 1632-33. He was a member of a junior branch of an old and widely-spread family in the eastern counties, but there was little property in the possession of this branch, and Samuel's father for a time followed the business of a tailor in the city of London. It was long doubted whether he was born at Brampton, near Huntingdon, where there was a small property belonging to his father's family, or in London. We know, however, that he was christened in London, that he went to school at Huntingdon before entering St Paul's School, and that he remained at the latter until he was seventeen years of age. On 5th March 1650-51 he first put on his gown as a scholar at Magdalene College, Cambridge. On the 1st December 1655, very soon after leaving college, he was married to Elizabeth St Michel, a beautiful but portionless girl of fifteen. Sir Edward Montagu (afterwards Earl of Sandwich), whose mother was a Pepys, gave a helping hand to the imprudent couple, and allowed them to live in his house. As Samuel does not appear to have owed much to his father, it seems probable that Montagu acted as a patron at a still earlier period of his life. At all events his true start was entirely due to this patron, for whom Pepys always expressed the most unbounded attachment. Pepys's real life begins for us on the 1st January 1659-60, when the *Diary* was commenced. His appointment to the clerkship of the Acts of the Navy in 1660 was distinctly a job, for he knew nothing of the work of the navy when he undertook the office, but it was a job that amply

justified itself, for his intelligence and industry were so great that he soon became master of the work of his office, and as Clerk of the Acts, and subsequently as Secretary to the Admiralty, he was one of the most distinguished officials in naval affairs that England has ever possessed. At the Revolution his career was closed, but until the end of his life he was still looked upon as the Nestor of navy affairs, to be consulted upon matters of particular importance, and his name is still held in honour at the Admiralty. It is not, however, as an official that the fame of Pepys still lives, but as the writer of a *Diary* which is unique in the literature of the world. This work has thrown the most unexpected light upon the history and manners of his day, while at the same time it presents a most remarkable psychological study. Never before had man written down his inmost feelings with so little disguise. Hence Pepys's character has suffered while his fame has spread. Passing thoughts which had but little real influence upon his actions were set down by him, and they have given a wrong impression of the man to numerous readers.

Pepys's life was prosperous, for he made money and held high offices. He was twice Master of the Trinity House, first in 1676 and a second time in 1685, Master of the Clothworkers Company in 1677, and President of the Royal Society (1684-86). But he was not without his troubles. At the period of the supposed Popish Plot in 1679 he was committed to the Tower, and in 1690 he was placed in Gatehouse at Westminster for a few days; and at his death the crown was indebted to him to the extent of £28,000, a sum which was never paid. The *Diary* ends on 31st May 1669, and we must ever regret that it was not continued to a later period. The shorthand MS. was deciphered by the Rev. J. Smith, and first published in 1825 under the editorship of Lord Braybrooke, but never in its entirety until 1893-99. Besides the *Diary*, Pepys wrote *Memoirs relating to the State of the Royal Navy*, published in 1690. Pepys was essentially a collector, and he never saw a curious or uncommon object without wishing to possess it. His library, bequeathed to Magdalene College, Cambridge, still remains in the exact condition in which he left it. In the room containing that library and among his books and papers we the better understand that method, diligence, and general intelligence which is exhibited in the *Diary*, and which, united with the power of carrying out his views, helped to consolidate the British navy.

See *Memoirs of Samuel Pepys, Esq., Comprising his Diary from 1659 to 1669*, edited by Lord Braybrooke (2 vols. 1825); *Diary and Correspondence*, by Rev. Mynors Bright (6 vols. 1875); *Life, Journal, and Correspondence of Samuel Pepys*, by Rev. John Smith (2 vols. 1841); *Samuel Pepys and the World he lived in* (1880) and the edition of the *Diary* (9 vols. and supplement, 1893-99), by H. B. Wheatley; and *Private Correspondence and Miscellaneous Papers of Samuel Pepys: 1679-1703*, by J. R. Tanner (2 vols. 1926), consisting almost wholly of unpublished matter; besides several works by Dr J. R. Tanner.

Pequots, or PEQUODS, a tribe of American Indians, a branch of the Mohicans, were warlike and powerful in the country round the Thames River when Connecticut was first settled.

Pera, a suburb of Constantinople (q.v.).

Peradeniya, 3 miles out of Kandy in Ceylon, is the seat of a celebrated Botanic Garden and laboratory.

Peraea (Gr. *Peraia*, 'the country beyond'), a term applied to many districts beyond a river or sea; most frequently to great part of Palestine (q.v.) beyond the Jordan. See KERAK.

Perak, one of the Federated Malay States, on the west side of the Malay Peninsula, under the pro-

tection of Britain since 1874. Estimated area, 7800 sq. m. The interior ranges up to 8000 feet. The soil is fertile, and for the most part covered with luxuriant vegetation. Elephants, leopards, huge snakes, and deer swarm in the inland forests. The soil produces rubber, rice, sugar, tobacco, coffee, tea, vanilla, and spices. But the principal production of the state is tin. Lead also exists in great quantity. Pop. mostly Malays and Chinese, increased from 55,880 in 1879 to 600,000 in 1921. The capital is Taiping, a tin-mining town. There are several railways. The British have made many miles of good roads. The state is now in a highly prosperous condition.

Perambulation. See BOUNDS (BEATING THE).

Perameles. See BANDICOOT.

Perception, in philosophical usage, may mean internal perception, the apprehension of any modification of consciousness; but it usually refers to external perception, the recognition of an external object by means of the senses—something more than sensation, and including an element of judgment or the comparing power.

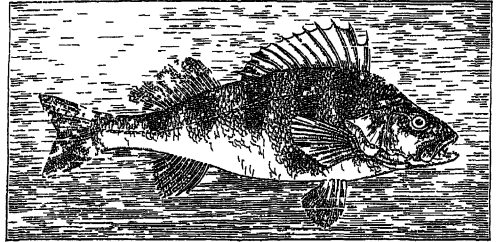
Two great disputes connect themselves with perception, both raised into prominence by Berkeley. The first is the origin of our judgments of the distances and real magnitudes of visible bodies; Berkeley maintaining, in opposition to the common opinion on this subject, that these were learned by experience, and not known by the mere act of vision (see VISION). The second question relates to the grounds we have for asserting the existence of an external and material world. See BERKELEY, KANT, REID; also PSYCHOLOGY, PHILOSOPHY.

Perceval, SPENCER, English minister, was the second son of the second Earl of Egmont, and was born in London, November 1, 1762. He was educated at Harrow and Trinity College, Cambridge, and was called to the bar at Lincoln's Inn in 1786. He soon obtained a reputation as a diligent lawyer, and in 1796 he entered parliament for Northampton, and became a strong supporter of Pitt. In the Addington administration he was made Solicitor-general in 1801 and Attorney-general in 1802, and in the Portland administration of 1807 he became Chancellor of the Exchequer, and was even then the real head of the government, being much trusted by George III. for his steadfast opposition to the Catholic claims. On the death of the Duke of Portland in 1809 Perceval became premier also, and retained office till his tragic death, 11th May 1812, when he was shot dead entering the lobby of the House of Commons, about five in the afternoon, by a Liverpool broker named Bellingham, whose losses had turned his head. Perceval's death was rather a private than a public calamity. He was a man of spotless integrity in his public and private character, but, though an effective parliamentary debater, his abilities were only moderate and his views were narrow. See Treherne, *Spencer Perceval* (1909).

Perch (*Perca*), a genus of spiny-finned or acanthopterous fishes, well represented by the Fresh-water Perch (*P. fluviatilis*). The members of the large family (Percidæ) to which the perch belongs are carnivorous fishes, frequenting the fresh waters and coasts of temperate and tropical regions. The body is somewhat compressed; the spinous dorsal fin is well developed; the ventral fins are thoracic in position; the teeth are simple and conical; there are no barbels. These characters are possessed by many perch-like fishes, some of which are discussed in separate articles—e.g. the Bass (*Labrax*); the Perch (*Lates*) of the Nile, Ganges, &c.; the Pike-perch (*Lucioperca*); the Sea-perch (*Serranus*); the Murray Cod and Hapuku (*Oligorus*); the Growler (*Grystes*), &c. Of American Percidæ

the 'glass-eye' or 'yellow pike' (*Stizostedion vitreum*) is largest and most important, while the dwarf-perches or darters (*Microperca*, *Percina*, &c.) are among the minutest fishes, *Microperca punctulata* measuring only an inch and a half.

The fresh-water perch is widely distributed in lakes, ponds, and rivers in Europe, North Asia, and North America, and is common in many parts of Britain. It is of a greenish-brown colour above and golden yellow on the under parts, with six or



Perch (*Perca fluviatilis*).

seven indistinct dark bands on the back. In length it measures about 18 inches, and its height is about a third of this. It sometimes weighs from three to five pounds, and a prize of nine pounds has been recorded. Among its characteristics may be noted the small villiform backward-turned teeth, their presence on the palatines and vomer, their absence from the tongue, the two dorsal fins, of which the first has thirteen or fourteen spines, and the small scales on the body. The perch loves still waters, and thrives well in ponds, at the cost, however, of smaller fishes. It also feeds on insects, worms, &c. It can endure removal from the water for a considerable time. The eggs are laid in sping, and are attached in long viscid strings to water-weeds. The number of eggs in one spawn may exceed a million. As an edible fish the perch has a good reputation, eating best with lemon-juice and cayenne-pepper, but the American variety is less esteemed. Of species distinct from *P. fluviatilis* little is known.—The so-called Climbing Perch (q.v.) is separately treated.

Perch. See ROD.

Percival, JAMES GATES, an American poet, was born at Kensington, Connecticut, 15th September 1795, graduated at Yale in 1815, at the head of his class, and afterwards studied botany and medicine. But his heart was not in herbs and physic, and although he practised—or rather advertised his willingness to practise—both in Kensington and in Charleston, S.C., very few professional calls dragged him from his favourite studies. His poems *Prometheus* and *Clio* appeared at Charleston in 1822. Two years later he filled for a few months the chair of Chemistry at West Point; but he found the duties heavy and irksome, and took himself to Boston, and then to New Haven. There the third part of *Clio* was published (1827). Percival afterwards divided his attention between his verses and geology, and as he grew older he gave more and more of his time to the new love, the visible results being *Reports on the Geology of Connecticut* (1842) and of Wisconsin (1855). These are valuable but very dry, and in delicious contrast to his poems, which flow freely and with volume, and on whose fluent, half-careless lines their author's learning is borne as easily as trees on a river in flood. His *Dream of a Day* appeared in 1843, and occasional lyrics for a long time after. He was appointed geologist of Wisconsin in 1854, and died there at Hazel Green, on

2d May 1856. His collected works were published in 1859, his *Life and Letters*, by J. H. Ward, in 1866.

Percussion, in Medicine, is the method of eliciting sounds by tapping or gently striking the surface of the body; its object being to determine by the nature of the sound the comparative density of the subjacent parts. This means of diagnosis was first employed by Auenbrugger in the middle of the 18th century, and it was afterwards adopted by Corvisart in the investigation of heart diseases; but its value was not fully appreciated till Laennec made the diseases of the chest his peculiar study; and since his time its application and various uses have been extended by the labours of Piorry, Skoda, Hughes Bennett, and other physicians.

Percussion is chiefly employed in the diagnosis of diseases of the lungs, heart, and abdominal organs. It may be *direct* (or, as some writers term it, *immediate*), or it may be *mediate*. In the former case, the part to be examined is struck with the ends of the first three fingers set close together on the same level, or with a small hammer tipped with india-rubber; while in the latter, which is now almost universally adopted, a flat body is placed upon the chest, or other part to be examined, and is then struck by the fingers or hammer. The flat intervening body is termed a *Pleximeter* (from the Gr. *plēsis*, 'a blow,' and *metron*, 'a measure'). The instrument usually sold as a pleximeter is a flat oval piece of ivory, but the left index or middle finger of the physician, with its flat surface fitted accurately to the part to be examined, acts equally well. The force of the stroke on the pleximeter—whether the stroke be made with the fingers or the hammer—must vary according as it is desired to elicit the sound from a superficial or a deep-seated part. The surface to be percussed should be exposed, or, at most, only covered with one layer of clothing; and the blow should fall perpendicularly on the pleximeter. When percussion is made over a considerable cavity filled with air—as the stomach or intestines—a hollow, drum-like, or (as it is usually termed by medical writers) a *tympanitic* sound is produced. When any part of the surface of the chest is struck below which there is a considerable depth of healthy lung-tissue, consisting of small cells filled with air, a clear sound, less loud and hollow than the tympanitic sound, and termed the *pulmonary percussion note*, depending partly on the vibrations of air in the lung-cells, and partly on the vibrations of the walls of the chest, is evolved. When the subjacent substance is solid (as the heart, liver, or spleen) or fluid (as when there is effusion into a closed sac) the sound is *dull* in proportion to the density and want of elasticity of the part struck. Important information is also gained by attending to the varying degree of resistance experienced by the fingers during percussion over different parts of the surface. The first thing that must be acquired in order to make percussion useful in the diagnosis of disease is an accurate knowledge of the sounds elicited from the different parts in their normal condition. When, for example, the healthy pulmonary percussion note is known, increased resonance of the walls of the chest will indicate a dilatation of the air-cells (or Pulmonary Emphysema), while various degrees of dullness will afford evidence of such morbid changes as deposit of tuberculous material, the widespread consolidation of pneumonia, or the presence of effusion in pleurisy. This is further shown in the articles PERICARDIUM and PLEURISY. Diagnosis by Auscultation (q.v.), directly and by means of the Stethoscope (q.v.), is often used in connection with percussion, and in recent years the conditions discovered by percussion are confirmed and further elucidated by X-ray examination.

Percussion Caps are small copper cylinders, closed at one end, for conveniently holding the detonating powder which is exploded by the act of percussion in percussion-arms. See FULMINATES; also FIRE ARMS.

Percussion, CENTRE OF. See CENTRE OF PERCUSSION.

Percy, a noble northern family, famous in the history of England for five hundred years. Its founder, William de Percy, came with the Conqueror to England, and was rewarded with lands in Hampshire, Lincolnshire, and Yorkshire—among the last being Topcliffe and Spofforth, long the chief seats of the house. The male descendants became extinct with the death of the third baron, and the representation of the house devolved upon his daughter Agnes, who married Joceline of Louvain, brother-in-law of King Henry I., on the condition that he assumed the name of Percy. Their youngest son, Richard de Percy, then head of the family, was one of the chief barons who extorted Magna Carta from King John, and the ninth feudal lord, Henry de Percy, gave much aid to Edward I. in the subjugation of Scotland, and was made governor of Galloway. The latter was driven out of Turnberry Castle by Robert Bruce, and was rewarded by Edward II. with the empty honour of Bruce's forfeited earldom of Carrick, and the governorship of the castles of Bamborough and Scarborough. In 1309 he obtained by purchase from Bishop Antony Bek the barony of Alnwick, the chief seat of the family ever since. His son, Henry de Percy, defeated and captured King David II. of Scotland at the battle of Neville's Cross (1346); his grandson fought at Crecy; his great-grandson, the fourth Lord Percy of Alnwick, was marshal of England at the coronation of Richard II., and was created the same day Earl of Northumberland. Henry, eldest son of the last, was the famous Hotspur whom the dead Douglas defeated at Otterburn (1388), and who himself fell at Shrewsbury (1403) fighting against King Henry IV. His brother, Thomas Percy, Earl of Worcester, was executed immediately after the battle. Their father, who had turned against Richard II., and helped Henry of Lancaster to the throne, was dissatisfied with Henry's gratitude, and with his sons plotted the insurrection which ended in Shrewsbury fight. Later he joined Archbishop Scroope's plot, and fell at Bramham Moor (1408), when his honours were forfeited on attainder, but restored in 1414 to his grandson Henry, the second earl, from which day the Lancastrian loyalty of the family never wavered. Henry became High Constable of England, and fell in the first battle of St Albans (1455). His son Henry, the third earl, fell at Towton (1461), and it was his brother, Sir Ralph Percy, who comforted himself as he lay bleeding to death on Hedgley Moor (1464), that he had 'saved the bird in his bosom.' The title and estates were now given to Lord Montagu, a brother of Warwick, the king-maker, but in 1469 Henry, the son of the third earl, subscribed an oath of allegiance to Edward IV., and was restored. He was murdered at his Yorkshire house of Cocklodge, in 1489, in an outburst of popular fury against an extortionate subsidy of Henry VII. The sixth earl, Henry Algernon, in youth had been the lover of Anne Boleyn, and was forced against his will to marry a daughter of the Earl of Shrewsbury. He died childless in 1537, and, as his brother Sir Thomas Percy had been attainted and executed for his share in the Pilgrimage of Grace, the title and honours were forfeited, and the title of Duke of Northumberland was conferred by Edward VI. upon John Dudley, Earl of Warwick, who in turn

was attained and executed under Mary in 1553. That queen in 1557 granted the earldom to Thomas Percy, son of the attainted Sir Thomas Percy. A devoted Catholic, he took part in the Rising of the North, and was beheaded at York in 1572. His brother Henry succeeded as eighth earl. He became involved in Throgmorton's conspiracy in favour of Mary Stuart, and was committed to the Tower, where he was found dead in bed, with a pistol beside him, whether through suicide or murder, 21st June 1585. His son, the ninth earl, was imprisoned for fifteen years in the Tower, and fined £30,000 on a baseless suspicion of being privy to the Gunpowder Plot. He was followed by his son, the tenth earl, who fought on the parliamentary side in the Civil War, and was succeeded by his son Josceline, the eleventh earl, with whose death in 1670 the male line of the family became extinct. Charles II. created in 1674 his third bastard by the Duchess of Cleveland, Earl, and afterwards Duke, of Northumberland, but the titles expired on his dying childless in 1716. The eleventh earl's only surviving child and heiress, in her own right Baroness Percy, married Charles Seymour, Duke of Somerset, and became the mother of Algernon, Duke of Somerset, who was created in 1749 Baron Warkworth and Earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, fourth Baronet, of Stanwick in Yorkshire. Sir Hugh succeeded to the earldom in 1750, assuming the surname and arms of Percy, and was created in 1766 Earl Percy and Duke of Northumberland. The sixth duke succeeded in 1867, the seventh on his death in 1899, the eighth in 1918.

See books cited under NORTHUMBERLAND; E. B. de Fonblanque's *House of Percy* (privately printed, 2 vols. 1887); and Brenan's *House of Percy* (2 vols. 1902).

Percy, THOMAS, editor of the *Reliques*, was born a grocer's son at Bridgnorth, 13th April 1729. He was educated at the grammar-school there; in 1746 entered Christ Church, Oxford; and in 1753 was presented by his college to the sequestered vicarage of Easton Maudit, Northamptonshire, where he lived for twenty-nine years. In 1759 he married happily. Three years earlier he had received also the adjacent rectory of Wilby. His leisure soon yielded fruit in *Hau Kiou Chooan* (4 vols. 1761), a Chinese novel translated from the Portuguese, and *Miscellaneous Pieces relating to the Chinese* (2 vols. 1762), as well as anonymously in *Five Pieces of Runic Poetry translated from Icelandic* (1763), prompted by the success of Macpherson, and *A New Translation of the Song of Solomon from the Hebrew* (1764). In the summer of 1764 Dr Johnson paid him a long visit at Easton Maudit. In later days they sometimes quarrelled, but continued to retain a high regard for each other. 'A man out of whose company I never go without having learned something'—so Johnson described him to Boswell. 'I am sure that he vexes me sometimes, but I am afraid it is by making me feel my own ignorance.' In the February of the following year (1765) Percy published in 3 vols. the *Reliques of Ancient English Poetry* (4th ed. 1794). He had long been engaged in collecting old ballads from every quarter, and a large folio MS. of ballads had fallen accidentally into his hands, having been found 'lying dirty on the floor under a Bureau in the Parlour' of his friend Humphrey Pitt of Shiffnal, in Shropshire, 'being used by the maids to light the fire.' This he claimed as the original of his work, but of the 176 pieces in the first edition only 45 were taken from the folio MS.; while almost all these were so touched up and tricked out in false ornament and conventional 18th-century poetic diction as often to bear but little likeness to their originals. For example, the 39 lines of the 'Child of Eli' have been puffed out to 200 in Percy's version,

nor do even all the 39 originals themselves appear. Again, the 'Heir of Lin' has swollen from 125 lines to 216, and these, moreover, polished to death. The antiquary Ritson, in his 'Observations on the Ancient English Minstrels' prefixed to his *Ancient Songs from Henry III. to the Revolution* (1790), attacked Percy with characteristic acrimony, denied the very existence of the folio MS. and denounced the work as an impudent forgery, and that the worse because by a clergyman. Percy exhibited the MS. in Pall Mall, and had his portrait painted by Sir Joshua Reynolds holding it in his hand. For over a hundred years it lay hid in Ecton Hall, jealously guarded from almost all eyes, until at length Dr Furnivall, instigated by Professor Child, succeeded in getting it printed (3 vols. 1867-68; those pieces deservedly marked by the bishop 'loose and humorous' being printed separately), with Introductions by Professor Hales and himself. The MS. was 15½ inches long by 5½ wide and about 2 inches thick, and was written in a Caroline hand.

The publication of Percy's *Reliques* was first suggested to him by Shenstone. The work was dedicated to the Countess of Northumberland, and the author was soon rewarded by being made chaplain to her husband, the first duke of the present creation, while he also succeeded in persuading himself that he was a scion of the noble house of Percy. In 1769 he became chaplain to George III., and next year he took his degree of D.D. at Cambridge, and published his translation of the *North-ern Antiquities* of the Swiss historian Paul Henri Mallet (1730-1807). In 1771 his wife was appointed nurse to the Prince Edward, afterwards father of Queen Victoria; it was to her, before their marriage, that Percy addressed the famous ballad, 'O Nancy, wilt thou go with me?' first printed in 1758, and happily set to music by an Irishman, Thomas Carter (c. 1735-1804). In 1771 Percy wrote also his pleasing ballad the 'Hermit of Warkworth.' In 1778 he was appointed to the deanery of Carlisle, in 1782 to be Bishop of Dromore, with £2000 a year. His only son died in 1783; his wife in 1806; he himself, after a few years of blindness, 30th September 1811—the only survivor of the original members of Dr Johnson's famous Literary Club. He left two daughters, and was buried in the transept which he himself had added to Dromore Cathedral.

For the literary influence of the *Reliques*, see the article BALLAD. There is a variorum edition by Schröder. See the Life by the Rev. J. Pickford prefixed to vol. i. of Furnivall, and that by Miss Gausson (1908). Many of Percy's letters are given in vol. viii. of J. B. Nichol's *Illustrations of the Literary History of the 18th Century*. Hecht edited the Shenstone Correspondence. His name was assumed by the Percy Society (94 issues, 1840-52).

Percy Anecdotes, a collection of extraordinary popularity, published in monthly parts (1820-23) by 'Sholto and Reuben Percy, Brothers of the Benedictine Monastery of Mount Benger.' Their real names were Thomas Byerley (died 1826), first editor of the *Mirror*, and Joseph Clinton Robertson (died 1852), projector and editor of the *Mechanics' Magazine*; the work owed its name to the Percy Coffee-house in Rathbone Place. An edition was prepared by John Timbs (1868).

Perdita. See ROBINSON (MARY).

Peregrine Falcon. See FALCON.

Perekop, ISTHMUS OF, connects the peninsula of the Crimea (q.v.) with the mainland of Europe. A ship-canal through the isthmus was projected in 1888, but not constructed. Remains of ancient fortifications can be seen. In the north of the isthmus is the small town of Perekop.

Père-la-Chaise. See LACHAISE; and for the cemetery, PARIS.

Perennial, in Botany, a term employed in contradistinction to Annual (q.v.) and Biennial (q.v.), to designate plants which subsist for a number of years. Some plants, however, which are annual in cold climates are perennial in warmer; whereas annuals of temperate regions become perennials in (say) North Greenland, where the summer is too short for completion of the life-cycle. The term perennial is in general applied only to herbaceous plants, and indicates a property only of their underground parts, the stems of most dying at the end of each summer. Perennial herbaceous plants are capable, like shrubs and trees, of producing flowers and fruit time after time, in which they differ from annual and biennial plants, which are fruitful only once. Those plants which are capable of being propagated by cloves, offset bulbs, or tubers are all perennial. Thus, the potato is a perennial plant, although the crop is planted in spring and reaped in autumn, like that of corn, whilst all the corn plants are annuals. There is great diversity in the duration of life of perennial plants.

Pereslavl, a town of Russia, 96 miles NE. of Moscow. It has a 12th-century cathedral, cotton-manufactures, and lake-fisheries. Pop. 10,000.

Perez, ANTONIO, minister of Philip II. of Spain, was born probably at Madrid. His reputed father, an ecclesiastic, was secretary to Charles V. and Philip II., and he himself was appointed to this office in 1567. Don John of Austria having sent Escovedo to Spain to solicit aid against the party of Orange, and Escovedo having rendered himself an object of suspicion to the king as an abettor of Don John's schemes, Philip entrusted Perez with the task of murdering him, which Perez accordingly did, 31st March 1578. The family of Escovedo denounced Perez, and all his enemies joined against him. The king at first sought to shield him; but in July 1579 he was arrested. Escaping to Aragon, he put himself under protection of its fueros, which secured a trial in open court. The king, charging him with heresy, now applied for aid in May 1591 to the Inquisition, and the Aragonese court delivered him up to its agents; but the people rose in tumult and liberated him from them. This happened repeatedly; and at last, in September 1591, Philip II. entered Aragon with an army powerful enough to subdue all opposition, and abolished the old constitutional privileges of the country. Perez, however, made his escape, was condemned in Spain as a heretic, but was treated with great kindness in Paris and in London, where he was the intimate of Bacon and the Earl of Essex. He spent the later years of his life in Paris, and died there, 3d November 1611, in great poverty. Perez wrote *Relaciones* (1594?), which some recent writers have regarded as lying fabrications.

See Mignet's monograph (5th ed. 1881); and Julia Fitzmaurice-Kelly's (1923); Morel-Fatio, *L'Espagne au XVI. et au XVII. Siècle* (1878); also Froude in *The Spanish Story of the Armada* (1892); and works cited at PHILIP II.

Pérez de Ayala, RAMÓN, Spanish novelist and critic, born in 1831, wrote *Novelas poéticas*, *Belarmino y Apolonio*, &c.

Pérez Galdós. See GALDÓS.

Perfectibility, or PERFECTIONISM, the doctrine that man in a state of grace may attain to perfection in this life. Catholics hold that no one, not even the most holy, can avoid sin altogether except by a special privilege of God, as in the case of the Blessed Virgin; the justified do not, however, commit mortal, but venial sins (see SIN). In various points Franciscans, Jesuits, and Molinists approach to a doctrine of perfection denied by

Dominicans and Jansenists. Among Protestants, Wesleyan Methodists believe in the possibility of a *Christian perfection* attainable in this life. It is not a perfection of *justification*, but a perfection of *sanctification*; which John Wesley, in a sermon on Christian Perfection, from the text Heb. vi. 1, 'Let us go on to perfection,' earnestly contends for as attainable in this life by believers, by arguments founded chiefly on the commandments and promises of Scripture concerning sanctification; guarding his doctrine, however, by saying that it is neither an *angelic* nor an *Adamic* perfection, and does not exclude ignorance and error of judgment, with consequent wrong affections, such as 'needless fear or ill-grounded hope, unreasonable love, or unreasonable aversion.' He admits, also, that even in this sense it is a rare attainment. The Friends profess that the justified may be 'free from actual sinning and transgression of the law of God, and in that respect perfect. Yet doth this perfection admit of a growth; and there remaineth a possibility of sinning where the mind doth not most diligently and watchfully attend unto the Lord.' Other schools also hold similar views; but most Protestants repudiate the doctrine of Perfectibility. For another sense of the term, see ILLUMINATI.

Perfection, COUNSELS OF. See SUPEREROGATION.

Perfectionists, also called BIBLE COMMUNISTS and FREE-LOVERS, a small American sect, founded by John Humphrey Noyes, who was born at Brattleboro, Vermont, 6th September 1811, graduated at Dartmouth in 1830, then studied law, and afterwards theology at Andover and Yale. While a theological student, he experienced a second conversion, discovered that the prevailing theology was wholly wrong, and lost his license to preach. He held that the gospel if accepted secures freedom from sin; that God has a dual body (male and female); that the author of evil is uncreated, but not God; and that communion with Christ not merely saves from sinning, but from disease and death. He now founded a 'Perfectionist' church at Putney, Vermont. He and his converts, men and women, with their children, put their property into a common stock; they gave up the use of prayer, all religious service, and the observance of the Sabbath; those who were married renounced their marriage ties, and a 'complex marriage' was established between all the males and all the females of the 'Family.' Having dispensed with law, he set up public opinion as a controlling power in its stead; and free criticism of one another by the members of the society became an important feature of his system. In 1848, after not a few difficulties, the community removed to a new home in the sequestered district of Oneida, in the state of New York, and soon numbered some 300 members, living in strict order and with much outward comfort on thoroughly communistic principles—the community of women and of children being an outstanding feature carefully regulated by the 'mutual criticism' of the family. In 1880, however, the pressure of outside opinion forced the family to modify their peculiar principles; marriage and the ordinary family relationship was introduced; communism of property gave way to limited liability joint-stock, each member having a separate share represented by so much stock in the Oneida Community, Limited. Various co-operative institutions were also established. The headquarters are at Kenwood, New York, and works have been started also at Niagara Falls, Ontario. Noyes, who assisted in elaborating the new constitution, died at Niagara Falls, 13th April 1886.

See Hinds, *American Communities* (Chicago, 1902); works by Noyes, *The Second Coming of Christ and His*

tory of American Socialism; the periodicals conducted by him (nearly 40 vols. 1834-80; in British Museum); Hepworth Dixon, *New America*, &c.; Charles Nordhoff, *Communist Societies of the United States* (1875); Hillquit, *History of Socialism in the United States*; Wells, *The New Utopia*.

Perfumery. *Vegetable Perfumes.*—The most ancient of the so-called primary odoriferous bodies are the gum resins which exude naturally from trees, or from wounds accidental or purposely inflicted to increase the yield. The most important are benzoin, myrrh, opoponax, tolu, Peru, and storax. Gum-resins form the chief ingredients in Incense (q.v.) and Pastilles (q.v.).

A second group is that large class of perfumes which are procured by distillation, and are mostly fluid bodies, and are termed Volatile Oils, Essential Oils, Attars, or Ottos—formerly Quintessences. As soon as the Greeks and the Romans learned the use of the still, which was an invention imported by them from Egypt, they quickly adapted it to the separation of the odorous principle from the numerous fragrant plants indigenous to Greece and Italy. Long before that time, however, fragrant waters were in use in Arabia. Odour-bearing plants contain the fragrant principle in minute glands or sacs; these are found sometimes in the rind of the fruit, as the lemon and orange; in others it is in the leaves, as sage, mint, and thyme; in wood, as rosewood and sandalwood; in the bark, as cassia and cinnamon; in seeds, as caraway and nutmeg; in yet others in the petals, as in rose, lavender, or Ylang-Ylang. The odour principle of orris is a solid resembling cocoa-butter, and is contained in what is really the rhizome of *Iris florentina*, though technically called orris-root. These glands or bags of fragrance may be plainly seen in a thin-cut slice of orange-peel; so also in a bay leaf, if it be held up to the sunlight, the oil-cells may be seen like specks. All the fragrance-bearing substances yield by distillation an essential oil peculiar to each; thus is procured oil of patchouli from the leaves of the patchouli plant, *Pogostemon Heyneanus*, a native of Burma; oil of caraway, from the caraway-seed; oil of geranium, from the leaves of *Pelargonium roseum*; oil of lemon, from lemon-peel, and so on.

The process of Distillation (q.v.) is very simple: the fragrant part of the plant is put into the still and covered with water, and when the water is made to boil the ottos rise along with the steam, are condensed with it in the pipe, and remain floating on the water, from which they are easily separated by decanting. In this way 100 lb. of orange, lemon, or bergamot fruit peel will yield about 10 oz. of the fragrant oil; 100 lb. of cedar-wood will give about 15 oz. of oil of cedar; 100 lb. of nutmeg will yield 60 to 70 oz. of oil of nutmeg; 100 lb. of geranium leaves will yield 2 oz. of oil.

The lemon-like odours are the most numerous, such as verberna, lemon, bergamot, orange, citron, citronella; then the almond-like odours, such as heliotrope, vanilla, violet; then spice odours, cloves, cinnamon, cassia. The whole may be classified into twelve well-defined groups. All these ottos are very soluble in alcohol, in fat, butter, and fixed oils. They also mix with soap, snuff, starch, sugar, chalk, and other bodies, to which they impart their fragrance.

Some flowers yield little or no essential oil by distillation. The perfume from these is collected by *enfleurage*. The flower-farmers of the Alpes Maritimes follow this method on a very large scale with rose, orange, acacia, violet, jasmine, tuberose, and jonquil. The blossoms, spread upon layers of fat, are changed every day, or every other day. The grease remains. Each time the fresh flowers are put on it is 'worked' with a knife, so as to

offer a fresh surface. The grease being *enfleuré* or 'infloved' in this way for three weeks or more—in fact, so long as the plants produce blossoms, or the fat is capable of absorbing more odour—is at last scraped off the *châsse*, melted, strained, and poured. Fat or oil is also perfumed with these same flowers by the process of *macération*—i.e. infusion of the flowers in oil or melted fat. After some hours the spent blossoms are strained away, and new added repeatedly, so long as they can be procured. Improved results are obtained by slightly heating the oil.

Jasmine and tuberose produce best perfumed grease by *enfleurage*; rose, orange, and acacia by *macération*; while violet and jonquil grease is best obtained by *enfleurage* followed by *macération*.

To extract the odour from solid fat it is chopped up fine, put into strong alcohol, and left to infuse for about a month. Scented oil has to be repeatedly agitated with the spirit. The spirit extracts all the odour, becoming itself 'perfume,' while the grease again becomes odourless. The reason for producing a pomade—as these scented fats are technically termed—of orange-flowers is that the odour of the essential oil obtained by the distillation of orange-blossoms with water has not, in the least degree, the odour of the orange-blossoms from which it is obtained. The otto in fact undergoes a chemical change, and becomes Neroli. The same applies, in a less marked degree, to rose.

Perfumes of Animal Origin.—Only four of these are used in perfumery—viz. Musk (q.v.), Ambergris (q.v.), Civet (q.v.), and Castor (see CASTOREUM). The power of musk to impart odour is such that polished steel will become fragrant of it if it be shut in a box where there is musk, contact not being necessary. In perfumery manufacture tincture of musk is mixed with other odorous bodies to give permanence to the more evanescent perfumes or bouquets, the musk acting to them almost as a mordant does to a dyestuff.

Civet is exceedingly potent as an odour, and when pure, and smelled at in the bulk of an ounce or so, is utterly insupportable from its nauseousness; in this respect it exceeds musk. But when it is much diluted its sweet perfume is generally admitted; the fragrant principle is the same as that of the narcissus. Civet is extensively used duly attenuated in perfumery. Its powerful and lasting odour enables it to be used in some soaps, and especially in sachets. It is one of the perfumes of 'Spanish Leather,' or Peau d'Espagne: the first gloves used in England were scented with it.

Castor cannot be largely used in any given perfume on account of the almost blackness of its tincture, still when properly diluted it is extensively employed. Its perfume, when old especially, is exceedingly pleasant, and its *fixing* power is at least equal to that of musk.

Synthetic Perfumes.—The progress of scientific chemistry has led to the production of numerous odoriferous substances, some identical with the active odoriferous principles of plants. Among them may be mentioned vanillin, the principle of vanilla (methyl protocatechic aldehyde); coumarin, of Tonquin bean (coumaric anhydride); ionone, of violet; and many derivatives of phenol. The artificial musk of L. Bauer is a delightful perfume, and has many applications in perfumery; but it differs widely in odour from true musk.

The perfumes or bouquets of the shops are really mixtures of some or several of the primitive odours. An example or two will illustrate this. 'Jockey Club Bouquet' is thus compounded: 2 gal. extract of orris; $\frac{1}{2}$ gal. each of cassia, rose, and tuberose pomades; $\frac{1}{2}$ gal. civet; $\frac{1}{2}$ gal. musk; $1\frac{1}{2}$ gal. spirits of wine; 8 oz. bergamot otto; $1\frac{1}{2}$ oz. rose. 'White Rose': 2 pints extract rose pomade; 1 pint each

cassia and jasmine; $1\frac{1}{2}$ pint spirits of wine; $\frac{1}{2}$ oz. rose otto; 1 dr. patchouli otto. It is obvious that the possible variety is infinite.

See OTTO OF ROSES, MUSK, &c.; and works by E. J. Parry.

Pergamus, or **PERGAMUM**, anciently a city of Mysia in Asia Minor, on the river Caicus, 15 miles from its mouth. According to tradition, the place was founded by Greeks from Arcadia. It first acquired prominence when Lysimachus, one of Alexander's generals, chose it as a stronghold to keep his treasures in. Under Philetærus, his eunuch, whom he appointed guardian of his treasures, it became the capital of a state, 283 B.C. His successor, Eumenes I., maintained its independence against the Seleucids, although the title of king was first assumed by Attalus I., who reigned from 241 to 197 B.C., and defeated the Gauls in a great battle. He intimately allied himself with the Romans against Philip V. of Macedon, and this alliance subsisted throughout succeeding reigns, during which the kingdom continued to increase in extent and importance. Attalus III., surnamed Philometer, who died in 133 B.C., left it to the Romans, and under them it was one of the chief cities of Asia Minor. The native kings had adorned it with grand sculptures, the work of artists belonging to the Pergamian school, and collected a library only inferior to that of Alexandria. Pergamus was a special seat of the worship of Asclepius (*Æsculapius*); and it gave its name to Parchment (q.v.). It began to decline under the Byzantine emperors. The place still exists under the name *Bergama*, and is noted for the splendour and magnificence of its ruins, which embrace temples, palaces, aqueducts, gymnasia, amphitheatres, and city walls. These were excavated for the Prussian government by Humann, Bohn, and others, in 1878-86, many of the treasures being carried to Berlin.

Pergolese, GIOVANNI BATTISTA, Italian musician, was born at Jesi, near Ancona, on 3d January 1710, studied music at Naples, and struck out an original style for himself. His first great work was the oratorio of *San Guglielmo*, composed in 1731, soon followed by his bright and tuneful operetta of *La Serva Padrona*. This is his masterpiece. In 1734 he was appointed *maestro di capella* of the Church of Loreto. In consequence of delicate health he removed to Pozzuoli, where he composed the cantata of *Orfeo* and his second masterpiece, the pathetic *Stabat Mater*, but died immediately afterwards on 16th March 1736. Besides the works named, Pergolese composed numerous operas, oratorios, and other pieces.

Peri, according to the mythical lore of the East, a being begotten by fallen spirits, which spends its life in all imaginable delights, is immortal, but is for ever excluded from the joys of Paradise. It takes an intermediate place between angels and demons, and is either male or female. So far from there being only female Peris, as is supposed by some, and these the wives of the Devs, the Peris live, on the contrary, in constant warfare with these Devs. Otherwise, they are of the most innocuous character to mankind, and, just like the fairies with whom our own popular mythology has made us familiar, are when female of surpassing beauty. They belong to the great family of genii, or Jinn (see **DEMONOLOGY**).

Periagua, a large canoe composed of the trunks of two trees, hollowed and united into one fabric; whereas an ordinary canoe is formed of the body of one tree only.

Perianth. See **FLOWER**.

Pericardium, a conical membranous sac containing the heart and the commencement of the

great vessels, to the extent of about 2 inches from their origin. It is placed with its apex upwards behind the sternum in the interval between the pleura—the serous sacs in which the lungs are enclosed; while its base is attached to the diaphragm. It is a fibro-serous membrane, consisting of an external fibrous and an internal serous layer. The outer layer is a strong, dense, fibrous membrane; the serous layer invests the heart, and is then reflected on the inner surface of the fibrous layer. Like all serous membranes, it is a closed sac; its inner surface is smooth and glistening, and secretes a thin fluid which serves to facilitate the natural movements of the heart. Inflammation of this serous sac constitutes the disease known as pericarditis.

DISEASES OF THE PERICARDIUM.—Pericarditis is a disease of frequent occurrence; the result of a very large number of post-mortem examinations being to show that about one in twenty-three of all who die at an adult age exhibits traces of recent or old attacks of this disorder. The first change which takes place in an inflamed pericardium is a dulling of its glistening surface, with some congestion, which is speedily followed by effusion into the sac. The effusion is sometimes almost entirely fibrinous, in which case it organises, and gives rise to adhesions between the heart and the pericardium; or it may consist almost entirely of liquid serum, which is later absorbed; or it may be, and most frequently is, a mixture of the two. In a few cases it rapidly becomes purulent. In the cases that prove fatal when fibrinous fluid has been effused, but has not organised to such an extent as to cause complete adhesion of the heart to the pericardium, the fibrin or lymph is seen to be of a yellowish-white colour, and to occur in a ragged, slaggy, or cellular form mingled with clear fluid. Laennec compared the surface on which the lymph is deposited to that which would be produced by suddenly separating two flat pieces of wood between which a thin layer of butter had been compressed. When the patient dies at a more advanced stage of the disease—viz. soon after the whole of the membrane has become adherent—incipient blood-vessels, in the form of red points and branching lines, are seen, indicating that organisation is commencing in the deposit, which if death had not ensued would have been finally converted into fibrous or cellular tissue, and might have occasioned the complete obliteration of the pericardial cavity.

The recognition of the disease depends almost entirely upon the signs revealed by auscultation and percussion. The earliest is generally the *friction-sound*, or *to and fro murmur*, caused by rubbing together of the roughened surfaces, and heard to accompany the heart's action; but if fluid is effused it may speedily disappear. In this case percussion of the chest shows that the dull area occupied by the heart is larger than normal, while the impulse of the organ on the chest-wall cannot be felt. The symptoms, besides those common to all inflammations, are extremely variable: in some cases where pericarditis comes on in the course of other serious disease the patient makes no complaint, and the complication is only discovered during the routine examination of the chest. But there may be intense pain and tenderness on pressure in the region of the heart, great irregularity or feebleness of the heart's action, distressing breathlessness, delirium, &c.

Pericarditis is a disease which occasionally runs a very rapid course, and terminates fatally in forty-eight hours or less. In ordinary cases, however, which terminate in apparent recovery, the disease generally begins to yield in a week or ten days, and, excepting that adhesion may remain, the cure appears to be complete in three weeks or less. If

the adhesions which have formed are dense and fibrous, they may impede the heart's action and lead to enlargement of the heart with serious symptoms at some subsequent period.

Pericarditis rarely occurs as an independent disease. It may result from extension of an inflammation in a neighbouring organ, pleura, ribs, &c. It is no uncommon result of an infectious disease, especially scarlatina, and of diseases associated with general degenerative changes, such as Bright's disease of the kidney; but, beyond all comparison, it is of most frequent occurrence in association with acute Rheumatism (q.v.), of which it forms one of the most serious complications. It is often associated with inflammation of the muscular substance of the heart, and, especially in rheumatism, of the lining membrane as well.

The treatment of pericarditis at present in favour is much less active than when bleeding, mercurialisation, &c., were considered necessary. Complete rest in bed, light diet, with opium or other sedatives as required; general medication suited to the disease with which the pericarditis is associated; local application of poultices or ice-bags, sometimes of iodine or blisters, are the chief measures employed. In cases where there is extensive fluid effusion it may be necessary to aspirate in order to free the heart from embarrassment.

The pericardium may also be distended with fluid without inflammation (hydropericardium) in the course of general dropsy; and occasionally is the seat of tumours, syphilitic or tubercular processes, &c.

Pericarp. See FRUIT.

Pericles, the greatest statesman of ancient Greece, was born of distinguished parentage in the early part of the 5th century B.C. His father was that Xanthippus who won the victory over the Persians at Mycale, 479 B.C.; and by his mother, Agariste, the niece of the great Athenian reformer Cleisthenes, he was connected with the princely line of Sicyon and the great house of the Alcmæonidae. He received an elaborate education; but of all his teachers the one whom he most revered was the serene and humane philosopher Anaxagoras. Pericles was conspicuous all through his career for the singular dignity of his manners, the Olympian grandeur of his eloquence, his 'majestic intelligence,' in Plato's phrase, his sagacity, probity, and profound Athenian patriotism. Both in voice and in appearance he was so like Pisistratus that for some time he was afraid to come forward in political life. Aristides had only recently died, Themistocles was an exile, and Cimon was fighting abroad. Although the family to which he belonged was good, it did not rank among the first in either wealth or influence; yet so transcendent were the abilities of Pericles that he rapidly rose to the highest power in the state as the leader of the dominant democracy. The sincerity of his attachment to the popular party has been questioned, but without a shadow of evidence. At anyrate the measures which he brought forward and caused to be passed were always in favour of extending the privileges of the poorer class of the citizens, and, if he diminished the spirit of reverence for the ancient institutions of public life, he enlisted an immense body of citizens on the side of law. He extended enormously, if he did not originate, the practice of distributing gratuities among the citizens for military service, for acting as dicast and in the Ecclesia, and the like, as well as for admission to the theatre—then really a great school for manners and instruction. Pericles seems to have grasped very clearly, and to have held as firmly, the modern radical idea, that, as the state is sup-

ported by the taxation of the body of the citizens, it must govern with a view to general interests rather than to those of a caste alone.

When the Spartans dismissed Cimon (q.v.) and the Athenian troops who were helping them against the revolted Helots, the oligarchical party was discredited. Cimon was ostracised (461). Ephialtes seized the opportunity to strike a great blow at the influence of the oligarchy, by causing the decree to be passed which deprived the Areopagus of its most important political powers. On the assassination of Ephialtes, in the same year, Pericles became leader of the democratic party. In general his attitude was hostile to the desire for foreign conquest or territorial aggrandisement, prevalent among his ambitious fellow-citizens. Shortly after the battle of Tanagra (457), in which he showed conspicuous courage, Pericles, according to Plutarch, magnanimously carried the measure for the recall of Cimon. His successful expeditions at different periods to the Thracian Chersonese, and to Sinope on the Black Sea, together with his colonies planted at Naxos, Andros, Orens in Eubœa, Brea in Macedonia, and Ægina, as well as at Thurii in Italy and Amphipolis on the Strymon, did much to extend and confirm the naval supremacy of Athens, and afford a means of subsistence for her poorer citizens. But his greatest project was to form in concert with the other Hellenic states a grand Hellenic confederation in order to put an end to the mutually destructive wars of kindred peoples, and to make of Greece one mighty nation, fit to front the outlying world. The idea was not less sagacious than it was grand. Had it been accomplished the semi-barbarous Macedonians would have menaced the civilised Greeks in vain, and even Rome at a later period might perhaps have found the Adriatic, and not the Euphrates, the limit of her empire. But the Spartan aristocrats were utterly incapable of appreciating such exalted patriotism, or of understanding the political necessity for it, and by their secret intrigues the well-planned scheme was brought to nothing. Athens and Sparta were already in that mood towards each other which rendered the disaster of the Peloponnesian war inevitable. When the Spartans about 448 restored to the Delphians the guardianship of the temple and treasures of Delphi, of which they had been deprived by the Phocians, the Athenians immediately after marched an army thither, and reinstated the latter. Three years later an insurrection broke out in the tributary Megara and Eubœa, and the Spartans again appeared in the field as the allies of the insurgents. The position of Athens was critical. Pericles wisely declined to fight against all his enemies at once. A bribe of ten talents (it was said) sent the Spartans home, and the insurgents were then thoroughly subdued. The thirty years' peace with Sparta (445) left him free to carry out his schemes for the internal prosperity of Athens.

Cimon was now dead and was succeeded in the leadership of the aristocratical party by Thucydides, son of Melesias, who in 444 B.C. made a strong effort to overthrow the supremacy of Pericles by attacking him in the popular assembly for squandering the public money on buildings and in festivals and amusements. Thucydides made an effective speech; but Pericles immediately rose and offered to execute the buildings at his own expense, if the citizens would allow him to put his own name upon them instead of theirs. The sarcasm was successful, Thucydides was ostracised, and to the end of his life Pericles reigned the undisputed master of the public policy of Athens. During the rest of his career 'there was,' says the historian Thucydides, 'in name a democracy, but in reality a government in the hands of the first

man.' And the Athens of his day was the home of Æschylus, Sophocles, Euripides, Anaxagoras, Zeno, Protagoras, Socrates, as well as Myron and Phidias; while there flourished at the same time, but elsewhere in Greece, Herodotus, Hippocrates, Pindar, Empedocles, and Democritus. The centre of this splendid group was Pericles, of whom the truthful pen of Thucydides records that he never did anything unworthy of his high position, that he did not flatter the people or oppress his adversaries, and that with all his unlimited command of the public purse he was personally incorruptible.

Soon after this the Samian war broke out, in which Pericles gained high renown as a naval commander. This war originated in a quarrel between Miletus and the island of Samos, in which Athens was led to take part with the former. The Samians after an obstinate struggle were beaten, and a peace was concluded (439). The position in which Athens then stood towards many of the Greek states was peculiar. Since the time of the Persian invasion she had been the leader of the confederacy formed to resist the attacks of the powerful enemy, and the guardian of the confederate treasury kept in the isle of Delos. Pericles caused the treasury to be removed to Athens, and, commuting the contingents of the allies for money, enormously increased the contributions to the patriotic fund, Athens herself undertaking to protect the confederacy. The grand charge against Pericles is that he applied the money thus obtained to other purposes than those for which it was designed; that, in short, he adorned and enriched Athens with the spoils of the allied states. To his mind Hellas was subordinate to Athens, and he confounded the splendour of the dominant city with the splendour of Greece in a manner possible to a man of poetic imagination, hardly to a man of the finest honour. His enemies, who dared not attack himself, struck at him in the persons of his friends. Phidias was flung into prison for the impiety of introducing portraits of himself and Pericles into the battle of the Amazons depicted on the shield of the goddess Athena in the Parthenon; the brilliant Aspasia (q.v.), the famous mistress of Pericles, was arraigned on a charge of impiety, and only acquitted through the eloquence of Pericles on her behalf; while the aged Anaxagoras was driven from the city.

It is unnecessary to give a detailed account of all that Pericles did to make his native city the most glorious in the ancient world. Greek architecture and sculpture under his patronage reached perfection. To him Athens owed the Parthenon, the Erechtheum, left unfinished at his death, the Propylæa, the Odeum, and numberless other public and sacred edifices; he also liberally encouraged music and the drama; and during his rule industry and commerce were in so flourishing a condition that prosperity was universal in Attica.

At length in 431 the long-foreseen and inevitable Peloponnesian war broke out between Athens and Sparta. The plan of Pericles was for Athens to follow a defensive attitude, to defend the city itself, leaving Attica to be ravaged by the enemy, but to cripple the power of Sparta by harassing its coasts. The story of the war is told elsewhere; here it is enough to say that the result was fatal to Athens for reasons for which Pericles was only in small part to blame. He trusted in the ultimate success of Athens both from her superior wealth and from her possessing the command of the sea, but he had not calculated upon the deterioration in her citizens' spirit, nor upon the robust courage of the Boeotian and Spartan infantry. Nor was his advice to keep behind the city walls rather than face the enemy in the field best calculated to arouse the Athenians' courage. The plague ravaged the city in 430, and in the autumn of the following year

Pericles himself died after a lingering fever. His two sons had been carried off by the plague; he had been harassed by a charge of peculation brought by Cleon, and the actual infliction of a fine by the dicastery, while he had been without office from July 430 to July 429; but before the last he recovered his hold over the Ecclesia, and was gratified in the closing days of his life by its legitimization of his son by Aspasia.

His greatest fault as a statesman was a failure to foresee that personal government is ultimately ruinous to a nation. He taught the people to follow a leader, but he could not perpetuate a descent of leaders like himself. Hence we cannot wonder, when days of trouble broke over Athens, how that men spoke bitterly of Pericles and all his glory. Yet he was a lofty-minded statesman, inspired by noble aspirations, and his heart was full of a noble love for the city and her citizens. Plutarch tells the story that as he lay dying and apparently unconscious his friends around his bed were passing in review the great achievements of his life, and the nine trophies which he had erected at different times for so many victories. The dying patriot quietly interrupted with the characteristic sentence—'What you praise in my life belongs partly to good fortune, and is, at best, common to me with many generals. But that of which I am proudest you have left unnoticed—no Athenian has ever put on mourning through any act of mine.'

For his life and character, see Thucydides and Plutarch; the histories of Greece; *The Camb. Anc. Hist.*, vol. v. (1927); and the excellent study by Evelyn Abbott (1891).

Peridinium. See INFUSORIA.

Peridot, Peridote. See CHRYSOLITE.

Peridotite. See IGNEOUS ROCKS.

Périer, CASIMIR, French politician, was born at Grenoble, 21st October 1777. A Parisian banker, he condemned in 1817 the financial policy of the ministry, and thereby won a seat in the Chamber of Deputies. In 1828 he held the portfolio of finance under Martignac, but resigned it next year. For an active part in the July revolution (1830) he was rewarded with a seat in the cabinet, without a portfolio. When, however, Laffitte became President of the Council (November 2), Périer undertook the presidency of the Chamber. On 13th March 1831 he succeeded Laffitte as minister; he sternly repressed all attempts at revolution, and governed by the *Juste Milieu* (q.v.) policy. He died of cholera, 16th May 1832. For his son, see CASIMIR-PÉRIER.

Perigee. See MOON.

Périgueux, a town of France, formerly capital of Périgord, now in the department of Dordogne, and situated on the right bank of the Isle, a tributary of the Dordogne, 95 miles by rail N.E. of Bordeaux. It consists of the ancient city, which is gloomy in aspect and has narrow streets, with numerous houses and other remains of mediæval and Renaissance architecture, and the Puy St Front, which until 1269 was a separate and a rival town. The cathedral of St Front is a Byzantine edifice, said to be a copy of St Mark's at Venice, built in 984-1047, but spoilt by 'restoration' in 1865. The town museum is especially rich in Roman and other antiquities. Statues of Montaigne, Fénelon, and the soldiers Daumesnil and Bugeaud adorn public places in the town. Iron is mined and worked, and woollens are manufactured. The celebrated *pâtés de Périgueux*, made of partridges and truffles, are largely exported. Population; 33,500. Périgueux, a town of the highest antiquity, is the Gallic *Vesunna* mentioned by Cæsar. The Romans built another town on the opposite side of the river at the junction of five Roman roads. Close to the modern town are the remains of a vast amphitheatre, aqueducts, baths,

and temples. The tower of Vesunna is the most remarkable fragment of Roman architecture. It is 89 feet high, 200 feet in circumference, and has walls 6 feet thick, but has neither doors nor windows. Its purpose is not known. The district of Périgord is noted for its Caves (q.v.) and archaeological finds. See FLINT IMPLEMENTS.

Perihelion (Gr. *peri*, and *hēlios*, 'the sun'), that point in its orbit at which a planet is nearest the sun. See PLANETS, ORBIT, APHELION.

Perim, a barren island, and coaling and telegraph station, belonging to Britain, situated in the Strait of Bab-el-Mandeb, at the southern entrance to the Red Sea, 97 miles W. of Aden, 1½ from the Arabian shore, and 9 from the African. It is about 3½ miles long by 2½ wide, having an area of 5 sq. m. It is crescent shaped, the two horns embracing a deep and spacious harbour. The island was held by the British in 1799-1800, and was again occupied in 1857. In 1883 it was made a coaling station. The island is under the jurisdiction of the governor of Bombay Presidency. Pop. about 2000.

Perineum, the floor of the human pelvis. The anterior portion, situated in front of the anus, is called the *true perineum*, or uethral portion of the perineum; the posterior portion is called the anal portion or ischio-rectal region.

Period and Periodicity. One of the most striking features of the ordinary phenomena of nature is their tendency to recur and repeat themselves apparently indefinitely; and in general this repetition takes place at successive and practically equal intervals of time. The day, the month, the year are familiar examples of such periods, corresponding respectively to the earth's rotation, the moon's progression through its phases, and the earth's changes of distance from the sun. As a factor in human life the year is practically traced out by the climatic changes that accompany its progress, but strictly speaking it is the period determined by the recurring configurations of earth and sun. Many periodic phenomena of importance, such as eclipses, transits, occultations, depend like the moon's phases on the configurations of three bodies; and long before Newton's law of gravitation gave the key to the cosmic universe the periods of some of these had been discovered. See CHRONOLOGY (with its various cycles—the metonic of 19 years, the Calippic of 76 years, &c.), CYCLE, DAY, ECLIPSE, YEAR, &c.

When we look into the minute mechanism of nature we find here also the same prominence attached to periodic qualities. Sound and light consist physically of a vibratory or oscillatory motion of some sort; and to the accurate time periodicity of these motions we trace our sensations of harmony in music and colour. In certain respects, however, the periodicity is imperfect, each period not being an exact reproduction of its predecessor. Thus, a tuning-fork or pianoforte-string vibrating freely in air rapidly loses its vibratory character, and its motion steadily decays; and yet, judged by the pitch, the frequency or time periodicity remains the same throughout. In these and similar cases Viscosity (q.v.) ultimately transforms the original vibratory energy into heat (see ENERGY). Heat itself is believed to be some kind of vibratory energy of the molecules; and the spectroscopic demonstrates that intense heat is certainly associated with definite periodic motions, giving rise to rays of corresponding periodicity (see SPECTRUM).

Passing now to the other extreme, we find, chiefly in astronomy, instances of long periods, some of which have not been completed within historic times, but of which the evidence is incon-

trovertible. The Precession (q.v.) of the equinoxes and the slow changes in the eccentricities and inclinations of planetary orbits may be mentioned by way of illustration. The geologist also has found evidence of periodic changes in the climatic conditions of the earth (see GLACIAL PERIOD, PLEISTOCENE). Generally periodicity involves the idea of time; but we may have periodic qualities depending on position or on grouping. A very good example of this is the periodic law of modern chemistry (see ATOMIC THEORY; also WAVE).

Life is as full of periodic phenomena as inanimate nature; but the increasing complexity of conditions makes the periodicity still less perfect. In the beating of the heart, in the alternation of waking and sleeping, of hunger and satiety we have examples of vital actions with a distinct periodic character.

Periodicals. A periodical is a publication issued at regular intervals, but the term does not include newspapers. The periodical dates back to the 17th century, but for practical purposes we can begin with the *Tatler*, started in 1709. It was followed by *The Spectator*, 1711. The *Gentleman's Magazine*, issued in 1731, first established the British type of magazine. Coming to more recent times, *Blackwood's Edinburgh Magazine* was started in 1817. The popular necessity for cheap literature led to the issue in the early part of the 19th century of numerous publications of a more or less educational character, such as the *Mechanic's Magazine*, *Chambers's Journal*, and the *Penny Magazine*. These were followed by *Cassell's Popular Educator* and other periodicals of a similar type. In 1881 the periodical world was revolutionised by the appearance of *Tit-Bits*, designed and edited by the late Sir George Newnes, Bart. The chief features of this publication were the pith, brevity, and human interest of its paragraphs, and the introduction of new features such as 'Answers to Correspondents.' *Tit-Bits* was followed in 1888 by *Answers*, established by Lord Northcliffe (then Mr Harmsworth), and in 1890 by *Pearson's Weekly*, established by the late Sir Arthur Pearson, Bart. (then Mr Pearson). These publications owed their success in no small degree to competitions in which large money prizes were offered. As time has passed these competitions have become increasingly popular. They now form an outstanding feature of periodical journalism, and have been adopted by periodicals and newspapers in all parts of the world. To Sir George Newnes belongs the credit of being the founder of this type of circulation raiser. Fiction periodicals have long held a leading position in the periodical world. The *Family Herald* (1843) and the *London Journal* (1845) had large sales at a time when big circulations were few and far between. Charles Dickens established *All the Year Round* in 1859, and in this periodical appeared many of his stories in serial form. The *Cornhill* was started about 1860 under Thackeray's editorship. It marked a new epoch in high-class periodical literature. In 1891 Sir George Newnes published the first modern illustrated magazine, *The Strand*, which has been copied in all parts of the world. For years past much of the best fiction has first appeared in serial form in various magazines. This has led to developments greatly to the advantage of authors. Nowadays copyright is split into different sections—first, and second, serial rights, and book rights of different dimensions according to the price of the various editions. Vast numbers of periodicals are issued week by week by the great publishing houses. In Britain the chief are the Amalgamated Press, Ltd., established by Lords Northcliffe and Rothermere, and now managed by Sir George Sutton, Bart.;

George Newnes, Ltd., and C. Arthur Pearson, Ltd., which are associated under the chairmanship of Lord Riddell; Cassells, Ltd., controlled by the Messrs Berry and the Odhams Press, Ltd.

The high-class reviews, such as the *Edinburgh* (1802), the *Quarterly* (1809), the *Nineteenth Century and After* (1877), the *Contemporary* (1866), the *Fortnightly* (1867), are devoted to critical comment on public events and literature. Their sales are not large but they are influential, and these publications are much quoted in the press.

In the space available it is impossible to describe the variety of the periodicals. In Britain the number is estimated at over 3000, while America claims nearly 5000. The total number in the world is estimated at 13,000, but little reliance can be placed on this figure. Every interest in life is catered for by some periodical or periodicals—from dancing to midwifery—and perhaps, needless to say, the advertisement pages are one of the chief features and sources of profit of most periodicals. Although some French and German periodicals are conducted with much enterprise and have large sales, Britain and America are the real homes of this class of publication. In this country periodicals of the *Tit-Bits* type, the cheap novelette, and cheap papers for women have enormous sales. In America conditions are somewhat different. The Sunday newspaper provides much of the material furnished by periodicals in Britain. But, having regard to geographical necessities, the newspapers circulate only in limited areas. No newspaper has a national sale. On the other hand, publications like the *Ladies' Home Journal* and *Saturday Evening Post* circulate throughout the length and breadth of America with wonderful commercial and advertising results. The periodical press of Britain is gathered together in the Periodical Trade Press and Weekly Newspaper Proprietors' Association, Ltd.

REFERENCES.—Mitchell's *Press Directory*; Williams's *History of English Journalism*; Kennedy Jones's *Fleet Street and Downing Street*; Simonis's *Street of Ink*.

Periophtalmus, a remarkable genus of acanthopterous fishes, allied to the gobies. Their eyes protrude and are very mobile; their pectoral fins can be used as legs. Several species occur on the coasts of the Indian Ocean and Western Africa; of these the best known is *P. koelreuteri*.



Periophtalmus koelreuteri.

(From Hickson's *Naturalist in North Celebes*, 1890.)

This fish lives about low tide-mark on the muddy flats or among rocks, and by means of its pectoral fins and tail hops along in search of crustaceans, insects, and gastropods. Respiration seems to be effected through the skin of the tail even more than by the gills. They cling by their fins to rocks and mangrove-roots, and keep their tails in the water; or they climb entirely out of the water, and jump with agility when disturbed.

Periostitis, inflammation of the periosteum, the tough fibrous membrane which surrounds

the various bones (see BONE). It generally occurs on the surface of thinly-covered bones, such as the tibia, clavicles, and cranial bones. Its chief causes are, in the acute form, an infective process following a bruise or other injury; and, in the chronic form, tuberculous, syphilitic, or rheumatism. In the acute form there are pain, tenderness to touch, redness of the skin, and swelling. In the chronic form the membrane is thickened and new bone is formed, with aching pain, usually worse at night. The treatment is by rest, elevation of the limb, and soothing applications; with, in the chronic form, internal administration of iodide of potassium.

Peripatetic Philosophy, a designation of the philosophy of Aristotle (q.v.) and of his followers. It is of doubtful origin, being supposed to have been derived either from his custom of occasionally walking about (*peripatein*) during the delivery of his lectures, or from the place in which they were delivered being a shaded walk.

Peripatus, a genus in the class Onychophora or Prototracheata which occupies a position between myriopods and insects on the one hand and annelids on the other. Thus, along with the tracheæ or air-tubes characteristic of insects, *Peripatus* has the nephridia or excretory tubes characteristic of the higher worms. The body measures about two inches in length, is shaped like that of a worm or caterpillar, but without external rings, bears numerous (14 to 42) imperfectly-jointed stump-like clawed feet, and has a soft skin, with little of that chitin which is abundant as a cuticular product in other arthropods. The head bears a pair of mobile antennæ, a pair of mandibles in the mouth, and a pair of oral papillæ from which slime oozes. With this *Peripatus* catches its prey of small insects, &c. The species live in moist places under stones and bark, and are nocturnal in their habits. Professor Sedgwick says that 'the exquisite sensitiveness and constantly changing form of the antennæ, the well-rounded plump body, the eyes set like small diamonds on the side of the head, the delicate feet, and, above all, the rich colouring and velvety texture of the skin all combine to give these animals an aspect of quite exceptional beauty.' There are many remarkable structural features: thus, the ventral nerves are widely separate; the eyes are simple, like those of an annelid; the body-cavity is divided into three longitudinal compartments, from which the cavities of the legs are furthermore distinct. The sexes are separate. The development varies considerably in different species, for the ova may contain a considerable amount of yolk or none at all. In several it has been observed that the cells of the embryo are for a prolonged period indistinctly separate from one another. The Onychophora are viviparous, and the newly-born young are quite like the parents except in size. The distribution is very wide; in South Africa there are several species—e.g. *P. capensis*, *P. balfouri*, in New Zealand, *P. novæ Zealandiæ*; in Queensland, *P. leuckartii*; in Carriacou, *P. edwardsii*; in Jamaica there are two species; and there are others from Demerara, Trinidad, St Vincent, Chile, Quito, the Malay Peninsula, &c. It is usual to distinguish several other genera besides *Peripatus*, such as *Eopeipatus*, *Paraperipatus*, *Peripatoides*, *Peripatopsis*. See figure under CATERPILLAR, and Bouvier's monograph (1907).

Periscope (Gr. *peri*, 'around,' *skopein*, 'to look'), an instrument used in submarine navigation and in trench warfare for observing the surroundings at or above the surface. It consists essentially of a tube with two mirrors; one at the top, at an angle of 45° with the axis (or whatever

other angle may be required for objects overhead), reflects rays down the tube to the second, also at 45°, which reflects them horizontally to the eye. The required magnification is got by lenses.

Perissodactyla. See ARTIODACTYLA.

Peristaltic Motion, the action of the muscular coat of the intestines, by which the substances contained within it are regularly moved onward. See DIGESTION.

Peritoneum (Gr. *periteinein*, 'to extend around'), a serous membrane, and, like all membranes of this class, a shut sac, which, however, in the female is not completely closed, as the Fallopian tubes communicate with it by their free extremities. The peritoneum more or less completely invests all the viscera lying in the abdominal and pelvic cavities, and is then reflected upon the walls of the abdomen, so that there is a visceral and a parietal layer. Numerous folds are formed by the visceral layer as it passes from one organ to another. They serve to hold the parts in position, and at the same time enclose vessels and nerves. Some of these folds are termed *Ligaments*, from their serving to support the organs. Thus, we have ligaments of the liver, spleen, bladder, and uterus formed by peritoneal folds. Others are termed *Mesenteries* (from the Gr. *meson*, 'the middle,' and *enteron*, 'the intestine'), and connect the intestines with the vertebral column. They are the Mesentery proper, the ascending, transverse, and descending meso-colon, and the meso-rectum. Lastly, there are folds called *Omenta*, which proceed from one viscus to another. The great omentum always contains some adipose tissue, which in persons inclined to corpulency often accumulates to an enormous extent. Its use appears to be (1) to protect the intestines from cold by covering them anteriorly as with an apron, and (2) to facilitate their movement upon each other during their vermicular action.

DISEASES OF THE PERITONEUM.—The peritoneum often becomes the seat of dropsical effusion, both in cases of general dropsy and in cirrhosis of the liver. It may also be attacked by cancer, either primary or secondary, and, like all the serous membranes, readily takes on inflammation from various exciting causes. This inflammation is termed Peritonitis, and may be either an acute or a chronic disease.

Acute Peritonitis, inflammation of the coating of the bowels, but often popularly spoken of as 'inflammation of the bowels,' generally presents well-marked symptoms. It sometimes commences with shivering, but severe pain in the abdomen is usually the first symptom. The pain is at first sometimes confined to particular spots (usually in the lower part of the abdomen), but it soon extends over the whole abdominal region. It is increased, on pressure, to such an extent that the patient cannot even bear the weight of the bedclothes; and to avoid, as far as possible, internal pressure upon the peritoneum, he lies perfectly still, on his back, with the legs drawn up, and breathes by means of the ribs, in consequence of the pain occasioned by the descent of the diaphragm in inspiration. The breathing is naturally shallow in these cases, and, less air being admitted at each movement of respiration, the number of those movements is increased. There are perhaps forty or even sixty respirations executed in a minute, instead of eighteen or twenty. The pulse is usually very frequent, often 120 or more in the minute, and small and tense, though occasionally strong and full at the commencement of the attack; the temperature is usually raised, and vomiting is almost always an early symptom. After the disease has continued for one or two days

the belly becomes tense and swollen; the enlargement being caused at first by flatus, and afterwards also by the effusion of fluid, as may be ascertained by percussion and palpation. The progress of the disease is in general rapid. In fatal cases death usually takes place within a week, and often sooner. The symptoms indicating that the disease is advancing towards a fatal termination are great distension of the abdomen, a very frequent and feeble pulse, a pinched and extremely anxious appearance of the face, and cold sweats.

Peritonitis is frequently the result of local violence, and of wounds penetrating the peritoneal sac, such as gunshot wounds, surgical operations become septic, &c. In the majority of cases it is due to extension of some inflammatory process in one of the abdominal viscera, particularly the hollow viscera (appendix vermiformis, stomach, intestines, gall-bladder, urinary-bladder, womb). It is sometimes caused by Bright's disease. Two varieties call for special mention: *puerperal peritonitis*, due to extension of septic inflammation of the lining membrane of the womb after childbirth or miscarriage, a most fatal form of disease; and *peritonitis from perforation* of one of the hollow viscera, which is characterised by the suddenness of the attack, intense pain arising in some part of the abdomen, the whole of which soon becomes tender in every part. This form of the disease is generally fatal, usually within a few days, unless it be anticipated by early operation upon the organ which forms the source of infection. Perforation of the small intestine, in consequence of ulceration of its glands, is of not uncommon occurrence in typhoid fever, and sometimes occurs in tuberculous ulceration, late in a case of phthisis. The vermiform appendage of the cæcum is a comparatively frequent seat of perforation, especially when the appendicitis early takes on a gangrenous or suppurative character. Sometimes it is the stomach which is perforated, and in these cases the patients are usually young women suffering from gastric ulcer, who may have previously appeared in good health, or at most have complained of slight dyspepsia. The organisms found in acute peritonitis are most commonly the bacillus coli; in puerperal cases usually a streptococcus; and occasionally the gonococcus is the cause.

At the onset of the disease it is not always easy to distinguish it from Colic (q.v.), but the progress of the case will soon settle the question. With this exception, the only disease with which peritonitis is likely to be confounded by the well-educated practitioner is a peculiar form of hysteria; but the age and sex of the patient, the presence of hysteria in other forms, and the general history of the patient and of her symptoms will almost always lead to a correct diagnosis of the disease.

The treatment of a case of peritonitis must depend upon the cause to which it is due. Perfect rest in bed is essential. The diet must be light and fluid; in cases of perforation of the stomach no food or even drink must be given by the mouth. Light poultices, or hot fomentations, should be constantly applied to the abdomen. In cases of perforation from disease or injury, and of suppurative peritonitis, immediate surgical intervention to open the abdomen and suture the leaking organ is the proper treatment. In the after-treatment, careful nursing, the position of the patient in bed, the administration of opium, saline aperients, or other drugs as required, all demand the strictest attention.

Chronic Peritonitis occurs in two forms, which differ in their origin and degree of fatality, but are very similar in their symptoms. In the first the inflammation is of the ordinary character, and, although the disease sometimes originates spontaneously, it is more frequently the sequel of an

imperfectly cured acute attack; in the second it depends upon tubercular inflammation. The symptoms of chronic peritonitis are more obscure than those of the acute form. There is abdominal pain, often slight, and not always constant, which is increased by pressure, or sometimes is felt only when pressure is made. The patient complains of a sensation of fullness and tension of the belly, although its size is not visibly increased; of a loss of appetite; and of nausea and vomiting; and the bowels are usually more or less out of order. After a time the abdomen enlarges, and becomes tympanitic, or more or less filled with fluid, and at the same time the patient's general debility increases. It is not always easy to determine, during life, whether the disease belongs to the first or second form. When its origin cannot be traced to a preceding acute attack, to local abdominal injury, or to chronic affections of the abdominal viscera, there is strong reason to believe it to be of the tubercular form, especially if the general constitution and the hereditary tendencies of the patient point in the same direction.

In treatment the general remedies for tuberculous, such as life in the open air, good food, and warm clothing are necessary; tuberculin is often used. The application of stimulating substances to the abdomen, such as iodine or mercurial ointment, helps to cause absorption. In cases which do not improve after some weeks or months of this treatment, opening of the abdomen with drainage and admission of air is often followed by excellent results.

Periwinkle (*Vinca*), a genus of plants of the family Apocynaceæ, having a 5-cleft calyx, and a salver-shaped corolla bearded at the throat, with five obliquely truncated segments. The leaves are opposite and evergreen; the flowers growing singly or in pairs from the axils of the leaves. The Lesser Periwinkle (*V. minor*), a native of many parts of Europe and of the southern parts of Britain, growing in woods and thickets, is a half-shrubby plant with trailing stems, rooting at their extremities, ovate-lanceolate leaves, and pale-blue—sometimes white or reddish-purple—salver-shaped flowers. The Greater Periwinkle (*V. major*) which has much larger flowers and ovate-cordate leaves, is a native of the south of Europe, and is found in a few places in the south of England. Both of these species are very commonly planted in shrubberies and gardens, rapidly cover unsightly objects with pleasing green foliage, and produce their beautiful flowers at almost all seasons of the year, even in winter when the weather is mild. The Herbaceous Periwinkle (*V. herbacea*), a Hungarian species, is remarkable for the abundance of its flowers. The Rose-coloured Periwinkle (*V. rosea*), a native of Madagascar, is a favourite hot-house plant. The Yellow Periwinkle (*Golonobus carolinensis*) is a native of the southern parts of North America.

Periwinkle (*Littorina*), a genus of marine Gasteropods, represented by several species on British coasts. The commonest, *Littorina littorea*, is abundant between tide-marks on the rocks, and is often collected and used for food. It is boiled in its shell, extracted as eaten, and is very palatable. Periwinkles crawl about under water, but usually remain passive when left uncovered by the tide. Without water they can survive for many hours, and they are also able to endure a considerable freshening of the salt water. They feed on seaweeds, and are often useful in keeping beds of young oysters from being smothered. Periwinkles drawn up from 70 to 80 fathoms were first in 1889 used as bait for cod-fishing on the banks of Newfoundland. The edible species is oviparous, but in

L. rudis, which is usually common nearer high-water mark, the young are hatched and have a hard shell before they leave the mother. These shells are apt to make this periwinkle gritty, and therefore it is not used as food. Among the structural characters of the periwinkle the substantial shell of few whorls, the closely-fitting, horny operculum, the nearly circular shell aperture without any siphon-notch are at once evident. Species of *Littorina* occur on almost all coasts, and there are about half a hundred in all. It should be carefully noticed that the periwinkle is often called the Wilk, Wulk, or Wheelk in Scotland, but it is not nearly related to the true wheelks (*Purpura*, *Buccinum*, &c.). See WHEELK.

Perizzites, the Canaanites of Galilee. See PALESTINE.

Perjury is the crime committed by one who, when giving evidence on oath as a witness in a court of justice, or before some constituted authority of the same kind, gives evidence which he knows to be false. But in order to make the giving of false evidence a crime the evidence must be material—i.e. it must affect the decision of some question before the court. If the falsehood occurred as to some trifling or immaterial fact no crime is committed. Moreover, it is necessary, in proving the crime, that at least two persons should be able to testify to the falsehood of the matter, so that there might be a majority of oaths on the matter—there being then two oaths to one. But this rule is satisfied though both witnesses do not testify to one point. The perjury must also have taken place before some court or tribunal which had power to administer the oath (see OATH). Though in some courts affirmations are allowed instead of oaths, yet the punishment for false affirmation is made precisely the same as for false swearing. The punishment for perjury was, before the Conquest, sometimes death or cutting out the tongue; perjury is now a misdemeanour, punishable by imprisonment with hard labour. The crime of Subornation of Perjury—i.e. the persuading or procuring a person to give false evidence—is also punishable as a distinct offence; if the false evidence is not given the crime is incitement. In many states of the American Union the crime of false swearing, recognised by common law, is further particularly defined by statute. The violation of an oath of office is not perjury; nor is a false affidavit to an account rendered to an administrator technically perjury, nor false evidence in depositions taken by consent by unauthorised persons.

Perkeniers. See MOLUCCAS.

Perlis, a state under British protection on the west coast of the Malay Peninsula N. of Kedah. Area, 316 sq. m.; pop. 40,000 (mostly Malays). See MALAY STATES.

Perlitic Structure, in Petrography, is a structure seen in some vitreous rocks. These rocks seem as if made up of little pearly or enamel-like spheroids, each of which is subdivided into a number of concentric coats by curved cracks, roughly parallel to its boundary. The spheroids usually lie packed between rectilinear or curved fissures that traverse the rock in all directions. Perlite is the name given to rocks showing this structure.

Perm, a town of the Ural District of Russia, on the Kama, by which it is 685 miles NE. of Kazan. It is the chief seat of the extensive transit trade between European Russia and Siberia, and has a cathedral, university, tanneries, flour-mills, and oil-works, and a government arsenal and cannon-foundry. Pop. 74,000. The region is exceptionally rich in minerals.

Permian System. In Britain this series of strata rests unconformably upon the Carboniferous rocks. It consists of the following groups:

UPPER RED SANDSTONES, clays and gyssins (50 to 100 feet thick in east of England, west of Pennine chain, 600 feet thick).

MAGNESIAN LIMESTONE (500 to 600 feet) = Zechstein of Germany.

MARL SLATE (about 60 feet) = Kupferschiefer.

LOWER RED AND MOTTLED SANDSTONES, with conglomerates and breccias (3000 feet in Cumberland; in the east of England not over 250 feet) = Rothliegendes of Germany.

The Lower Red Sandstones are greatly developed in Staffordshire, Cheshire, and Lancashire, and the Vale of Eden in Westmorland and Cumberland. Small areas also occur in the valleys of the Nith and Annan and in Ayrshire; and similar areas appear in the districts of Down, Tyrone, and Armagh in Ireland. The breccias met with in this group often contain erratics, and have the general aspect of glacial accumulations; and Sir A. Ramsay thought they probably indicate the occurrence of a glacial episode in the Permian period. In the Scottish area the rocks contain sheets of lava-form rocks and tuffs, associated with which are many small filled-up volcanic vents or necks. The most important member of the overlying groups is the Magnesian limestone, which is the chief repository of Permian fossils. Many of its beds assume curious concretionary forms, as is well seen on the coast of Durham.

In Germany the Permian consists of an upper and lower group—hence the system is often termed *Dyas*—the Zechstein and Kupferschiefer forming the upper, and the Rothliegendes the lower group. Volcanic rocks are associated with the latter. The Kupferschiefer has long been famous for its ores of copper and other metals, and fossil fishes; while associated with the Zechstein are beds of anhydrite, gypsum, rock-salt, and bituminous shales. In Russia the system occupies an area of more than 15,000 sq. m. between Moscow and the Urals. It is well developed in the government of Perm, from which it derives its name. While the German *Dyas* presents the same general features as the Permian of Durham and the east of England, the Russian development resembles the Permians of the Midlands and north-west of England—limestone being quite a subordinate formation, and often wanting. But while most of Northern Europe was land during Permian times, the southern portion of that continent, together with Central Asia, must have been covered by the sea, since they now exhibit a continuous succession of marine deposits from the Carboniferous to the Permian. In North America and Australia similar conditions obtained, and the strata, which include the remarkable coal-bearing series of Australia, are designated *Permo-Carboniferous*.

Life of the Period.—The Permian strata as a whole are not rich in fossils—the red sandstones which form so large a portion of the system being for the most part barren. As contrasted with the flora of the Carboniferous period that of the Permian is poor and meagre. But that poverty may be only apparent—the conditions for its preservation not having been so favourable as during Carboniferous times. It may be considered as an impoverished continuation of the Carboniferous flora. The most common plants are ferns—both herbaceous and arborescent—many of the genera being Carboniferous, while others, such as *Callipteris*, are not known as Carboniferous forms. Conifers were likewise numerous, especially the yew-like *Walchia* and the cone-bearing *Ullmannia*. Cycads also flourished, *Pterophyllum* and *Psygophyllum* being forms met with in Permian strata. Finally, it may be noted that many characteristic Paleozoic types died out in Permian times, such as the *Lepidodendroids*, *Sigillarioids*, and *Calamites*.

The animal life of the period is somewhat better represented; but it too appears impoverished when contrasted with that which flourished in the preceding Carboniferous period. We note that rugose corals, so abundant in the older Paleozoic rocks, are very sparingly met with in Permian strata; even tabulate forms are feebly represented. Polyzoa are fairly numerous in the Magnesian Limestone. Amongst brachiopods the more abundant types are survivals from the Carboniferous, as *Productus*, *Spirifera*, *Strophalosia*. Lamellibranchs are somewhat more numerous than brachiopods, common forms being *Schizodus*, *Bakevella*, *Edmondia*, &c. *Gastropods* (*Murchisonia*, *Pleurotomaria*) are feebly represented, and the same is the case with the cephalopods (*Nautilus*, *Orthoceras*, *Cyrtoceras*). It is worthy of note that the trilobites are represented by one form (*Phillipsia*)—the last appearance of that eminently Paleozoic order. Among the fishes the principal genera are *Palæoniscus* and *Platysomus*. Amphibians seem to have abounded; they are all labyrinthodonts (*Archegosaurus*, *Branchiosaurus*, *Pelosauros*). At this horizon true reptiles make their earliest appearance.

In most parts of Europe where Permian strata are developed they rest unconformably on Carboniferous and other rocks, from which it is evident that towards the close of Carboniferous times considerable earth-movements took place. These caused the sea to disappear from wide regions in Europe, and resulted eventually in the isolation of certain areas, which thus became inland seas or salt lakes. In these latter mottled sandstones, dolomitic limestones, rock-salt, and gypsum were accumulated, so that the conditions were not favourable to life. One or more such inland seas covered large areas of what is now central England, and extended into southern Scotland and the north of Ireland. Similar large inland seas existed in middle and eastern Europe. The strata accumulated in such basins show plentiful footprints and other indications of shallow-water conditions, such as worm-tracks, sun-cracks, rain-pittings, and ripple-marks—evidence which indicates that the level of the lakes was often abnormally lowered during dry seasons, leaving wide tracts exposed over which crawled annelids, amphibians, and reptiles. Volcanic action was rife in Scotland and Germany, and it has been suggested that the abundant and well-preserved fish remains which occur in the Kupferschiefer may have been poisoned by the sudden influx of mineral springs connected with the volcanic disturbances of the time. Some of the inland seas may have had occasional connection with the open sea for longer or shorter periods, as, for example, during the formation of the thicker fossiliferous limestones. But, taken as a whole, the general character of the strata is that of accumulations formed in inland seas. The climate of the period, so far as one can judge from the aspect of flora and fauna, was probably mild and genial. Nevertheless the occurrence of coarse breccias, with their scratched stones and erratics, in the Permian of Britain and the Continent, and the similar appearances met with in strata, which are believed to be of the same age, in India, Australia, and South Africa seem hard to explain without the agency of floating ice.

Permutations and Combinations. A combination, in Mathematics, is a selection of a number of objects from a given set of objects, without any regard to the order in which they are placed. The objects are called elements, and the combinations are divided into classes, according to the number of elements in each. Let the given elements be the four letters *a, b, c, d*; the binary combinations, or selections of two, are *ab, ac, ad,*

bc, bd, cd—six in all; the combinations of three are *abc, abd, acd, bcd*—four in all; while there is only one combination of four—viz. *abcd*.

Permutation, again, has reference to the order of arrangement; thus, the two elements, *a* and *b*, may stand *ab* or *ba*, so that every combination of two gives two permutations; the three elements, *a, b, c*, may stand *abc, acb, bac, bca, cab, cba*, one combination of three thus affording six permutations. The combinations of any order with all their permutations are called the *Variations*. Formulas are given in works of algebra for calculating the number of permutations or combinations in any given case. Suppose seven lottery-tickets marked 1, 2, 3, to 7, and that two are to be drawn; if it is asked how many possible pairs of numbers there are, this is a question of the number of combinations of seven elements, *two* together, which is found to be 21. If we want to know how many times the same seven persons could sit down to table together with a different arrangement each time, this is to ask how many permutations seven objects admit of, and the formula gives $7 \times 6 \times 5 \times 4 \times 3 \times 2 = 5040$. The theory of probabilities is founded on the laws of combination. Thus, in the case of drawing two tickets out of seven, since there are 21 possible pairs, the chance or probability of drawing any particular pair is 1 in 21, or $\frac{1}{21}$. In working out questions in 'combinations' advantage is often taken of the fact that, whatever number of elements be taken from a group to form a combination, the number left gives the same number of combinations; thus, the number of combinations of 10 elements *three* together, is the same as that of 10 elements *seven* together.

Pernambuco, or RECIFE, the busiest seaport of north Brazil, stands at the easternmost point of the coast, in 8° 3' S. lat. It consists of three portions, connected by bridges—*Recife* ('the-reef') proper, a Dutch-looking quarter, with narrow, winding streets, the chief seat of commerce, on a peninsula; *São Antonio*, a modern quarter, with straight, wide streets, on an island between the peninsula and the mainland; and *Boa Vista*, where are the merchants' villas, on the mainland. Spacious avenues have been made. The principal buildings and public institutions embrace two arsenals, an observatory, the palace of the Archbishop of Olinda (q.v.), law and other schools, &c. The harbour, formed by a reef lying a quarter to half a mile from the coast, is now accessible to great ships. Cottons, machinery, and tobacco are manufactured, and shipbuilding is carried on. There is a lighthouse in the harbour, which is defended by forts. The principal exports are sugar and cotton. Pop. (1878) 94,493; (1920) 238,843. Recife was founded in the second half of the 16th century. Sir James Lancaster captured it in 1595, and the Dutch in 1630. The other two quarters, Mauritsstad (now San Antonio) and Schoonzigt (Boa Vista), were laid out by the Dutch Count Maurice in 1639. The Portuguese captured the town in 1654.—The *state* has a hot, moist climate; produces sugar and cotton; and has an area of 38,312 sq. m. and a pop. of (1872) 841,539; (1920) 2,154,835. Large portions of the interior still remain in a state of nature, uncultivated and covered with forests.

Pernambuco Wood. See BRAZIL-WOOD.

Pernau (Est. *Parnu*), a seaport of the Baltic, in Esthonia, stands at the mouth of the river Pernau, at the northern extremity of the Gulf of Riga, 100 miles N. of Riga and 80 W. of Dorpat. Besides linseed and barley, it ships large quantities of flax, principally to Great Britain. Pop. 20,000. The university of Dorpat was stationed here from 1699 to 1710.

Pérouse. See LA PÉROUSE.

Perowne, JOHN JAMES STEWART, was born at Burdwan in Bengal, 13th March 1823, of a family of Huguenot origin. He had his education at Norwich grammar-school and at Corpus Christi College, Cambridge, graduated B.A. in 1845, and was elected Fellow of his college in 1849. He was afterwards examiner for the classical tripos, select preacher, Hulsean lecturer (1868), and Lady Margaret's preacher; professor in King's College, London; and from 1862 till 1872 vice-principal of St David's College, Lampeter. Later he was prelector in Theology and Fellow of Trinity College, Cambridge; preacher at the Chapel Royal, Whitehall; and canon residentiary of Llandaff from 1869 to 1878, when he was appointed Dean of Peterborough. Already, since 1875, he had been also Hulsean professor of Divinity at Cambridge. From 1891 till he resigned in 1901 he was Bishop of Worcester; he died 6th November 1904. A sound Hebrew scholar, he sat throughout in the Company for the Revision of the Old Testament, and was general editor of 'The Cambridge Bible for Schools.' His commentary on the *Book of Psalms* (2 vols. 1864-68) was a masterpiece of exegetical science.

Perpendicular, the name given to the style of Gothic architecture in England which succeeded the Decorated style. It prevailed from about the



Winchester Cathedral—Nave, looking west.

end of the 14th century to the middle of the 16th century, and was thus contemporary with the Flamboyant style in France. These styles have

much in common, but they derive their names from the features peculiar to each. Thus, the Flamboyant (q.v.) is distinguished by the flowing lines of its tracery; whilst the Perpendicular is remarkable for its stiff and rectilinear lines. The lines of the window-tracery are chiefly vertical, and the mullions are frequently crossed by transoms or horizontal bars. The mouldings are usually thin and hard. The same feeling pervades the other features of the style; the buttresses, piers, towers, &c. are all drawn up and attenuated, and present in their shallow recesses and meagre lines a great contrast to the deep shadows and bold mouldings of the earlier styles. The art of masonry was well understood during the Perpendicular period, and the vaulting was admirably built. Pan-tracery Vaulting (q.v.) belongs to this style. The depressed or four-centre arch is another of its peculiar features. In doorways the arched head is frequently enclosed in a square panel over the arch, with spandrels containing shields, quatrefoils, &c. Panelling was also much used, the walls being frequently almost entirely covered with it, as in Henry VII.'s Chapel at Westminster. There are many well-known buildings of this style. Most of the colleges at Oxford and Cambridge belong to it, and in almost every cathedral and church of importance there are some specimens of it—e.g. William of Wykeham's nave at Winchester (q.v.). Open timber-roofs are very common in the Perpendicular style, and are amongst the peculiar and beautiful features of the architecture of England. The roof of Westminster Hall, built by Richard II., is the largest example ever erected.

Perpetual Cure. See CURATE, VICAR.

Perpetual Motion. Formerly the attempts made to 'square the circle' led to an enormous waste of time till mathematicians proved, by repeated and unassailable methods, that the circular area cannot possibly be expressed in terms of the diameter or radius. It logically follows from the definition of a circle that it is a plane figure which does not admit of being squared. In the same way, to all who have understood the words *force* and *motion*, it follows from the definition of a machine that it does not admit of being 'perpetual,' or self-moved. Every machine is constructed to transmit motion or force. The machine, further, modifies the transmitted force, so as to overcome certain resistances, some 'useful' and some 'prejudicial.' In every instance the motion of the machine is derived from without, and the energy so conveyed is to be at once referred to muscular action, or the weight of falling water, or a current of air, or the expansive force of steam, or some other natural power. Some such force is at once implied by the action of any machine, whether the motion is only commencing or has continued for an indefinite time. In an ordinary clock, for example, action is due to the muscular force expended in coiling a spring or raising a weight. The sight of motion in wheels or levers compels us to believe that force has been exerted upon them, and that they are merely vehicles for transmitting it. The machine has gained so much motion and energy, but only at the expense of some exterior agent. The quantity of force in existence being fixed, no new stock can be created, and therefore a self-moving machine is absurd even in name. The practical engineer knows that the force of his steam-engine is exactly in proportion to the amount of coal burned per hour—i.e. the work depends on the consumption of heat. If the mechanical force produced is in excess, however small, of its equivalent (measured by the coal burned), then perpetual motion would be at last found, because then the engine would be generating force—i.e.

giving out more than was derived from the heat of the coal. This, of course, is impossible; it is from the inexhaustible stores of nature alone, such as fire, water, wind, chemical action, and electricity, that force is derived to give motion to any machine whatever. Instead of producing more force than it has received, and so laying up a stock of energy which might render it 'perpetual,' every machine must in its results show less energy than has been transmitted to it. Some of the machine's work is always spent on friction and the atmospheric resistance, so that it cannot give out all the force that was put in.

A 'simple pendulum' swinging in an exhausted receiver, or a top spinning there, might illustrate the term *Perpetual Motion*, if friction could be avoided. Neither of these, however, could be called a perpetual machine. Give the top some work to do by putting it in gear, say, with a wheel or a crank, and speedily its motion slackens; which proves that, for a 'machine,' new force is constantly required from without, especially if anything more than mere motion is required. In the words of the French Academy (*Histoire*, 1775): 'Neglecting friction and resistance (of the air), a body to which motion has been given will retain it for ever, but only on condition that it does not act on other bodies; and the only perpetual motion possible, even on this hypothesis, would be useless for the purpose of the devisers. . . . Numerous mechanics who might have been of great service have wasted (on this kind of research) their means, time, and talents.'

The mere enumeration of all the chief attempts made in various countries to contrive a self-moving machine would be tedious. We shall only note some typical cases in each class. In one class of so-called perpetual machines the essential part was a wheel revolving on a horizontal axis, with several movable weights so distributed round the rim as apparently to act always more on one side than the other, and thus continue the revolution. One of these was by the ingenious Marquis of Worcester, and is described in his *Century of Inventions* as having been tried in the Tower before the king and court. On the same principle was Jackson's machine shown in fig. 1. In other attempts of this class the side of the wheel was divided symmetrically into cells with curved sides, each cell holding a ball which rolled about as the

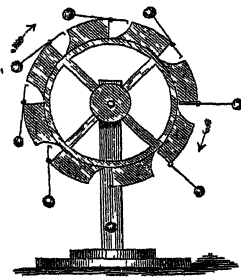


Fig. 1.

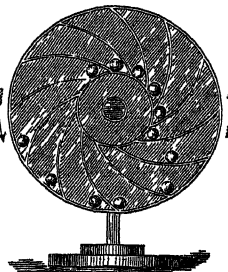


Fig. 2.

revolution took place, so that the balls should, by being further from the centre, act more on one side than on the other, as shown in fig. 2. A foreign instance, described in a letter to Newton as an undoubted success, was that of Orffyreus, consisting of a large wheel covered with canvas. When set in motion the speed increased till it reached a rate of twenty-five revolutions a minute; and when sealed up by the Elector of Cassel it was found at the end of two months to be moving as rapidly as ever. We must of course assume the existence of some imposition in this and more recent cases.

In another class of self-moving machines water or mercury became the prime motor, and was sometimes used in defiance of the most elementary laws of hydrostatics. One of these consisted essentially of a large vessel having a curved tube leading from the bottom up one side and bending over the bim. The inventor actually concluded that the great weight of the liquid in the vessel when full, or nearly so, must force the liquid in the tube up higher than the edge of the vessel, and thus cause a perpetual circulation.

Another class depended on magnetic action, such as Bishop Wilkins's inclined plane up which an iron ball was drawn in a groove by the attraction of a loadstone fixed at the top (fig. 3). Before reaching the loadstone the ball was ingeniously intended to fall through a hole in its path on to a curving incline beneath, and thus be conveyed by a second groove to the foot of the first inclined plane, in order to recommence its upward journey under exactly similar circumstances. The bishop overlooked the fact that the magnetic action would also tend to prevent a fall; but for that fallacy, he had come

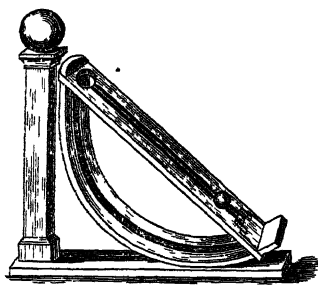


Fig. 3.

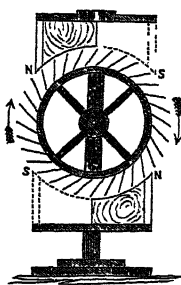


Fig. 4.

as near success as the laws of nature permit. In Addeley's perpetual motion the wheel was surrounded by a set of magnets, projecting like teeth in a slanting direction, and having the S poles all towards the centre (fig. 4). Four larger fixed magnets were disposed outside the wheel, two of which at opposite points of the circumference presented their S poles to attract the revolving magnets, while half-way between them the other two presented their N poles to retard them. All the four magnets, however, acted against the inventor's purpose, as well as in the direction which he intended. In fact, if magnetic action or gravity could be temporarily nullified in a particular direction (as light is by interposing an opaque body) the problem of perpetual motion could immediately be solved.

Innumerable patents have been taken out for magnetic and electric machines, but in the principle of each some fallacy lurks, due to a misconception of the laws of force-transmission. A typical case is an electric machine driven by a gas-engine where the latter is heated by the decomposition of water by the electricity produced; just as if a steam-engine, for example, could be heated by the friction of certain bodies set in motion by itself.

Some intelligent and practical proposals have from time to time been made to utilise the rise and fall of tides as the motive power of machines. These, however, should not be classed, as is sometimes done, under those named 'perpetual,' since the supply of power is obviously derived from a natural source—the moon's attraction combined with the earth's daily rotation. A tide-mill, exactly as a water-mill or wind-mill, is entirely dependent on an outward supply of power, and can in no sense be termed self-moving or 'perpetual.' Ultimately, of course, all the forms of natural energy are to be referred to the sun, the

source of planetary force as well as life, whatever be their modifications. See H. Dircks, *Perpetuum Mobile: Search for Self-motive Power* (2d series, 1861-70).

Perpetuity, in English law, means an arrangement whereby property is tied up—i.e. rendered inalienable—for all time or for a very long period. Testators and settlers have always been tempted by family pride to restrain their successors from parting with settled property, especially land; but the policy of the law requires that owners should be free to dispose of their property, and perpetuities are sternly discouraged. Land was formerly tied up by means of Entails (q.v.) and by the creation of remainders, but these forms of disposition were brought within strict rule. Trusts were then used to evade the rules of common law, but the equity courts gradually evolved a rule that property should not be tied up unless for the lives of persons in being and twenty-one years beyond; any disposition which may possibly postpone the vesting of property beyond that period is void. The rule left a settler free, by selecting the lives of young persons, to tie up his property for eighty or ninety years. Thellusson, a London banker, attempted to create an immense fortune by directing that the income of his property should go on accumulating during the lives of his children, grandchildren, and great-grandchildren, living at the time of his death, and for twenty-one years beyond. This led to the passing of what is called the Thellusson Act in 1800; the act restricts accumulation of income (except for payment of debts, &c.) to a period of twenty-one years from the death of the settler, or some other of the limited periods described in the act. It is to be observed that trusts for public and charitable purposes are not, as a general rule, within the scope of the law against perpetuities. In the United States the rules developed by the English courts have been generally adopted as the basis of the law; several states have legislated on the subject, and in some cases the local law against perpetuities has been made a part of the state constitution.

Perpignan, a town of France, and a fortress of the river Têt, 7 miles from the Mediterranean, 40 by rail S. of Narbonne, and 17 from the Spanish frontier. It commands the passes of the Eastern Pyrenees, and is defended on the south by a citadel, which encloses the old castle of the Counts of Roussillon, and by a detached fort. The streets are narrow and the houses of semi-Moorish construction, and show evidences of Spanish influence. The cathedral (begun in 1324), the Moorish-Gothic cloth-hall or bourse (1396), the town-house (1692), the building of the former university (1349—French Revolution), the palace of justice, and a college are the principal public buildings and institutions. Good red wine is made, sheep and silkworms are bred, vegetables and fruit grown, brandy distilled, cloth woven, and corks cut; and there is a good trade in wine, spirits, wool, cork-bark, oil, cloth, and silk. As capital of the former county of Roussillon Perpignan was in the hands of the kings of Aragon from 1172 to its capture by France in 1475; it was restored to Spain in 1493; but Richelieu retook it in 1642, and France has possessed it ever since. Pop. 54,000.

Perranzabuloe ('Perran in the sands'), a Cornish coast parish, 10 miles N. by W. of Truro. The rude little stone oratory (25 by 12½ feet) of St Piran, who was sent to Cornwall by St Patrick in the 5th century, had been buried in the sands for a thousand years, when it was discovered in 1835; it is probably the earliest ecclesiastical structure in England. Perran Round is a circular

enclosure, with seven rows of seats that could seat 2000, in which miracle plays were performed of old.

Perrault, CHARLES, immortal as the author of 'Puss-in-Boots,' 'Cinderella,' and 'Bluebeard,' was born at Paris, January 12, 1628, the youngest of an advocate's four sons. He was sent at nine to the Collège de Beauvais, but quarrelled with his masters, and had the rest of his education left to chance. He studied law fitfully, and took his license at Orleans in 1651, but soon tired of the humdrum routine of the profession, and filled from 1654 till 1664 an easy post under his brother, the Receiver-general of Paris. In 1663 he became a kind of secretary or assistant to Colbert in matters of architecture and art generally, and for twenty years enjoyed a salary, if not his master's friendship throughout, while by his influence he was admitted to the Academy in 1671. His poem, 'Le Siècle de Louis XIV.,' read to the Academy, and Boileau's angry criticisms thereon, opened up the famous and foolish dispute about the relative merits of the ancients and moderns; to the modern cause Perrault contributed his ambitious but poorly argued *Parallèle des Anciens et des Modernes* (4 vols. 1688-96). The same quarrel inspired his *Éloges des Hommes Illustres du Siècle de Louis XIV.* (2 vols. folio, 102 portraits; 1696-1700), the labour of his latest years. He died May 16, 1703. His *Mémoires* appeared in 1769.

All his writings would already have been forgotten but for the happy inspiration which prompted him to publish in 1697 his eight inimitable prose fairy-tales, the *Histoires ou Contes du Temps Passé*, with the title on the frontispiece of 'Contes de Ma Mère L'Oye.' These had already appeared anonymously from 1696 to 1697 in Moetjens' *Recueil*, a little miscellany published at the Hague since 1694. The same volume contained a reprint of three tales in verse by Perrault (*Peau d'Ane*, *Les Souhaits Ridicules*, and *Griselidis*), which had already appeared both in Moetjens' *Recueil* and in small volumes at Paris in 1694-95. The prose *contes*, on the other hand, were expressly stated to be by P. Darmancour, Perrault's little boy, to whom the 'Privilège du Roy' is granted. M. Paul Lacroix attributes the complete authorship to the son; it is more reasonable to believe with Andrew Lang that, if the naïveté and popular traditional manner point to the conservatism of the child and the native inspiration of his nurse, many a happy touch is due to the elderly academician and wit. But whatever the method of composition of these tales, the resultant is a group of masterpieces in the most difficult of arts, the same judgment of which is renewed generation after generation. It were impertinence to praise these stories; it is enough to enumerate their names: 'La Belle au Bois Dormant' (The Sleeping Beauty); 'Le Petit Chaperon Rouge' (Little Red Riding Hood); 'La Barbe Bleue' (Bluebeard); 'Le Maître Chat, ou le Chat Botté' (Puss-in-Boots); 'Les Fées' (The Fairy); 'Cendrillon, ou la Petite Pantoufle de Verre' (Cinderella); 'Riquet à la Houppe' (Riquet of the Tuft); and 'Le Petit Poucet' ('Hop o' my Thumb, Tom Thumb).

See the introduction to Andrew Lang's edition (1888); Charles Deulin, *Contes de Ma Mère l'Oye avant Charles Perrault* (Paris, 1879); Deschanel, *Boileau, Charles Perrault, &c.* (Paris, 1888); P. Saintognes, *Les Contes de Perrault et les Récits parallèles* (1924).

Perry, an agreeable beverage made by fermenting the juice of pears. It is extensively made in Worcestershire, Gloucestershire, Herefordshire, and Devonshire, and forms, with cider, the chief diet-drink of those districts. It contains from 5 to 9 per cent. of alcohol. See CIDER.

Perry, OLIVER HAZARD, an American naval officer, born at South Kingston, Rhode Island, 23d August 1785, is famous for his defeat of a British force on Lake Erie in 1813. Perry, who had nine vessels, with 54 guns and 492 officers and men, fought six vessels, with 63 guns and 502 officers and men, lost four-fifths of the crew of his flagship, and finally won a complete victory, which he announced in the brief despatch: 'We have met the enemy, and they are ours—two ships, two brigs, one schooner, and one sloop.' Perry died of yellow fever at Trinidad, 23d August 1819, and was buried at Newport, Rhode Island, where there is a bronze statue (1885). See Life by A. S. Mackenzie (New York, 1843), in Fenimore Cooper's *Lives of Distinguished American Naval Officers* (1846), and that by Barnes (New York, 1898).

Perryville, a village of Kentucky, about 40 miles SW. of Lexington, was the scene of a hard-fought battle between the Union and Confederate armies of Buell and Bragg, 8th October 1862.

Perse Grammar School, at Cambridge, was founded (1615) by Stephen Perse, M.D. (1548-1615). Jeremy Taylor seems to have been among its first pupils. During Dr W. H. D. Rouse's headmastership (since 1901) the school has attracted world-wide attention, in great measure owing to the remarkable literary work of the boys under Mr H. Caldwell Cook's play method. See J. M. Gray, *History of Perse School* (1921), and *The Perse Play Books*, ed. H. C. Cook.

Persecution. The principles that underlie the persecution of obnoxious opinions, as opposed to the principles of toleration, are regarded by those who persecute as essentially similar to those that arm justice against the criminal. Persecution of unpopular religious views has on religious or political grounds been especially common. The persecutions of the early Christians by the Roman emperors (see CHURCH HISTORY) have been usually, though artificially, counted as ten, viz. under Nero, 64 A.D.; Domitian, 95; Trajan, 107; Hadrian, 125; Marcus Aurelius, 165; Septimius Severus, 202; Maximinus, 235; Decius, 249; Valerianus, 257; Diocletian, 303. Some of the best of the emperors were thus the most strenuous persecutors of the Christians. The persecution seemed in many cases but to fan the zeal of the victims and survivors; in Tertullian's words, the blood of the martyrs was the seed of the church. But there have been many cases in which minor sects have been extinguished, partly or wholly by systematic persecution. The orthodox persecuted the Arians not without success; and the number of Lapsed (q.v.) raised a serious problem in the church. Cathari and Albigenses were practically persecuted out of existence by the Dominicans and the Inquisition; and the measures adopted to suppress the Reformation were triumphant in Bohemia, Spain, and Italy. In the Huguenot wars religion was complicated with politics (see BARTHOLOMEW, St); and the Dragonnades (q.v.) were part of a deliberate attempt to crush out Protestantism. The name persecution is used in England specially for the sufferings inflicted by Catholics on Protestants and by Protestants on Catholics in Mary's and Elizabeth's reigns; in Scotland also on the measures used against the Covenanters and other recusants in the 17th century. The oppressive legislation against Independents in Charles II.'s reign may also be classed under this head; and Massachusetts and most of the Puritan colonies passed several repressive measures against the Quakers. The persecutions carried on in the Netherlands by the Spanish authorities (see HOLLAND) were especially cruel and persistent. They comprised fine, imprisonment, ban, torture, beheading,

strangling, strangling and burning, burning alive, burying alive; and their continuance goaded the people into a great national revolt. It deserves to be noted that the strenuous denunciation by Voltaire of the persecution of the unfortunate Calas (q.v.) family led to a new chapter in the history of toleration. Furious persecutions extirpated Catholicism from Japan in the middle of the 17th century, and Korea in the middle of the 19th. The Orthodox Eastern Church had in Russia the assistance of the state in repressing the Raskolnik sectaries. Luther and Melancthon were more pronouncedly hostile to the heretical astronomy of Copernicus than the Catholic authorities. A notable case of the persecution of a Protestant by Protestants is that of Servetus (q.v.; see also CALVIN). In this case Calvin had the sympathetic support of many foreign Protestant churches and their leaders. The 'theocratic' system established in Geneva by Calvin so confounded errors, sins, and crimes as to turn the administration of justice largely into a persecuting organisation; in three years there were fifty-eight sentences of death, and over eight thousand imprisonments for the crime of blasphemy. The old Scottish discipline of the kirk-session was regarded as persecuting in spirit long ere it ceased to be rigorously applied. The persecutions of the Jews were especially persistent and especially unsuccessful, and have recurred in recent years in Russia, Rumania, and elsewhere. Nor have the Unitarians been unmolested in Rumania.

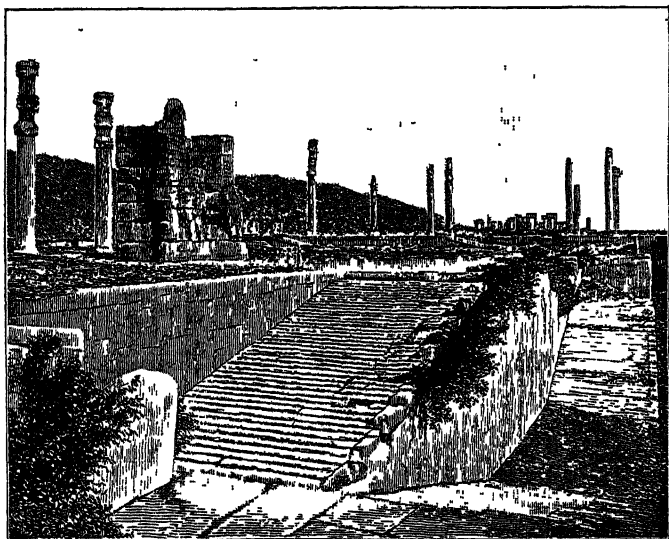
See the articles named above, especially INQUISITION and TOLERATION; also ALBIGENSES, AUTO DA FÉ, BLASPHEMY, BRUNO, CAMISARDS, CATHOLIC EMANCIPATION, GALILEO, HERESY, HUGUENOTS, MORMONS, WALDENSES, WITCHCRAFT; such works as Foxe's *Book of Martyrs* on one side, and on the other Challoner's *Memoirs of Missionary Priests and other Catholics who suffered Death for Religion*; Buckle's *History of Civilisation*; Lecky's *Rationalism in Europe*; and Draper's *Conflict between Science and Religion*.

Perseids. See METEORS.

Persephone. See PROSERPINE.

Persepolis ('Persian City'), the Greek translation of the lost name (*Parsa-Karta*?) of the capital of ancient Persia, was situated to the east of the river Medus (Polwar—i.e. Murghab), about 14 miles above its confluence with the Araxes (Bendemir), in the plain of Merdusht, about 35 miles to the north-east of Shiraz, on the road to Isfahân. A series of most remarkable ruins is all that now remains of that city, with which, according to ancient writers, 'no other city could be compared either in beauty or in wealth,' and which was generally designated 'The Glory of the East.' Darius Hystaspes, Xerxes, Artaxerxes, and other Achæmenides each in his turn contributed towards its aggrandisement. Alexander the Great in his march of conquest is said to have destroyed Persepolis completely; but this must probably only be understood to apply to some of the chief palaces. It may also be presumed that after the fall of the Achæmenides the extension of the original town (afterwards known as Istakhr), on which were situated the royal edifices and the temples used as royal treasuries up to the time of Epiphanes, gradually fell into decay. The

situation of these structures, overlooking the vast luxuriant plain of Merdusht, is described in terms of rapturous enthusiasm by every traveller from Chaidin to our own day. Three groups are chiefly distinguishable in the vast ruins existing on the spot. First, the Chehel-Minâr (Forty Pillars), with the Mountain of the Tombs (Rachmed), also called Takht-i-Jamshîd or the throne of Jamshîd, after a fabulous king, the reputed founder of Persepolis. The next in order is Naksh-i-Rustam, to the north-west, with its tombs; and the last, the building called the Haram of Jamshîd. The most important is the first group, situated on a vast terrace of cyclopean masonry at the foot of a lofty mountain-range. The extent of this terrace is about 1500 feet north and south and about 800 east and west, and it was, according to Diodorus Siculus, once surrounded by three walls of 16, 32, and 60 cubits respectively in height. The whole internal area is further divided into three terraces—the lowest towards the south; the central being 800 feet square and rising 45 feet above the plain, and the third, the northern, about 550 feet long and 35 feet high. No traces of structures are to be found on the lowest platform; on the northern, only the so-called 'Propylæa' of Xerxes; but the central platform seems to have been occupied by the foremost structures, which again, however, do not all appear to have stood on the same level. There are distinguished here the so-called 'Great Hall of Xerxes' (called Chehel-Minâr by way of eminence), the Palace of Xerxes, and the Palace of Darius. The stone used for the buildings is dark gray marble, cut into gigantic square blocks, and in many cases exquisitely polished. The ascent from the plain to the great northern platform is formed by two double flights, the steps of which are nearly 22 feet wide, 3½ inches high, and 15 inches in the tread, so that many travellers have been able to ascend them on horseback. What are called the Propylæa of Xerxes on this platform are two masses of stone-work, which probably formed an entrance-gateway for foot-passengers, paved with gigantic slabs of polished marble.



Great Staircase to Northern Platform, and Propylæa of Xerxes;
Great Hall of Xerxes and Palace of Darius in the distance.

Portals still standing bear figures of animals 15 feet high, closely resembling the Assyrian bulls of Nineveh. The building itself, conjectured to have

been a hall 82 feet square, is, according to the cuneiform inscriptions still extant, the work of Xerxes.

An expanse of 162 feet divides this platform from the central one, which still bears many of those columns of the Hall of Xerxes from which the ruins have taken their name. The staircase leading up to the Chehel-Minâr or Forty Pillars is, if possible, still more magnificent than the first; and the walls are more superbly decorated with sculptures, representing colossal warriors with spears, gigantic bulls, combats with wild beasts, processions, and the like; while broken capitals, shafts, pillars, and countless fragments of buildings, with cuneiform inscriptions, cover the whole vast space of this platform, 350 feet from north to south, and 380 from east to west. The Great Hall of Xerxes, perhaps the largest and most magnificent structure the world had ever seen, is computed to have been a rectangle of about 300 to 350 feet, and to have consequently covered 105,000 square feet or $2\frac{1}{2}$ acres. The pillars were arranged in four divisions, consisting of a centre group six deep every way, and an advance body of twelve in two ranks, the same number flanking the centre. Fifteen columns are all that now remain of the number. Their form is very beautiful. Their height is 60 feet, the circumference of the shaft 16, the length from the capital to the torus 44 feet. The shaft is finely fluted in fifty-two divisions; at its lower extremity begin a cincture and a torus, the first 2 inches in depth and the latter 1 foot, from which devolves the pedestal, shaped like the cup and leaves of the pendent lotus, the capitals having been surmounted by the double half-bull. Behind the Hall of Xerxes was the so-called Hall of the Hundred Columns, to the south of which are indications of another structure, which Fergusson terms the Central Edifice. Next along the west front stood the Palace of Darius, and to the south the Palace of Xerxes, measuring about 86 feet square, similarly decorated and of similar grand proportions.

For a more minute description, see the travels of Niebuhr, Ker Porter, Rich, &c.; Fergusson's *Palaces of Nineveh and Persepolis Restored*, Vaux's *Nineveh and Persepolis*, Rawlinson's *Five Great Monarchies*, Madame Dieulafoy's *La Perse et La Susiane*, M. Dieulafoy's *L'Art Antique de la Perse*, Perrot and Chipiez's *Histoire de l'Art dans l'Antiquité* (v. 1890), and above all, for detailed photographic views, *Persepolis*, by F. Stolze and Th. Nöldeke (Berlin, 1882). See also CYRUS, DARIUS, XERXES, CUNEIFORM, and PERSIA (*Persian Architecture*).

Perseus, in Greek Mythology, the son of Zeus and Danaë (q.v.) and grandson of Acrisius. He was brought up at Seriphos, one of the Cyclades, where Polydectes reigned, who, wishing for private reasons to get rid of him, sent him when yet a youth to bring the head of the Gorgon Medusa, on the pretence that he wanted to present it as a bridal gift to Hippodamia. Perseus set forth under the protection of Athena and Hermes, the former of whom gave him a mirror by which he could see the monster without looking at her (for that would have changed him into stone), the latter a sickle, while the nymphs provided him with winged sandals and a helmet of Hades or invisible cap. After numerous wonderful adventures he reached the abode of Medusa, who dwelt near Tartessus, on the coast of the ocean, and succeeded in cutting off her head, which he put into a bag and carried off. On his return he visited Ethiopia, where he liberated and married Andromeda (q.v.), by whom he subsequently had a numerous family, and arrived at Seriphos in time to rescue his mother from the annoyance of the too ardent addresses of Polydectes, whom, along with some of his companions, he changed into stone. After this he went to Argos,

from which Acrisius fled to Thessaly, and Perseus assumed the vacant throne. But this, like many other details of the myth, is differently narrated. Perseus was worshipped as a hero in various parts of Greece, and, according to Herodotus, in Egypt too. In ancient works of art the figure of Perseus much resembles that of Hermes. See Hartland, *The Legend of Perseus* (1894-96).

Perseverance of Saints, a doctrine necessarily resulting from the most essential part of the Calvinistic system, and therefore held by almost all who adopt the Calvinistic or Augustinian doctrines. It is advocated not only by arguments from other doctrines, as those of election, atonement, the intercession and mediatorial dominion of Christ, imputed righteousness, and regeneration, but also from many texts of Scripture, as those which declare eternal life to be always connected with believing, and those which encourage the believer to depend on the faithfulness, love, and omnipotence of God. To an objection very commonly urged against it, that it tends to make men careless concerning virtue and holiness, its advocates reply that this objection is valid only against a doctrine very different from theirs, the true doctrine of Perseverance of Saints being one of perseverance in holiness, and giving no encouragement to a confidence of final salvation which is not connected with a present and even an increasing holiness.

Pershing, JOHN JOSEPH, American general, was born 13th September 1860 in Linn County, Missouri, and educated at Kirksville Normal School and West Point. After serving in Indian wars he was professor of military science in Nebraska University, where at the same time he studied law. His personal bravery in Cuba during the war with Spain was much commended; and in 1899-1903 he was in the Philippines where, with the rank of captain, he overcame the Moros. For this service he was made brigadier-general in 1906. In 1909-13 as military governor he had again to subdue the Moros. In 1916 he led the American expedition in Mexico, and he was in command on the border when in 1917 he was sent to the World War (q.v.) as commander-in-chief of the American Expeditionary Force. In 1921-24 he was chief of staff of the United States army.

Pershore, a pleasant, old-fashioned market-town of Worcestershire, in a great fruit-growing district, on the Avon, 9 miles S.E. of Worcester. Holy Cross, the church of a mitred Benedictine abbey, originally founded in 689, is but a restored fragment—choir, south transept, and central tower, mainly decorated in style, but with Norman and Early English features. Pershore has manufactures of destructors and agricultural implements, and market-gardening is carried on extensively. The first co-operative fruit and vegetable auction-market in England was started there in 1909, and soon became large and successful. Pop. 3000.

Persia, called by its natives IRAN (see ARYANS, &c.), the most extensive and powerful kingdom of western Asia, is bounded on the N. by Turkmenistan, the Caspian Sea, and Transcaucasia; on the E. by Afghanistan and Beluchistan; on the S. by the Strait of Ormuz and the Persian Gulf; and on the W. by Iraq and Turkish Kurdistan. It extends 900 miles from east to west and 700 miles from north to south, and has an area of about 638,000 sq. m. It consists for the most part of a great tableland or elevated plateau, which in the centre and on the east side is almost a dead level, but on the north, west, and south is covered with mountain-chains. The provinces of Azerbaijan, Mazanderan, Gilan, Kurdistan, Luristan, and Fars are almost wholly mountainous.

From the southern boundary of Persian Azerbaijan the majestic range of the Elburz runs eastward, following the line of the Caspian coast at a distance varying from 12 to 60 miles. On reaching Astrabad the mountains sink into ridges of lower elevation, one of which joins the Paropamisus in Afghanistan. A hill-country lies north of this line; it terminates in the Daman-i-koh chain, which sinks abruptly to the low plain of Turkestan. South and east of Azerbaijan a broad mountain-belt traverses Persia from north-west to south-east, the chains and valleys of which it consists lying in the same direction. To this region belong the mountains running from Hamadan to Shiraz, some of the peaks of which are clad with perpetual snow, and the Zagros Mountains and Pushti Kuh on the western frontier. The Persian mountains are mostly primitive; granite, porphyry, felspar, and mountain-limestone enter largely into their composition. They also exhibit indications of volcanic action, Demavend, a conical peak 18,600 feet in height, the highest summit connected with the Elburz range (or ranges), being an extinct volcano; and earthquakes occasionally occur. The Persian plateau, which lies in an angle formed between these mountains, is intersected by many subsidiary ranges and groups of mountains, and spreads eastward to the plateau of Afghanistan, its general elevation ranging from 2000 to 5000 feet above sea-level, the lowest portion being the Great Salt Desert in the south-west of Khorasan, which has 2000 feet of elevation above the sea; while the average elevation of the whole plateau above the sea is about 3700 feet. See *ASIA*.

A great part of Khorasan, the north half of Kerman, the east of Iraq-Ajemi, which form the great central plain, and detached portions of all the other provinces, with the exception of those on the Caspian Sea, forming more than three-fourths of the surface of Persia, are desert—that is to say, are uncultivated owing to the want of rain and of artificial irrigation. In some parts of this waste the surface produces a scanty herbage of saline plants; in other parts, called *Kevir*, it is covered with an efflorescence of saltpetre, which glitters and flashes in the sunlight, forcing the traveller on these inhospitable wastes to wear a shade to protect his eyes; but by far the greater portion of this region consists of light dry soil, which only requires irrigation to become fruitful. This great central desert contains a few oases, but none of great extent. A narrow strip of low and level country extends along the shores of the Persian Gulf and the Strait of Ormuz. It consists of a succession of bare plains, occasionally interrupted by a plantation of palms near the scanty rivulets which traverse it. It is called *Dushtistan*, or by the generic name, applied to many other localities, of *Garmisir*—i.e. the warm region, in opposition to the mountainous districts, called *Sarhad*, or the cold country.

Although so much of Persia is desert, some parts of the country are of exceeding fertility and beauty; the immense valleys, some of them 100 miles in length, between the various ranges of the Kerman Mountains abound with the rarest and most valuable vegetable productions. Great portions of the provinces of Fars, Khuzistan, Ardekan, and Azerbaijan have been lavishly endowed by nature with the most luxuriant vegetation; while the provinces of Gilan and Mazanderan, which lie between the Elburz and the Caspian Sea, and the southern slopes of the Elburz are as beautiful as wood, water, and a moderately hot climate can make them—the mountain-sides being clothed with trees and shrubs, and the plain, 300 miles long by from 5 to 30 miles wide, studded with mulberry plantations, rice-fields,

vineyards, orchards, orange grounds, and sugar and cotton plantations.

Rivers and Lakes.—Persia has hardly one river that can properly be termed navigable, though some of them are several hundred miles in length, and of great width and volume of water. The Karun (q.v.) was opened to foreign steam-navigation from its mouth to Ahwaz (where there is a series of rapids) in 1889. The rivers which flow to the southward receive in the latter part of their course few tributaries, and fertilise only a narrow strip of land on each side of them, except when their waters are applied, by means of canals or other works, to the artificial irrigation of the soil. Most of the monuments of the architectural skill and laborious industry of the ancient Persians in this department are now ruinous. As a natural consequence of the nature and situation of its surface, Persia abounds with saline lakes, and there are nearly thirty of them having no visible outlets. The chief lake is Lake Urmiah or Urmia (q.v.), in Azerbaijan. Lake Bakhtegan, in the east of Fars, the receptacle for the drainage of the northern half of that province, is sometimes about 60 English miles in length by 9 in breadth. Lake Shiraz is much smaller. Part of Hamun-i-Helmand is included in the frontier of Persia.

Climate and Products.—The climate is necessarily very varied. What the younger Cyrus is reported to have said to Xenophon regarding the climate, 'that people perish with cold at one extremity of the country, while they are suffocated with heat at the other,' is literally true. Persia may be considered to possess three climates—that of the southern *Dushtistan*, of the elevated plateau, and of the Caspian provinces. In the *Dushtistan* the autumnal heats are excessive, those of summer more tolerable, while in winter and spring the climate is delightful. On the plateau the climate of Fars is temperate. About Isfahan the winters and summers are equally mild, and the regularity of the seasons appears remarkable to a stranger. To the north and north-west of this the winters are severe. The desert-region of the centre and east, and the country on its border, endure most oppressive heat during summer and piercing cold in winter. The Caspian provinces, from their general depression below the sea-level, are exposed to a degree of heat in summer almost equal to that of the West Indies, and their winters are mild. Rains, however, are frequent and heavy, and many tracts of low country are marshy and extremely unhealthy. Except in the Caspian provinces, the atmosphere of Persia is remarkable above that of all other countries for its dryness and purity.

The cultivated portions of Persia, when supplied with moisture, are very fertile, producing an immense variety of crops. The chief cultivated products are wheat (the best in the world), barley, and other cereals, cotton, sugar and rice (in Mazanderan), and *tumbaku* or tobacco for the *narghileh* or water pipe. The vine flourishes in several provinces, and the wines of Shiraz are celebrated in eastern poetry. Mulberries are also largely cultivated, and silk is one of the most important products of the kingdom.

The forests of the Elburz abound with wild animals, as wolves, tigers, jackals, boars, buffaloes, foxes, and the Caspian cat. Leopards abound in Mazanderan, and lions in parts of Fars and Arabistan. Among domestic animals the horse, the ass, and the camel hold the first place. The horses have always been celebrated as the finest in the East. They are larger and more handsome, but less fleet, than the Arabian horses. The Caspian rivers abound with fish, especially sturgeon, great quantities of which are cured and exported to Russia. The mineral products of Persia are unim-

portant, with the sole exception of oil; salt, iron, and turquoises are worked, as is coal in a very small way; copper occurs in considerable quantity in the mountains of Mazanderan and Kerman; and lead, antimony, and other minerals also abound.

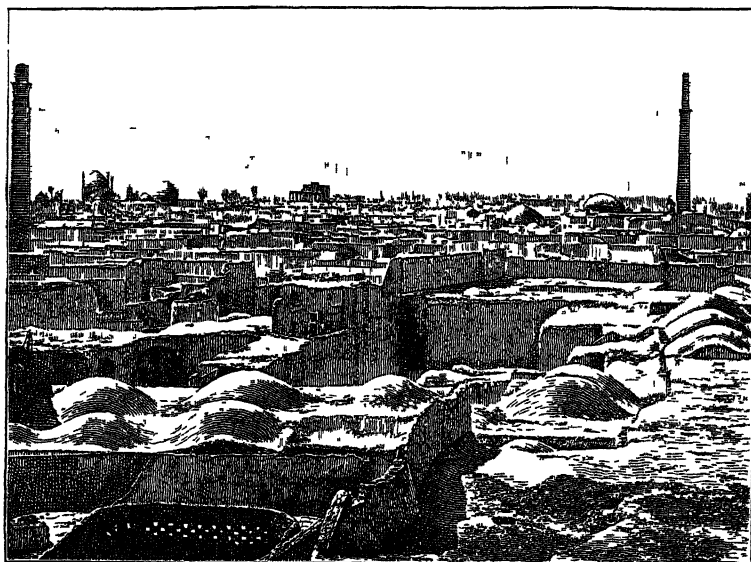
Inhabitants.—The settled population are chiefly Tajiks, the descendants of the ancient Persian race, with an intermixture of foreign blood. To this class belong the agriculturists, merchants, artisans, &c. The Tajiks are Mohammedans of the Shiite sect, with the exception of the remaining Parsees (some 9000 in number), who are found chiefly at Yezd, and still retain their purity of race and religious faith. The Tajiks have been spoken of as timid, cunning, and servile, but against these are to be set industry, and capacity for and love of culture. The nomad or pastoral tribes, or *eylats* (*eyl*, 'a clan'), often spelt *ilyats*, are of four distinct races—Turks (not Osmanli Turk), Kurds, Lûurs, and Arabs. Their organisation is very similar to that which formerly subsisted among the Highland clans of Scotland, with the exception that the former are nomad, while the latter inhabited a fixed locality. Each tribe is ruled by its hereditary chief (*yak*),

thought 40 millions not too high a figure. A recent estimate is 9 millions, including 2 to 3 million nomads. Of cities, Tehrân and Tabriz may have about 200,000; Isfahân and Mashhad, perhaps 60,000 to 80,000.

The houses, those of the wealthiest people not excepted, appear contemptible, being generally built of earth or mud, and are grouped, even in the towns, with little attention to uniformity or order. They scarcely ever exceed one story in height, and they are surrounded by high blank walls. The public buildings, such as mosques, colleges, and caravanserais, are of similar appearance to the ordinary houses, and built of the same materials. The interiors, however, of the houses of the rich are sometimes perfect paradises of luxury and elegance. The miserable look of the towns is, moreover, greatly redeemed by the beauty of the gardens which surround them.

Manufactures and Trade.—The trade of Persia is comparatively of little importance, except the export of petroleum. Silk used to be the great staple, and is produced in almost every province, but chiefly in Gilan, Kashan, and Yezd.

Repeated failure of the crop has, however, interfered very seriously with this industry. Cotton and woollen fabrics, shawls, carpets, and felts are largely manufactured for use and export in different parts of the country. The principal trade centres are Tabriz, Tehrân, Isfahân, Hamadan, and Bushire. Railways have but begun in Persia. Tabriz is connected with the Russian system (by Tiflis), Nuzdab with the Indian (by Nushki and Quetta). A line from Bagdad touches the western frontier, and that from Krasnovodsk to Meiv the northern. There are short railways at Tehrân (1888; the oldest), Reht, and Bushire. Roads are mostly neglected. Trade-routes, however, for caravans



Isfahân, looking south.

and under him by the heads of the cadet branches (*tirehs*) of his family. Of the four nomad races the Turk is the most numerous, and to it belongs the late Kajar dynasty. The Kurds are few in number, the greater part of their country and race being beyond the bounds of Persia. The Arabs are also few in number, and at the present day can hardly be distinguished from the Persians, having adopted both their manners and language. The Lûurs are of nearly pure Persian blood. The nomad races are distinguished from the Tajiks by their courage, manliness, and independence of character; but they are inveterate robbers, and have been the cause of many civil wars and revolutions. There is a small population of native Christians—the Nestorians of Urumiah and Telmais, and Armenians, whose principal settlement is at Julfa (Isfahân).

We have no certain information regarding the population of Persia. There can be no doubt that in antiquity, and even during the middle ages, while the irrigation-works still fertilised great tracts of country, it supported a great population. In the 17th century the French traveller Chardin

or (sometimes) motor-cars, connect the chief towns with railways and with the ports of the Persian Gulf and the Caspian; and British steamers ply on the Karun as far as Ahwaz. The exports, besides petroleum, consist of carpets, opium, fruits, cotton, silk, skins, wool, wheat, rice, wine, raisins, almonds and nuts, olive-oil, tobacco, drugs, gums; the chief imports are cotton goods, sugar, iron goods, and tea. Russian trade, especially in the north, long rivalled British; but during Russia's troubles it fell off. Now most of the imports come by the Gulf ports, Iraq, and India, though trade with Constantinople and Trebizond by Tabriz is not negligible.

Government, Taxation, Education, &c.—The government was, till 1906, a pure despotism, limited only by the power and influence of the Mohammedan mollahs, domestic intrigues, dread of private vengeance, and an occasional insurrection. The monarch, who has the title of 'Shah' and 'Padishah,' possessed absolute authority over the lives and property of his subjects. His deputies, the governors of provinces and districts, possessed similar authority over those under them; their actions were, how-

ever, liable to revision by the Shah, who might summarily inflict any punishment upon them for real or alleged misgovernment. Oppression of the sedentary agricultural classes is almost a necessity of such a form of government. The central government consisted of a ministry, nominally modelled somewhat after the cabinets of European states. Usually, however, the power fell actually, if not nominally, into the hands of one of their number. The Shah, nevertheless, was in reality his own prime-minister, and even trivial matters were submitted for his personal decision. In 1906-9 parliamentary government was introduced. The law both in civil and criminal cases is administered by the governors, who not unfrequently refer points of law, which is based upon the Koran and its commentaries, to mollahs and mushteheds. The punishments commonly inflicted are fines, flogging (the *bastinado*), and death by decapitation, stabbing, or torture.

Elementary education is very generally diffused among all classes. There are many colleges where students are instructed in religion and Persian and Arabian literature. Among a considerable section of the upper classes it is asserted that the Mohammedan religion is losing its hold, and that unbelief is widely prevalent.

Army.—The standing army is composed of about 30,000 or 40,000 men, in five divisions, with modern armaments. The officers in the Persian army are for the most part ignorant and inefficient, but the soldiers are obedient, sober, intelligent, and capable of enduring great fatigue.

History.—According to the *Shah Nameh* of Firdausi, the history of Persia begins some thousands of years before the Christian era. Archaeologists, indeed, have found within the limits of the kingdom (at Susa and elsewhere in Elam) one of the earliest known civilisations, which disputes priority with Egyptian and Sumerian. Its painted pottery, perhaps already an old art by 4000 B.C., is declared to be 'among the finest ever made by man.' Little has been done towards extracting the grains of historical truth that may be contained in the mass of fable that constitutes the native Persian annals, and as yet we must rest contented with the accounts derived from Greek writers. The north-western part of Iran, anciently called Media (q.v.), was at the earliest period known to the Greeks a part of the Assyrian empire, but the Medes revolted, and in 708 B.C., under Deioces, established an empire which subdued both that of Assyria and their own kindred tribes of Persis. Hakhamanish (Achæmenes) and his son Chispis (Teispes), king of Anzan or Elam, in the 7th century founded the Persian dynasty of the Achæmenides. Under their descendant Cyrus (q.v.) or Kai-Khusru the Persians rebelled, subdued their former masters, the Medes (who from this time became amalgamated with them), took Babylon (B.C. 539), and established a mighty empire, which extended beyond Persia, as far as the Oxus and Indus, Asia Minor, Syria, Palestine, and Mesopotamia. His son, Cambyses, a most ferocious and bloodthirsty tyrant (529-522), subdued Tyre, Cyprus, and Egypt. After the brief rule of the usurper Smerdis (522-521), Darius I. (q.v., surnamed Hystaspes—the Gushtasp of the Persians—521-485) mounted the throne. He was a politic and energetic prince, and succeeded in firmly establishing his dynasty, and adding Thrace and Macedonia to his empire; but his two attempts to subdue Greece were completely foiled, the first by the Thracians, and the second by the Athenians at Marathon (490). His son, Xerxes I. (485-465), renewed the attempt to subdue the Greek states, and, though at first successful, was compelled by the defeats of Salamis and Plataea to limit himself to a defensive warfare, which exhausted the re-

sources of his kingdom. His son, Artaxerxes I. (465-425), surnamed Longimanus (the Bahman of the Persians, better known as Ardeshir Dirazdust), was a valiant prince, but he was unable to stay the decadence of Persia, which had now commenced. He, however, crushed a formidable rebellion in Egypt, though his wars with the Greeks and Ionians were unsuccessful. The empire now became a prey to intestine dissensions, which continued during the reigns of his successors, Xerxes II., Sogdianus, Darius II., Artaxerxes II., and Artaxerxes III. Darius III. Codomannus (336-329), the last of the dynasty, was compelled to yield his throne to Alexander the Great (known as Iskander or Secunder by the Persians), who reconquered all the former provinces of Persia, and founded a vast empire, which at his death, in 324, was divided into four parts, Persia along with Syria falling to the share of the Seleucidæ, and its old dependency, Egypt, to the Ptolemies.

The Seleucidæ soon lost Bactria (now Balkh), which became independent under a series of Greek sovereigns; and about 246 Parthia (q.v.; now Northern Khorasan) also rebelled under Arsaces I., who founded the dynasty of the Arsacidæ, under whom the greater part of Persia was wrested from the Greeks, and maintained against both the Greeks and Romans. The Greek empire of Bactria, which is said to have included a great part of India, was overthrown by an influx of nomad tribes from Turkestan (160-140); and these invaders having been driven out by the Parthians, Bactria was added to their empire (138). But the dynasty of the Arsacidæ, which maintained itself for four hundred and fifty years, was brought to an end by a Persian named Ardashir Babegan, who managed to gain possession of Fars, Kerman, and nearly the whole of 'Iraq, before Arduan, the Parthian king, took the field against him. At last a great battle was fought (218 A.D.) on the plain of Hormuz, in which the Persians were completely victorious. Babegan was now hailed as Ardashir (Artaxerxes), king of Persia, and 'Shahan Shah,' or king of kings, his dynasty being named Sassanidæ from his grandfather Sassan. The Sassanian kings raised Persia to a height of power and prosperity such as it never before attained, and more than once imperilled the existence of the eastern empire. The most notable kings of the dynasty were Shapur I. or Sapor (240-273), who routed the Romans, and took the Emperor Valerian captive at Edessa; his grandson, Shapur II., who also maintained an equal conflict with the Romans; and Chosroes I. and II. (q.v.), the latter of whom was ultimately crushed by Heraclius (q.v.) in 628.

The last Sassanian king, Yazdgerd (Yazdajird), was driven from the throne, after a great battle at Nahavend (639), by the Arabs, who now began to extend their dominion in all directions; and from this period may be dated the gradual change of character in the native Persian race, for they were from this time constantly subject to the domination of alien races. During the reigns of Omar (the first of the Arab rulers of Persia), Othman, Ali, and the Omniyades (634-750) Persia was regarded as an outlying province of the khalifate, and was ruled by deputy governors; but after the accession of the Abbaside dynasty (750) Bagdad became the capital, and Khorasan the favourite province of the early and more energetic rulers of this race, and Persia consequently came to be considered as the centre and nucleus of the khalifate. But the rule of the khalifs soon became merely nominal, and ambitious governors, or other aspiring persons, established independent principalities in various parts of the country. Many of these dynasties were transitory;

others lasted for centuries, and created extensive and powerful empires. The chief were the Tahirites (820-872), a Turkish dynasty in Khorasan; the Saffarides (Persian, 869-903), in Seistan, Fars, Iraq, and Mazanderan; the Samani, in Transoxiana, Khorasan, and Seistan; the Dilemi (Persian, 933-1056), in western Persia; and the Ghaznevids (see GHAZNI), in eastern Persia. These dynasties supplanted each other, and were finally rooted out by the Seljuks (q.v.), whose dominion extended from the Hellespont to Afghanistan. A branch of this dynasty, which ruled in Khaurezm (Khiva), gradually acquired the greater part of Persia, driving out the Ghaznevids and their successors, the Ghurids; but they, along with the numerous petty dynasties which had established themselves in the south-western provinces, were all swept away by Mongols under Genghis Khan (q.v.) and his grandson, Hulagu Khan, the latter of whom founded a new dynasty, the Perso-Mongol or Ilkhan (q.v.; 1253-1335). This race, becoming effeminate, was supplanted by the so-called Ilkhanians in 1335; but an irruption of the Tatars of Turkestan under Timūr again freed Persia from the petty dynasties which misruled it. After the death of Timūr's son and successor, Shah Rokh, the Turkomans took possession of the western part of the country, which, however, they rather preyed upon than governed; while the eastern portion was divided and subdivided among Timūr's descendants, till, at the close of the 15th century, they were swept away by the Uzbeks (q.v.), who joined eastern Persia to their newly-founded khanate of Khiva.

A new dynasty (Sufi) now arose (1500) in western Persia, the first prince of which (Ismail, the descendant of a long line of devotees and saints), having become the leader of a number of Turkish tribes who were attached by strong ties of gratitude to his family, overthrew the power of the Turkomans, and seized Azerbaijan, which was the seat of their power. Ismail rapidly subdued the western provinces, and in 1511 took Khorasan and Balkh from the Uzbeks; but in 1514 he had to encounter a much more formidable enemy—to wit, the mighty Selim, the Sultan of Turkey, whose zeal for conquest was further inflamed by religious animosity against the Shiites (q.v.). The Persians were totally defeated in a battle on the frontiers; but Selim reaped no benefit from his victory, and after his retreat Ismail attacked and subdued Georgia. The Persians dwell with rapture on the character of this monarch, whom they deem to be not only the restorer of Persia, but the establisher of the faith in which they glory as the national religion—viz. the *Shiah*, as distinguished from the *Sunni* sect of Mohammedanism. His son Tamasp (1523-76), a prudent and spirited ruler, repeatedly drove out the predatory Uzbeks from Khorasan, sustained without loss a war with the Turks, and assisted Hodayun, the son of Baber, to regain the throne of Delhi.

After a considerable period of internal revolution, during which the Turks and Uzbeks attacked the empire without hindrance, Shah Abbas I. the Great (1585-1628) ascended the throne, restored internal tranquility, and repelled the invasions of the Uzbeks and Turks. In 1605 he inflicted on the Turks such a terrible defeat as kept them quiet during the rest of his reign, and enabled him to recover the whole of Kurdistan, Mosul, and Diarbeker, which had for a long time been separated from Persia; and in the east Kandahar was taken from the Great Mogul. Abbas's government was strict, but just and equitable; roads, bridges, caravanserais, and other conveniences for trade were constructed at immense expense, and the improvement and ornamentation of the towns were not neglected. His tolerance was

remarkable, as he encouraged the Armenian Christians to settle in the country. Of his successors, Shah Sufi, Shah Abbas II. and Shah Solomon, the two former were sensible and judicious rulers, and advanced the prosperity of their subjects. During the reign of Sultan Hussein, a weak and bigoted fool, priests and slaves were elevated to the most important and responsible offices of the empire, and all who rejected the tenets of the Shiites were persecuted. The consequence was a general discontent, of which the Afghans took advantage to declare their independence and seize Kandahar (1709). Their able leader, Mir Vais, died in 1715; but his successors were worthy of him, and one of them, Mahmud, invaded Persia (1722), defeated Hussein's armies, and besieged the king in Isfahān till the inhabitants were reduced to the extremity of distress. Hussein then abdicated the throne in favour of his conqueror, who, on his accession, immediately devoted his energies to alleviate the distresses and gain the confidence of his new subjects. Becoming insane, he was deposed in 1725 by his brother Ashraf; but the atrocious tyranny of the latter was speedily put an end to by the celebrated Nadir Shah (q.v.), who first raised Tamasp (1729), of the Saffavean race, to the throne, then deposed him and made his young son the nominal sovereign, and finally, on the latter's early death, himself seized the sceptre (1736). But on his death (1747) anarchy again returned; the country was horribly devastated by the rival claimants for the throne; Afghanistan and Beluchistan finally separated from Persia, and the country was split up into a number of small independent states till 1755, when a Kurd, named Kerim Khan, re-established peace and unity in western Persia, and by his wisdom, justice, and warlike talents acquired the esteem of his subjects and the respect of neighbouring states. After the usual contests for the succession, accompanied with the usual barbarities and devastations, Kerim was succeeded in 1784 by Ali-Murad, Jaafar, and Lutf-Ali, during whose reigns Mazanderan became independent under Aga-Mohammed, a Turkoman eunuch of the Kajar race, who repeatedly defeated the royal armies, and ended by depriving Lutf-Ali of his crown (1795).

The great eunuch-king, the first of the dynasty that reigned until 1925, on his accession announced his intention of restoring the kingdom as it had been established by Kerim Khan, and accordingly invaded Khorasan and Georgia. The Georgians besought the aid of Russia; but the Persian monarch, with terrible promptitude, poured his army like a torrent into the country, and devastated it with fire and sword. His conquest was, however, hardly completed when he was assassinated (1797). His nephew, Fath-Ali (1797-1834), after numerous conflicts, fully established his authority, and completely subdued the rebellious tribes in Khorasan. But the great commotions in western Europe produced for him bitter fruits. He was dragged into a war with Russia soon after his accession, and by a treaty concluded in 1797 surrendered to that power Derbend and several districts on the Kur. In 1802 Georgia was declared to be a Russian province. War with Russia was recommenced by Persia at the instigation of France; but, after two years of conflicts disastrous to the Persians, the treaty of Gulistan (1813) gave to Russia all the Persian possessions to the north of Armenia, and the right of navigation in the Caspian Sea. In 1826 a third war, equally unfortunate for Persia, was commenced with the same power, and cost Persia the remainder of its possessions in Armenia, with Erivan, and a sum of 18,000,000 rubles for the expenses of the war. The severity exercised in procuring this sum by taxa-

tion so exasperated the people that they rose in insurrection (1829), and murdered the Russian ambassador, his wife, and almost all who were connected with the Russian legation. The most humiliating concessions to Russia, and the punishment by mutilation of 1500 of the rioters, alone averted war. The death of the crown-prince, Abbas Mirza, in 1833, seemed to give the final blow to the declining fortunes of Persia, for he was the only man who seriously attempted to raise his country from the state of abasement into which it had fallen. By the assistance of Russia and Britain Mohammed Shah (1834-48), the son of Abbas Mirza, obtained the crown. Mohammed resolved to demand reacknowledgment of sovereignty from his alleged vassals in parts of Afghanistan, Beluchistan, and Kliwa, but an attempt he made to reannex Herat, 'the key to India,' was resisted by England. The war was terminated in 1838 by the landing of a small sepoy force on the shores of the Persian Gulf.

Nasr-ed-Din succeeded to the throne on his father's death in 1848. He also resolved to assert his claims in Afghanistan and Beluchistan. The ruler of Herat having recognised the claims of Persia, the English government remonstrated with the Shah, and he was compelled to sign an engagement (1853), by which he became bound not to interfere further with the internal affairs of Herat. In 1856, however, on the pretext that Dost Mohammed, the Amir of Kabul, was about to invade Herat, the Persians again took the city. Thereupon a British army was landed on the coast of the Gulf, and, under Generals Outram and Havelock, repeatedly defeated the Persians, and compelled them to restore Herat (July 1857). Since that time the Persians have not interfered with the 'key to India,' but they have been engaged in a long series of disputes with regard to their frontier north and south of it. After the war of 1857 their encroachments became systematic. In 1868 they occupied Seistan, a province claimed by the Afghans, and extended their jurisdiction over part of Beluchistan; but at length they agreed with the Amir of Afghanistan and the Khan of Kelat to refer the questions in dispute to an English commissioner, General Sir Frederick Goldsmid, who in 1872 fixed the Persian frontier substantially as it now is. The north-eastern frontier was settled by a treaty between Russia and Persia in 1881. The great extension of Russian territory and Russian power on the north-east, while overshadowing Persia, had the effect of sheltering the adjoining regions of Persia from the terrible inroads of the Telkies and other Turkomans. In 1896 Nasr-ed-Din was assassinated, and was succeeded by his second son, Muzaffar-ed-Din, who was in turn succeeded in 1907 by his son, Mohammed Ali Mirza. In 1905 there was a strong movement, supported by the priests, in favour of representative institutions; and in January 1907, after difficulties, hostile intrigues, and risings in the towns, a constitution was formally proclaimed, and the powers and duties of the National Council fixed. The constitution was revoked in 1908 by the Shah, who surrounded the parliament house with troops, who captured and hanged some of the leaders of the democratic party, while others escaped to the British legation. Many houses of Persian nobles were pillaged or destroyed, apparently according to a scheme of proscription. In 1909 the constitution was restored, the Shah fled, and his son Sultan Ahmad succeeded. In 1907 an 'Anglo-Russian agreement' recognised a Russian sphere (including Isfahan and Yezd), a British sphere with the Gulf Coast and Bandar Abbas for its base; the remainder, with Bushire as port, being neutral.

Persia was not a participator in the Great War,

but Turks and Russians fought within her bounds; nor were British troops all removed till 1921. Lord Curzon's treaty of 1919 had brought all Persia much more than ever under British influence. But new stirrings of nationality had begun. In 1921 Riza Khan, a colonel of Persian Cossacks who had risen from the ranks, accomplished a *coup d'état*. Thereafter he was minister of war, whatever changes of government might be made. From 1923 he was also prime minister, with a free hand owing to the Shah's departure for Europe. The Anglo-Persian treaty was denounced (1921), the state strengthened against Russia and Britain alike, the army made efficient, the finances reformed (with American help), and by 1924 feeling against an absentee king of a Turkish dynasty had risen so high that a republic was on the point of being declared. Riza Khan, however, after consultation with the mushteheds at Kum declared a republic irreligious — looking perhaps to recent Turkish history. The Mejlis in October 1925 deposed Sultan Ahmed Shah, and in December, by 257 votes to 3, the prime minister was placed on the throne as Riza Shah Pahlavi. Thus once more a Persian wore the 'crown of Darius,' and the succession which under the Turkish Kajars had been denied to sons of Persian mothers was now confined to these.

See E. G. Browne, *A Year among the Persians* (1893), and *The Persian Revolution* (1910); Wills, *Land of the Lion and the Sun* (1883); Curzon, *Persia and the Persian Question* (1892); Napier-Macdonald, *Five Years in a Persian Town* (1905); Ella Sykes, *Persia and its People* (1910); Morier's *Hajji Baba*, also the histories by Sir J. Malcolm (2d ed. 1828), Watson (1866), Sir Clements Markham (1874), and Sir Percy Sykes (1915; revised and enlarged, 1921; a shorter work, 1922); Rawlinson's *Seventh Great Oriental Monarchy* (1876); *The Cambridge Ancient History* (vols. iv., vi., 1926-27).

PERSIAN ARCHITECTURE.—The architecture of Persia and that of Assyria closely resemble one another, and, owing to the mode and the materials in which they were constructed, their remains serve to illustrate and complete each other's history. In Assyria, where no solid building-materials exist, the walls are composed of masses of sun-dried

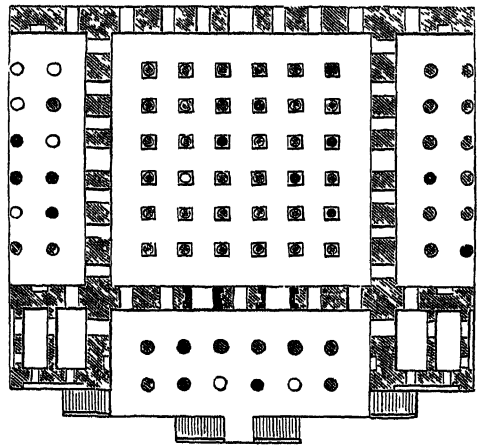


Fig. 1.—Plan of Great Hall of Xerxes at Persepolis.

brickwork, lined on the inside, to a certain height from the floor, with large sculptured slabs of alabaster. The Assyrian remains are of palace-temples, buildings somewhat resembling the Egyptian temples (which were also palaces); and many of the sculptures represent the exploits of the king in war and in peace. The palaces are always raised

on lofty artificial mounds, and approached by magnificent flights of steps (see ASSYRIA, BABYLON).

After Babylon came Pasargadæ, where the splendid palaces of Cyrus and Cambyzes still exist in ruins, and Persepolis, the capital of Darius and Xerxes (560-523 B.C.); and remains are still to be found at Susa, Ecbatana, and Tehrân. At Persepolis there is abundance of stone, and the pillars, walls, doorways, &c., are still preserved.

The halls at Persepolis were square in plan, having an equal number of pillars in each direction for the support of the roof, which was flat. In the centre a portion was left open for the admission of light, and sheltered by another roof raised upon pillars. The remains of the seventy-two columns with which it was adorned are still extant (fig. 1). The hall had thirty-six columns, six on each side, and on three sides had an external portico, each with two rows of six columns. These columns had capitals, composed of bulls' or horses' heads and shoulders (fig. 2), between which the beams of the roof rested; while others were ornamented with scrolls like the Ionic order (fig. 3). The bases also are suggestive of the origin of that Greek style. This hall was 350 feet by 300, and covered more ground than any similar buildings of antiquity, or any mediæval cathedral except that of Milan. The palaces of Persepolis stand on lofty platforms, built with walls of cyclopean masonry, and approached by magnificent flights of stairs, adorned, like the palaces, with

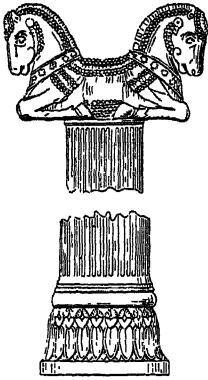


Fig. 2.



Fig. 3.

Details of Persian Architecture.

sculptures somewhat similar to those of Assyria. The interiors were ornamented with paintings. The arches of the gates of Khorsabad spring from the backs of sculptured bulls, and are beautifully ornamented with enamelled bricks. The Louvre has a splendid frieze in coloured enamelled bricks with life-sized figures of warriors from the palace of Darius I., and another similar frieze with lions from the palace of Artaxerxes.

Modern Persian architecture is separated by a wide historic gap from that of ancient Persia, and all posterior to the Moslem conquest belongs to the type known as Saracenic or Arabian. But it seems that the old art of Persia has a more direct influence on that of modern Persia than has been sometimes admitted; and even the Egyptian type of Saracenic art (see ARABIAN ARCHITECTURE) may have been moulded by Persian as well as by Byzantine artists, working for the Moslem conquerors. In Persia itself there seems no doubt that architecture of Mohammedan Persia, which

in its palmiest days rivalled in splendour that of Egypt, Bagdad vying with Cairo, is in many respects a reproduction of the ancient palaces of Nineveh and Babylon. In the mosques thick walls of imperfectly burnt bricks are covered with brilliantly coloured decorations of glazed and painted tiles and bricks. Fig. 4 is a view of the

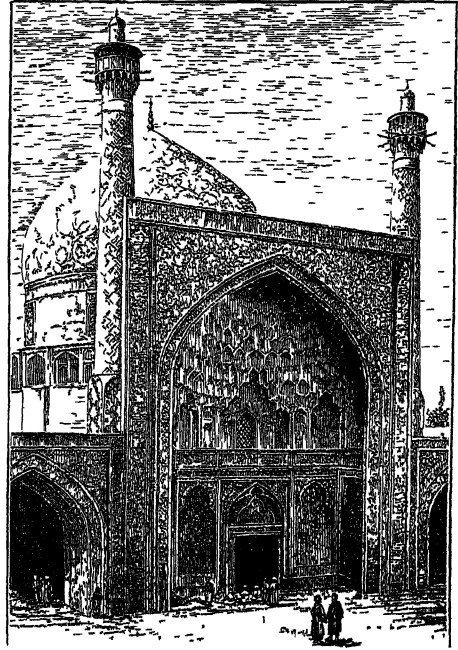


Fig. 4.—Gateway of Masjid Shah, Isfahân.

gateway of the Masjid Shah, or Great Mosque of Isfahân, dating from the reign of Shah Abbas the Great (1585-1628 A.D.).

PERSIAN LANGUAGE AND LITERATURE.—The ancient and modern idioms of Persia, in general designated as Iranian, belong to the great class of Indo-European languages; but the term Persian itself applies more particularly to the language as it is now spoken, with a few exceptions, throughout Persia, and in a few other places formerly under Persian dominion, like Bokhara, &c. The more important and better known of the ancient idioms are (1) *Zend* (the East Iranian or Bactrian language, in two dialects—the 'Gátha idiom' and 'ancient' or 'classical *Zend*'), which died out in the 3d century B.C.—one of the most highly developed idioms, rich in inflections, in the verbs as well as in the nouns, and in the former almost completely agreeing with Vedic Sanskrit; yet such as we find it in the small remains which have survived it is no longer in the full vigour of life, but almost decaying, and grammatically somewhat neglected. Geographically, this idiom may be placed in northern Persia. Its alphabet is of Semitic origin, and the writing goes from right to left (see *ZEND, ZEND-AVESTA*). (2) *Ancient Persian*, the chief remnants of which are found in the cuneiform inscriptions of the time of the Achemenides, discovered in the ruins of Persepolis, on the rock of Behistun, and some other places of Persia (see *CUNEIFORM*). Some relics, chiefly consisting of proper names for gods and men, and terms for vessels and garments, have survived in the writings of the classical period, and in the Bible, chiefly in Daniel. This idiom is much nearer to *Zend* and Sanskrit than to modern Persian. (3) *Pehlevi* (West Iranian, Median, and

Persian), in use during the period of the Sassanides (3d to 7th century A.D.), an idiom largely mixed with Semitic words, and poorer in inflections and terminations than Zend. Its remnants consist of a certain number of books relating to the Zoroastrian religion, of coins and inscriptions; and the language is not quite the same in all cases—according to the larger or smaller infusion of foreign words. The non-Iranian element is known as Huzvaresh, and is simply Chaldee; while the Iranian element is but little different from modern Persian. There are three distinct idioms to be distinguished in Pehlevi, and the writing varies accordingly, yet it is not certain whether the difference arises from their belonging to different districts or periods. When, however, Pehlevi ceased to be a living language, and the restoration of the pure Iranian had begun, people, not daring to change the writings (chiefly of a sacred nature, as having descended to them from the Sassanian times), began to substitute in reading the Persian equivalents for the Huzvaresh words. At last a new form of commentaries to the sacred writings sprang up, in which more distinct and clear Zend characters were used, where each sign had but one phonetic value, and where all the foreign Huzvaresh words were replaced by pure Persian ones; and this new form was called (4) *Pāzend*. The transition from ancient to modern Persian is formed by the *Parsee*, or, as the Arabs and the modern Persians themselves call it, *Farsi*, in use from 700 to 1100 A.D., once the language purely of the south-western provinces, distinguished chiefly by a peculiarity of style, rigid exclusion of Semitic words, and certain now obsolete forms and words retained in liturgical formulas. It is the Persian once written by the Parsees, and is in other respects very similar to the present or *modern Persian* (which also is invariably called *Farsi* by the modern Persians), the language of Jami, Nizami, and Hafiz—from 1100 to the present time—with its numerous dialects. The purest dialect is said to be that spoken in Shiraz and Isfahan and their neighbourhood. In general, the language is pronounced by universal consent to be the richest and most elegant of those spoken in modern Asia. It is the most sonorous and muscular, while at the same time it is the most elegant and most flexible of idioms; and it is not to be wondered at that in Moslem and Hindu realms it should have become the language of the court and of the educated world in general, as French used to be in Europe. Its chief characteristic, however, is the enormous intermixture of Arabic words, which, indeed, make up almost half its vocabulary. Respecting its analytical and grammatical structure, it exhibits traces only of that of the ancient dialects of Zend and Achaemenian, of which it is a direct descendant. The elaborate system of forms and inflections characteristic of those dialects has been utterly abandoned for combinations of auxiliary words, which impart fullness and an incredible ease to speech and composition. The grammar of the Persian language has been called 'regular;' but the fact is that there is hardly any grammar worth mentioning. Thus, there is no gender distinguished in declension; the plural is always formed in the same manner, the only distinction consisting in animate beings receiving the affix *ān*, while the inanimate are terminated in *ā*. Imported Arabic nouns, however, invariably take their Arabic plural. Not even the pronouns have a gender of their own; the distinction between masculine and feminine must be expressed by a special word, denoting male or female. There is no article, either definite or indefinite. The flexion of the verb is equally simple. As to syntax, there is none, or, at all events, none which would not come almost instinctively to any student acquainted

with the general laws of speech and composition. The time of its greatest brilliancy may be designated as that in which Firdausi wrote, when Arabic words had not swamped it to the vast degree in which they have since done, and were still, as far as they had crept in, amenable to whatever rules the Persian grammar imposed upon the words of its own language.

In the history of the Persian writing three epochs are to be distinguished. First, we have the Cuneiform (q.v.), by the side of which there seems, however, to have been in use a kind of Semitic alphabet for common purposes. This, in the second period, appears to have split into several alphabets, all related to each other, and pointing to a common Syriac origin (such as the different kinds of Pehlevi characters and the Zend alphabet) cleverly adapted to the use of a non-Semitic language. In the third period we find the Arabic alphabet enlarged for Persian use by an addition of diacritical points and signs for such sounds as are not to be found in Arabic (*p, ch, zh, g*). The writing is but slightly different from the usual Arabic Neskhi.

Of the literature of the Persians before the Mohammedan conquest we shall not speak here, but refer to the article ZEND. The literary period now under consideration is distinguishable by the above-mentioned infusion of Arabic words into the Persian language, imported together with the Koran and its teachings. The writers are one and all Mohammedans. With the fanaticism peculiar to conquering religions, all the representatives of old Persian literature and science, men and matter, were ruthlessly persecuted by Omar's general, Saad Ibn Abi Wakkas. The consequence was that for the first two or three centuries after the conquest all was silence. The scholars and priests who would not bow to Allah and his Prophet took with them what had not been destroyed of the written monuments of their ancient culture, while those that remained at home were forced to abandon their wonted studies. Yet, by slow degrees, as is invariably the case under such circumstances, the conquered race transformed the culture of the conquerors to such a degree that native influence soon became paramount in Persia, even in the matter of theology. It is readily granted by later Mohammedan writers that it was out of the body of the Persians exclusively that sprang the foremost, if not all, the greatest scholars and authors on religious as well as grammatical subjects, historians and poets, philosophers and men of science; and the only concession they made consisted in their use of the newly-imported Arabic tongue. A further step was taken when the Persians, under upstart native dynasties, returned also to the ancient language of their fathers during the first centuries of Mohammedanism. The revived national feeling, which must have been stirring for a long time previously among the masses, then suddenly burst forth in prose and in verse, from the lips of a thousand singers and writers. The literary life of Persia, the commencement of which is thus to be placed in the 9th century A.D., continued to flourish with unabated healthy vigour for five centuries, and produced a host of writers in every branch of science and belles-lettres, of whom we can only here give the most rapid of surveys, referring for the most important names to special articles.

About 952 Abul Hasan Rudagi, the Blind, rose by the king's favour to such an eminence that he had two hundred slaves to wait upon him; but little has remained of his 1,300,000 distiches, and of his metrical translation of Bidpai's Fables. About 1000 we hear of Kalub, the Dilemite prince, as the author of *The Perfection of Rhetoric*, and poems. In the time of the Ghaznevids, chiefly

under Mahmud, who surrounded himself with no less than four hundred court-poets, we find those stars of Persian song, Ansari (1039), author of *Wamîk and Asra*; Ferruchi, who, besides his own poems, wrote the first work on the laws of the Persian metrical art; Esedi, from Tus; and, above all, Firdausi (q.v.), the author of the *Shah-Namêh*. Under the Atabek dynasty was the panegyrist Auhad-ed-Din Anwari, who, with his praise, well knew how to handle satire. Nizami (about 1200) is founder of the romantic epos. Conspicuous in Persia is the mystic (Sufistic) poetry, which, under Anacreontic allegories, in glowing songs of wine and love, represented the mystery of divine love and of the union of the soul with God (see *SUFISM*). In this province we find the famous Omar Khayyam (q.v.; died 1123), and Farid-ed-Din Attar (born 1216), the renowned author of *Pend-Namêh* ('Book of Counsel'), a work containing the biographies of saints up to his own time; such is the depth and hidden meaning of his mystic poems that for centuries after him the whole Moslem world has busied itself with commentaries on the meaning of his sacred poetry. He died about 1330, more than a hundred years old, as a martyr. Greater still in this field is Jelal-ed-Din Rumi (died 1273), whose poem on *Contemplative Life* has made him the oracle of oriental mysticism up to this day; he wrote also a great number of lyrical poems. The 13th century cannot better be closed than with Sâdi (q.v.), the first and unrivalled Persian didactic poet. But far above all shines Hâfiz (q.v.), who sang of wine and love, and nightingales and flowers. After him the full glory of Persian poetry begins to wane. Among those that came after him Jami (1419-92) stands highest, a poet of most varied genius, second only in every one of the manifold branches to its chief master—in lyric and in didactic to Sâdi, in romance to Nizami, in mysticism to Jelal-ed-Din; but most brilliant as a romantic poet. Of prose works we have by him a history of the Sufis, and an exceedingly valuable collection of epistolary models. Hafiz (died 1785) wrote beautiful odes; and Qâ'ânî (c. 1860) was the most notable of more recent poets. Since 1850 the Bâbis and Bahâ'is have produced poetry full of fire and beauty, as well as powerful and flexible prose. The dramatic poetry of the Persians is not without merit, but is of small extent.

The numerous tales, stories, novels, anecdotes, anthologies, and all the miscellaneous entertaining literature in which Persia abounds form a fit transition from poetry to prose. Able rivals of the great Arabic historiographers sprang up at an early period. For the history of mythical times Firdausi's gigantic epos remains the only source. Reshid-el-Din, the vizier of Ghazan (born 1247; executed in 1320), wrote a summary of the history of all Mohammedan countries and times, containing besides a complete history of sects. His contemporary Wassaf is the model of the grand rhetorical style. His most successful imitator in the 15th century is Sherif-ed-Din, who wrote the history of Tamerlane. Up to that period pomposity of diction was considered the principal beauty, if not the chief merit, of a classical Persian history. From the 15th century downwards a healthy reaction set in, and simplicity and a striving after the real representation of facts became the predominant fashion. Foremost among the modern historians is Mirkhond, whose *Universal History* comprises the period from creation to the reign of Sultan Hasan Beikara. His son Khondemir also wrote history. Among Indian historians who wrote in Persian we have Mohammed Kasim Ferishtah (1640), who wrote the ancient history of India up to the European conquest, Mohammed Hashim, Abul Fadel Mobarrek, and others. The *Measiri Sultaniye*, which contains

the history of the Kajar dynasty of Persia, and was published at Tehrân in 1825, was translated by Bridges (Lond. 1833).

Biographies, legends, histories of martyrs, and the like are legion. Most of the biographies of the Prophet, however, are taken from the Arabic. Works on geography—generally treated together with history—are those of Mestafi, Ahmîn Ahmed Rasi, Berdshendi, &c. In theology little beyond translations of the Koran, commentaries, and some portions of the Traditions has been produced. Jurisprudence has likewise little to show that is original, and not mere translation, partial commentary, or adaptation in Persian. The *Hedâd-shah*, the *Inadshah*, the *Futawa Alemgiri* are the most important legal works. Much has been written on medicine, surgery, pharmacy, and physical sciences by Persians, but nearly all their chief works are in Arabic. Mathematics, astronomy, and philosophy have not been neglected; rhetoric, works on letter-writing, and on metrical and poetical arts are numerous. Grammar and lexicography found their principal cultivators in India. Translations from Greek, Indian, Arabic, Turkish, and other languages into Persian exist in abundance.

See E. G. Browne, *Literary History of Persia* (4 vols. 1902-24), and *Press and Poetry of Modern Persia* (1914); Reuben Levy, *Persian Literature: an Introduction* (1923); and books by Reed (Chicago, 1893), Darmesteter, Etche, Horn, Dole and Walker (New York, 1901), R. A. Nicholson, J. H. Moulton, as well as the older works by Hammer and Ouseley. See the articles in this work on FIRDAUSI, HÂFIZ, OMAR KHAYYÂM, *SUFISM*, &c. Dictionaries, besides the native ones, are those of Johnson and Richardson, Vullers (1867), Palmer (1876-84), Steingass (1880-92), Wollaston (1889).

Persian Gulf, an arm of the Indian Ocean which penetrates between Arabia and Persia to the extent of 650 English miles in a general north-westerly direction. Its breadth varies from 55 miles at the mouth to 250 miles, and the area is estimated at 77,450 sq. m., not including the islands, which are scattered over the western half, or lie close inshore along the eastern side. The chief of these islands are Ormuz, at the mouth; Kishm, 810 sq. m. in extent; and the Bahrein Islands. The Great Pearl Bank stretches along the western side from Ras Hassan to nearly half-way up the gulf. The coast is mostly formed of calcareous rocks. On the Arabian side it is low and sandy, occasionally broken by mountains and cliffs; while on the Persian side it is higher and abrupt, with deep water close inshore, owing to the mountain-ranges of Fars and Laristan running close to the water's edge. The islands are partly of limestone and partly of ironstone, and are generally destitute of springs, barren, desolate, and presenting numerous traces of volcanic eruptions. Except the Shatt-el-Arab (see *EUPHRATES*), the Persian Gulf receives only insignificant streams. Its eastern side presents abundance of good anchorage, either in the numerous bays or in the lee of islands. The order of the periodic currents in this gulf is precisely the reverse of that of the Red Sea (q.v.) currents, as they ascend from May to October, and descend from October to May. The greatest depth does not exceed 50 fathoms; and Sir John Murray calculated its total cubic contents at 2200 cubic miles of water. Oriental geographers give to this gulf the name of the 'Green Sea,' from a remarkable strip of water, of a green colour, lying along the Arabian coast. Among the ports are Bender Abbas (q.v.), Bushire (q.v.), and Lingah.

Persian Powder. See *INSECT-POWDER*.

Persigny, JEAN GILBERT VICTOR FIALIN, DUC DE, an adherent of Napoleon III., was born

at Saint-Germain-l'Espinasse (dept. Loire), 11th January 1808, entered the cavalry school at Saumur in 1826, and the 4th Hussars in 1828; but he was expelled from the army for insubordination in 1831. Then, having been introduced to Louis Napoleon, he secured his favour, and commenced a career of Bonapartist propagandism throughout France and Germany. He had the chief hand in the affair of Strasburg (1836) and in the descent on Boulogne (1840), but was captured there, and condemned to twenty years' imprisonment. On the breaking out of the revolution in 1848 Persigny was one of the men who secured the election of Napoleon as President of the Republic; he also took a prominent part in the *coup d'état* of December 1851. In January 1852 he succeeded De Morny as minister of the Interior; from 1855 to 1860 (except for one year) he was ambassador at the English court; then he resumed the office of minister of the Interior until June 1863. In September of the same year he was created duke. Thereafter he sat in the senate until the fall of the empire, when he escaped to England. He died at Nice on 12th January 1872. See his *Mémoires* (1896).

Persimmon. See DATE PLUM.

Persius (AULUS PERSIUS FLACCUS), third in the line of Roman satirists, being later than Lucilius and Horace and earlier than Juvenal, was in some respects the ablest, certainly the most dramatic, of the four. Born of a distinguished equestrian family, 4th December 34 A.D., at Volaterræ in Etruria, he lost his father when six years old, was educated till twelve in his native town, and thereafter in Rome under the grammarian Remmius Palaemon and the rhetorician Verginius Flavius. In early manhood he came under the ennobling influence of the Stoic philosopher Cornutus, who imbued him with the tenets of his school and gave his mind and character an impress which ever deepened and strengthened. But he died before completing his twenty-eighth year (62 A.D.). The admiration and affection entertained by the master for his pupil was shared by the friends of the latter—Lucan, Cæsius Bassus, the lyric poet, and other contemporaries of light and leading, among whom, however, Seneca had little attraction for the young author. The noble and virtuous Pætus Thrasea accompanied him on several tours through Italy, finding a kindred soul in the modest, prepossessing youth, whose integrity and piety were conspicuous in his worldly as in his family relations. The austere discipline of Cornutus affected the style of Persius, who in consequence wrote fastidiously and sparingly, leaving at his death six brief satires, the whole not exceeding 650 hexameter lines. These, slightly corrected by Cornutus and edited by Cæsius Bassus, enjoyed, even through the early mediæval darkness till the Renaissance and down to our own day, the highest esteem, fathers of the church like Augustine and Jerome, humanists like Buchanan and Casaubon, anticipating later schools of literature in evolving and interpreting the poet's pregnant, if sometimes obscure, ridicule of the rapidly degenerating life of 1st-century paganism. The best satire is, on the whole, the first, on the prevailing false taste in poetry. 'Probably no writer ever borrowed so much and yet left on the mind so decided an impression of originality,' says Conington, who further indicates the striking resemblance between the genius of Persius and that of Carlyle. He has had many editors, of whom the most helpful have been Casaubon (1605), Otto Jahn (1843-68), and Conington, whose edition, revised by Nettleship (Oxford, 1878), gives text, prose translation, and notes embodying the best results of previous criticism. G. G. Ramsay (1918) also includes a translation.

He has had a host of translators in the chief modern languages—that of the Italian Sacchi of Faenza surpassing all others, not excepting the English versions by Dryden and Gifford.

Person (Lat. *persona*, 'a mask') came to be applied to the person wearing the mask, and thus to mean a personage, an individual, a numerically distinct being. In theology there is a special use of the word for the three Persons of the Trinity (q.v.). The name *Persona*, Person, was first applied to the Trinity by the Latins; the corresponding Greek word, *Prosōpon*, being of later use. The earlier Greek Fathers used the word *Hypostasis*, 'substance,' where the Latins used *Persona*, and considerable controversy for a time grew out of this diverse use; after the condemnation of the Sabellian heresy, and still more after the Council of Nicæa, all ambiguity of words being at an end, the controversy turned upon the substance of the doctrine, in the form of the Arian controversy. See ARIUS.

Personal Equation. See EQUATIONS.

Personal Exception, in the law of Scotland, the equivalent of the English *Estoppel* (q.v.); a ground of objection which applies to an individual and prevents him from doing something which, but for his conduct or situation, he might do.

Personality, as used in philosophy, signifies the distinctive attribute or attributes which distinguish a person from an animal or a thing. A thing we ordinarily consider to be unconscious, an animal to be conscious, a person to be self-conscious. That is to say, we suppose the animal to have intelligent experience of a kind, without being able to reflect upon that experience, and so to be conscious of itself as the unitary subject whose the experience is. The last is the essential mark of personality in the intellectual sphere. 'A person,' says Locke, 'stands for a thinking intelligent being, that has reason and reflection, and can consider itself as itself, the same thinking being in different times and places' (*Essay*, ii. 27). In the moral sphere personality means self-determination or reason-directed will, and may be said to be the foundation of moral responsibility. Hence the central position which it occupies in the ethics of Kant and Hegel. The consciously realised unity and identity of the individual thus constitutes what is most distinctive of personality as such. But under the name of *Double Personality* or *Double Consciousness* the records of medical science contain many cases of mental disorder, in which the sense of personal identity is curiously interfered with. Cases are, of course, of constant occurrence in which the patient mentally affected conceives himself to be some one else (e.g. Napoleon or a Bible character). Others conceive that parts or properties of their frame belong to another person, or that they are inhabited and ruled by a spirit or entity acting in opposition to their will and interests. Others, again, are possessed by the idea that they are two persons at once, or rather that their body is the seat of two beings who are often in strife with one another, one being generally identified more strictly with the self, and the other being regarded as a hostile power and a *mauvais sujet* who prompts the better self to evil courses. The struggle between the two persons of this duality often takes bodily shape, and the patient maltreats his own body under the impression that he is castigating the vicious 'other one' who haunts him. This alienation or extrusion of part of the individual's experience from the inner circle of the personality may be due, it has been suggested, to a morbid alteration in the cænesthesis or organic sensations which represent in consciousness the state of the body as a whole. Any part of the body in which this common sensibility is wanting

or disturbed is regarded by the patient as no longer a part of himself, and even as belonging to some hostile being. It even happens in extreme cases of such somatic insensibility that the individual doubts or denies his own existence, as in the case of a patient cited by Ribot, who declared that he had been dead two years, though (according to his own account) he still continued to exist in a mechanical fashion in which he was not consciously interested.

These manifestations, however, are not what is meant by double consciousness in the strict sense of the term. Double consciousness does not necessarily imply the presence of any insane delusion as to the patient's present existence and surroundings, but consists in the fact that a certain portion of his past life is temporarily withdrawn altogether from his conscious memory, to reappear, however, at a later period, when he will have as completely forgotten his present experiences and the whole section of his life connected with them. In the normal human being the memory is unitary, and consequently the life-experiences of the individual are felt and recalled as parts of one whole. In these morbid cases, on the contrary, the conscious life seems, as it were, to be cut into sections or lengths which are entirely dis severed, and retained, so to speak, in separate memories. These mutually exclusive sections are remembered by the individual intermittently in successive periods, generally separated from one another by a swoon, a fit, or some violent nervous crisis. Now, as it is our memory of past experiences that may be said to form the anchor of personal identity, it follows that in such cases we shall have, in greater or less completeness, the extraordinary phenomenon of two separate and independent trains of thought—consequently two separate personalities—in the same physical individual.

Perhaps the most clearly defined and complete instance on record is that of the young American woman reported by Macnish in his *Philosophy of Sleep*. She fell without forewarning into a profound sleep lasting several hours beyond the usual term. Before her sleep she was well informed and possessed an excellent memory. 'On waking she was discovered to have lost every trace of acquired knowledge. It was found necessary for her to learn everything again. She even acquired by new efforts the art of spelling, reading, writing, and calculating, and gradually became acquainted with the persons and objects around, like a being for the first time brought into the world. In these exercises she made considerable proficiency. But after a few months another fit of somnolency invaded her. On rousing from it she found herself restored to the state she was in before the first paroxysm, but was wholly ignorant of every event and circumstance that had befallen her afterward. She is as unconscious of her double character as two persons are of their respective natures. For example, in her old state she possesses all the original knowledge, in her new state only what she acquired since. In the old state she possesses fine powers of penmanship, while in the new she writes a poor, awkward hand, having not had time or means to become an expert.' A similar experience is observable in the case of somnambulists, who are totally ignorant, in the waking state, of their somnambulist experience, but when again in the somnambulist state recall what happened in the previous crisis. Lost objects have been recovered, and even crimes brought to light by taking advantage of this peculiarity. The same phenomenon is also said to have been observed in cases of intoxication, what is done in one fit of drunkenness being remembered in the next, but forgotten in the sober interval. Instances of double

consciousness, however, are not always of the precise type mentioned by Macnish. Thus, in the case of Felida X., reported by Dr Azam, the woman during the second state was conscious of her whole life-experience, but during the first or original state knew nothing of anything that had happened in the second. The alternations began in this case in 1856, and continued for upwards of thirty years, and it is remarkable that the second state, which at first appeared only in short dream-like periods, gradually supplanted the first state, which came to recur only at long intervals, and for a few hours. The second state was physically and mentally superior to the first, and the patient herself spoke of the first as *état bête*. A still more extraordinary case, reported from Paris, is that of Louis V., a young man of epileptic and hysterical temperament and criminal tendencies (born 1863), where the medical record signalises not two, but six states mutually exclusive, but, taken together, embracing his whole past life. An ingenious literary use of the notion of double personality, on different planes of morality, is seen in R. L. Stevenson's creation of Dr Jekyll and Mr Hyde. See MEMORY (DISEASES OF).

Personality, or **PERSONAL PROPERTY**, originally distinguished from realty, or real property, by the fact that in the case of realty the thing itself could be recovered, but in personality only damages could be recovered. Furniture, money, stock in public companies, assurance policies, are all personal property, which, unlike real property, is the subject of absolute ownership. On intestacy it was divided among the next-of-kin according to the Statutes of Distribution. By the Administration of Estates Act, 1925 (15 Geo. V. chap. 3), the existing law of succession to personality is abolished. Entirely new rules of succession are enacted. See **INTESTACY**, **KIN** (**NEXT OF**), **REAL**. In Scots law, the corresponding phrase is **Moveables**; see **HERITABLE AND MOVEABLE**.

Perspective (Lat. *perspicio*, 'I look through') is the art of representing natural objects upon a plane surface in such a manner that the representation shall affect the eye in the same way as the objects themselves. The distance and position of objects affect both their distinctness and apparent form, giving rise to a subdivision of perspective into *linear perspective*, which, as its name denotes, considers exclusively the effect produced by the position and distance of the observer upon the apparent form and grouping of objects; while *aerial perspective* confines itself to their *distinctness*, as modified by distance and light. The necessity of attending to the principles of perspective in all pictorial drawing is apparent when we consider, for instance, that a circle when seen obliquely appears to be not a circle but an ellipse, with its shortest diameter in line with the spectator, and its longest at right angles to this. A square, when looked at from a position opposite the middle of one of its sides, appears as a trapezoid, the sides which are perpendicular to the direction of vision appearing to be parallel, while the other two appear to converge to a point in front of the spectator, &c. For the same reason two rows of parallel pillars of equal height, seen from a point between and equidistant from each row, appear not only to converge at the further end, but to become gradually smaller and smaller. An excellent idea of a perspective plan can be easily obtained by interposing a vertical transparent plane (as of glass—a window, for instance) between the observer and the objects of his vision, and supposing that the objects he sees are not seen *through* the glass, but painted on it. A sketch made on a glass plane in this position by following with a pencil all the lines

and shades of the objects seen through it, the eye being all the time kept quite steady, would form a picture in perfect perspective. In practice, however, it is found unfortunately that glass is not a suitable material for sketching on, and that the vertical position is not the most convenient; it is therefore preferable to make a careful study of the effects produced by change of position and distance on the appearance of objects in nature, and from the results of this to compile a body of rules, by the observance of which painters may be enabled to produce an effect true to nature. After the 'scope' (i.e. the number of objects to be introduced, and the distance at which they are to be

viewed) of the picture has been determined, and before the design is commenced, it is necessary to draw upon the perspective plan three lines: (1) The *base line*, or *ground line*, limits the sketch towards the operator, and is the base line of the picture. (2) The *horizontal line* represents the ordinary position of the sensible horizon. The height of the horizontal line is about

one-third of the height of the picture, when the sketcher is placed at or little above the level of the horizon; but it may rise in a degree corresponding to his increase of elevation till it reaches near to the top of the perspective plan. The general rule is to have a high horizontal line when the view is taken, or supposed to be taken, from an eminence; but when the station is on a level, either actual or assumed, as is the case when a statue or a mountainous landscape is figured, the horizontal line must be low. The horizontal line in nearly all cases is supposed to be level with the spectator's eye. (3) The *vertical line* is drawn from the supposed position of the sketcher, perpendicular to the *ground* and *horizontal* lines, meeting the latter in a point which is called the *point of sight*, or centre of the picture. The vertical line has no

representative in nature, and is merely a mechanical adjunct to the construction of the picture, all vertical lines in nature being parallel to it in the picture. The point of sight, being the point directly opposite to the observer, is properly placed in the centre of the picture, for it is most natural that the view should lie symmetrically on each side of the principal visual line; but this is not by any means a universal rule, for we very frequently find it on the right or left side, but always, of course, on the horizontal line. All lines which in nature are perpendicular to a vertical plane which is raised upon the ground line as a base, meet in the point of sight, which is thus their *vanishing point* (see the line of the tops and bottoms of the pillars in fig. 1). The *points of distance* are two points in the horizontal line on each side of the point of sight, and in a 'direct' sketch are at a distance from it equal to the horizontal distance of the sketcher's eye from the ground line. The equality of distance of these points from the point

of sight is not, however, necessary, as it occurs only in those cases where the lines, of which the points of distance are the *vanishing points*, are inclined (in nature) at an angle of 45° to the base line; but in all cases the two points of distance are about twice as far apart as the eye is from the picture. One important use of the points of distance is to define the distance of objects in a row (fig. 1) from each other. For this purpose two points of distance are not necessary, as when the position of one pillar is found, that of the one opposite is at once obtained by drawing a line parallel to the base or ground line. We have seen that the point of sight is the vanishing point

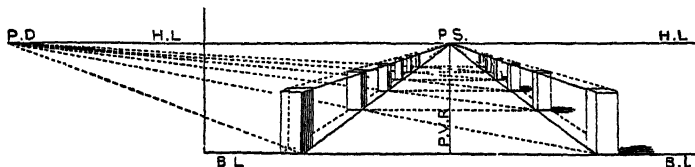


Fig. 1.

Illustrating the more important points and lines; PVR is the principal visual ray.

of all level lines which meet the ground line or a vertical plane on it at right angles, and that the points of distance (in a *direct* picture) are the vanishing points of all lines which cut the ground line at an angle of 45° ; but there are many other groups of parallel lines in a picture which have different situations, and therefore different vanishing points. Such lines with their vanishing points (called for distinction's sake *accidental points*) are represented in fig. 2. If the accidental point is above the horizontal line, it is called the *accidental point aerial*; if below, the *accidental point terrestrial*; and a little consideration makes it evident that these points may or may not be situated within the plane of the picture. Such are the points and lines necessary for the construction of a plan in true perspective; and from the above

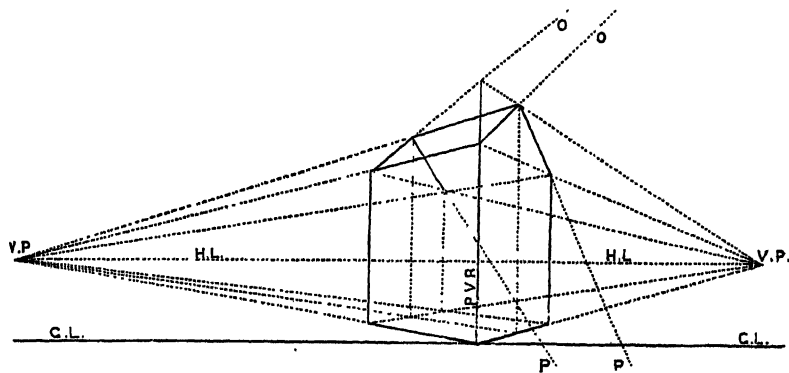


Fig. 2.

The lines O, O converge to the accidental point aerial, and P, P to the accidental point terrestrial.

explanation we may deduce the two general principles: (1) that all parallel straight lines in nature are no longer parallel when projected on the perspective plane, but meet in a point which is called the vanishing point, and is some one of the three above described, unless these lines happen to be also parallel to the ground line or the vertical line, in which case they remain parallel when transferred to the picture; and (2) that, since the bodies drawn below the horizontal line are seen as if from above, those above as if from below, and

those to the right and left of the point of sight as if observed from the left and right, it follows that straight lines which in the picture are above the horizontal line lower themselves, those below raise themselves to it, whilst those to the left, following the same law, direct themselves to the right, and *vice versa*.

Aerial perspective consists in a modulation of the brightness and colours of objects in accordance with the state of the atmosphere, the depth of the body in the perspective plane (i.e. distance in nature from the ground line), and other accidents of place and time. As the distance of objects increases, their illuminated parts are made less brilliant and their shaded parts more feeble. The bluish tint imparted by a large mass of the atmosphere to the bodies seen through it is frequently imitated by the mixing of a slight tint of blue with the colours to be applied; a yellow object thus assumes a greenish tint, a red one a violet tint, &c. The air when charged with vapour is represented by a diminution of the brightness of colours, and by the grayish tint imparted to them. But in this part of the subject rules are of little avail, for experience alone can guide the painter in faithfully copying the myriad aspects presented by nature.

A thorough knowledge of perspective is a *sine quâ non* to the painter or designer, and though many are inclined to think it a superfluity, and that the sketcher has only to make use of his eyes and copy justly, the very fact that such is their opinion shows that they have never made the attempt; for it is impossible for the painter, and much more so for the designer, to execute a copy of nature with sufficient accuracy by the sole aid of the eye and hand, a fact that is unfortunately much too frequently proved by many of the sketches exhibited in fine-art collections. Perspective was known to the ancients, but seems to have become extinct during the disturbances that convulsed Italy, and was revived by Albert Dürer and Bramantino of Milan (c. 1470–1535), whose body of rules was extended and completed by Peruzzi and Ubbaldi about 1600. Dr Brook Taylor in 1715 and 1719 was the first Englishman who discussed the subject scientifically.

Perspiration. See SKIN.

Perth, the county town of Perthshire, on the right bank of the tidal Tay, 43 miles NNW. of Edinburgh, 22 WSW. of Dundee, and 62 NE. of Glasgow. The beauty of its surroundings—the noble river; the two wooded heights, Moncreiffe and Kinnoull Hills, 725 and 730 feet high; and, away to the north, the Grampians—makes the 'Fair City' worthy of the name. A handsome nine-arch bridge (1772; widened 1871), 840 feet long, and stretching over a waterway of 590 feet, leads to the suburb of Bridgend, where Ruskin spent much of his childhood, on the east bank of the Tay; another bridge was built in 1899–1900. Along the west bank extend two beautiful public parks, the North and South Inches, 98 and 72 acres in area. St John's Church is the only old building—a cruciform Decorated pile, with an earlier central square tower. Other edifices are St Ninian's Episcopal Cathedral (1850–90), an Early Middle Pointed structure, by Butterfield; the Tudor municipal buildings (1879), the Greek county buildings (1819–67), the city hall (1844), the infirmary (1837–69), the penitentiary and general prison for Scotland (1812–59), and a museum. Kinnoull Hill was given to the town in 1924. Railways have largely diverted the river-trade; and dyeing is now the leading industry, with the manufacture of ink. A royal burgh since 1210 or earlier, taking precedence of all others save Edinburgh, Perth till 1918, when

it was merged in East Perthshire, returned one member to parliament. Pop. (1831) 19,238; (1861) 25,250; (1891) 29,919; (1901) 32,873; (1921) 33,208.

Perth, or St Johnstoun, as it was formerly called, has a wealth of historic memories—the bloody combat on the North Inch between sixty members of the clans Chattan and Kay (1396); the murder of James I. (q.v., 1437); Knox's 'thundering sermon against idolatry' in St John's (1559); the Gowrie Conspiracy (q.v., 1600); and Montrose's victory of Tippeimuir (1644); besides sixteen ecclesiastical councils and fourteen parliaments. James, fourth Lord Drummond, was in 1605 created Earl of Perth—a title forfeited in 1695 by the Jacobite fourth earl (titular Duke of Perth), and restored in 1853 to George Drummond, sixth Duc de Melfort.

The *Five Articles of Perth*, memorable in the ecclesiastical history of Scotland, were agreed upon in a meeting of the General Assembly, convened at Perth, by command of James VI. in 1618. They enjoined kneeling at the Lord's Supper, the observance of Christmas, Good Friday, Easter, and Pentecost, and confirmation, and sanctioned the private administration of baptism and of the Lord's Supper. Highly obnoxious to the Presbyterians as having been adopted in mere compliance with the king's will, they yet were ratified by the parliament, and enforced by the Court of High Commission. They became one of the chief subjects of that contention between king and people which produced results so grave and sad for both in the subsequent reign. The General Assembly of Glasgow in 1638 declared that of Perth to have been 'unfree, unlawful, and null,' and condemned the Five Articles.

Perth, the capital of Western Australia (q.v.), occupies a picturesque site on the north bank of the Swan River, 12 miles from Fremantle, its port, at the mouth of the river. Perth is the centre of railway lines to Bunbury and to Albany in the south, to Kalgoorlie and Mount Margaret eastwards, and to Geraldton and the Murchison goldfields to the north. A university was established in 1911 and opened in 1913. Among buildings are the town-hall, the Anglican (1888) and Roman Catholic cathedrals (both archiepiscopal), churches, mechanics' institute and museum, and the governor's residence. Pop. (1881) 5044; (1890) 9617; (1901) 36,274; (1921) 64,166.

Perth Amboy, a city and port of New Jersey, on the Kill van Kull, 21 miles SW. of New York. There is a ferry to Tottenville in Staten Island. Pop. (1885) 6311; (1900) 17,699; (1920) 41,707.

Perthes, FRIEDRICH CHRISTOPH, German publisher, was born at Rudolstadt, 21st April 1772, learned his business in Leipzig, and started on his own account in Hamburg in 1796, and soon pushed himself into the front rank of German publishers. An ardent patriot, he in 1810 started the *National Museum*, with contributions from the most influential writers of the day, and took an active personal part in resisting the establishment of French authority in Hamburg and Germany. Having built up his business again during the first years of peace, he removed in 1821 to Gotha. There his greatest publication was the historical series of works on all European nations, edited by Heeren, Ukert, and Giesebrecht. He died at Gotha, 18th May 1843. See *Life* (6th ed. 1872; Eng. trans. 1878) by his son Clemens Theodor.—JOHANN GEORG JUSTUS PERTHES (1749–1816), an uncle to Friedrich, established a publishing-house at Gotha in 1785, which has acquired in the hands of his sons a great reputation as a geographical institute; it issues *Petermann's Mitteilungen*, Stieler's *Atlas*,

numerous books of travel and geography, and the *Almanach de Gotha*.

Perthshire, the fourth largest county of Scotland, bounded by Inverness, Aberdeen, Forfar, Fife, Kinross, Clackmannan, Stirling, Dumfries, and Argyll shires. Partly Lowland, but mainly Highland (Strathmore the dividing-line), it is called by Scott 'the fairest portion of the northern kingdom;' and such, indeed, it is, with its mountains and glens, its rivers and lakes, its forests and fertile vales. The chief rivers are the Forth and Tay, the former receiving the Teith, Allan, and Devon, the latter the Tummel, Lyon, Isla, Braan, Almond, and Earn; whilst amongst upwards of eighty lakes are Lochs Tay, Erich, Earn, Rannoch, Lydoch, Katrine, Achray, Vennachar, and the Lake of Menteith. In the south rise the Ochils, with White Wisp (2110 feet) and Blairdenon Hill (2072); in the south-east the Sidlaw Hills, with Dunsinane (1012) and King's Seat (1235); and the Highland area is largely occupied by the Grampians, of whose forty-six summits exceeding 2300 feet may be mentioned Ben Lawers (with cairn, 4004), Benmore (3843), Ben-y-Gloe (3671), Schiehallion (3547), Ben Vorlich (3224), Ben Ledi (2875), Ben Vrackie (2757), and Ben Venue (2393). The soil is extremely varied, in places of great fertility—e.g. in Strathearn and in the Carse of Gowrie, which skirts the north side of the Tay's estuary; but barely a fifth of the entire surface is in tillage, the rest being pasture, woods, deer-forests, mountain, and desolate moorland, such as Rannoch. The woods cover nearly 100,000 acres; and the deer-forests, grouse-moors, and rod and net fishings are valuable. Ancient divisions were Atholl (N.), Rannoch (NW.), Breadalbane (W.), Balquhider (SW.), Menteith (S.), Perth (SE.), Gowrie (E.), Stormont and Strathearn (central). Perth and Kinross return two members, one for the eastern division and one for the western (including Kinross). Perth itself was till 1918 a parliamentary burgh. Other towns and villages are Aberfeldy, Abertay, Auchterarder, Birnam, Blair-Atholl, Blairgowrie, Callander, Comrie, Coupar-Angus, Crieff, Doune, Dunblane, Dunkeld, Pitlochry, Scone, and Stanley. The Roman camp at Ardoch is a famous antiquity; and Perthshire contains the battlefields of Methven, Tippermuir, Killiecrankie, and Sheriffmuir; whilst it possesses memories of Bruce, Gavin Douglas, Queen Mary, Rob Roy, Burns, Scott, Lady Nairne, and Wordsworth. The mansions, which are very numerous, include Taymouth (now a hotel), Drummond, and Blair castles. Pop. (1801) 125,583; (1831) 142,166; (1881) 129,007; (1901) 123,283; (1921) 125,515, 5 per cent. Gaelic-speaking.

See separate articles on many of the above-named places; also works by Drummond (1879), Marshall (1880), Hunter (1883), and Millar (1890).

Pertinax, **HELVIVS**, Roman emperor, was born, according to Dio Cassius, at Alba-Pompeia, a Roman colony of Liguria, August 1, 126 A.D. He received a good education, and, entering the military service, rose through the various grades till he obtained the command of the first legion, at the head of which he signalled himself in Rhetia and Noricum against the native tribes. In 179 he was chosen consul, aided to repress the revolt of Avitus in Syria, and was governor successively of the provinces of Mœsia, Dacia, and Syria. The Emperor Commodus sent him to take the command of the turbulent legions in Britain, who against his will proclaimed him emperor; thereupon he solicited to be recalled, and was appointed pro-consul of Africa, prefect of Rome, and consul (a second time) in 192. On the death of Commodus his assassins almost forced Pertinax to accept of the purple, which with great

hesitation he did; but, in spite of his promise of a large donation, he was unable to gain over the prætorian guard. His accession was, however, hailed with delight by the senate and people, who were rejoiced to have as ruler an able captain instead of a ferocious debauchee; and Pertinax, encouraged by this favourable reception, announced his intention of carrying out an extensive series of reforms, having reference chiefly to the army, in which he hoped to re-establish the ancient Roman discipline. Unfortunately for his reforms and himself, he was attacked by a band of the rebellious prætorians, two months and twenty-seven days after his accession, and, disdaining to flee, was slain, and his head carried about the streets of Rome in triumph.

Perturbations, in Physical Astronomy, are the disturbances produced in the simple elliptic motion of one heavenly body about another by the action of a third body, or by the non-sphericity of the principal body. Thus, for instance, were there no bodies in space except the earth and moon, the moon would describe accurately an ellipse about the earth's centre as focus, and its radius-vector would pass over equal areas in equal times; but only if both bodies were homogeneous and truly spherical, or had their constituent matter otherwise so arranged that they might attract each other as if each were collected at some definite point of its mass. The oblateness of the earth's figure, therefore, produces perturbations in what would otherwise be the fixed elliptic orbit of the moon. Again, when we consider the sun's action it is obvious that in no position of the moon can the sun act equally upon both earth and moon; for at new moon the moon is nearer to the sun than the earth is, and is therefore more attracted (in proportion to its mass) than the earth—i.e. the *difference* of the sun's actions on the earth and moon is equivalent to a force tending to draw the moon away from the earth. At full moon, on the other hand, the earth (in proportion to its mass) is more attracted than the moon is by the sun; and the perturbing influence of the sun is again of the nature of a force tending to separate the earth and moon. About the quarters, again, the sun's attraction (mass for mass) is nearly the same in amount on the earth and moon, but the *direction* of its action is not the same on the two bodies, and it is easy to see that in this case the perturbing force tends to bring the earth and moon nearer to each other. For any given position of the moon, with reference to the earth and sun, the *difference* of the accelerating effects of the sun on the earth and moon is a disturbing force; and it is to this that the perturbations of the moon's orbit, which are the most important, and amongst the most considerable, in the solar system, are due. See MOON, PLANETS, &c.

Peru (Span. *República del Perú*), a republic of South America, which, before annexations by Chile (Tarapacá permanently; Tacna and Arica conditionally) after the war of 1879–81, stretched southward to 22° 10', with a length along the Pacific coast of 1400 miles, and a width of 300 miles. It borders on the Pacific, Ecuador, Colombia, Brazil, Bolivia, and Chile. The area is roughly estimated at 700,000 sq. m. There has been no census since 1876, but the population (believed to be stationary owing to infant mortality and other causes) was in 1896 stated at about 4,600,000; the aboriginal Inca Indians forming 57 per cent., the *Mestizos* or half-castes 23 per cent., and the people of pure Spanish descent, negroes, Chinese, &c., 20 per cent. Peru is still the country of the Inca people.

Surface of the Country.—The surface of Peru is extremely varied. It is divided longitudinally into

three well-marked regions. (1) The *Coast* extends from the base of the Andes to the Pacific Ocean, and consists of a sandy desert crossed at intervals by rivers, along the banks of which there are fertile valleys. (2) The *Sierra*, or region of the Andes, about 250 miles wide, contains stupendous chains of mountains, elevated plains and tablelands, warm and fertile valleys and ravines. (3) The *Montaña*, skirting the eastern slopes of the Andes, is the third region. It consists of tropical forests traversed by great tributaries of the Amazon. The coast region has been upraised from the ocean at no very remote period. The absence of rain on this strip of land between the mountains and the sea is caused by the action of the lofty uplands of the Andes on the trade-wind. Reaching the snow-capped summits the last particle of moisture is wrung out of the wind that the very low temperature can extract, and it rushes down to the Pacific coast, cool and dry. Its moisture is deposited as snow on the tops of the cordillera, and feeds the mountain-streams which flow down to irrigate the coast-valleys. From November to April there is usually constant dryness on the coast, from June to September the sky is obscured for weeks by mist, sometimes accompanied by drizzling rain. The maximum temperature is about 78° in summer and 60° in winter. When it is hottest and driest on the coast it is raining heavily in the Andes, and the rivers are full. When the rivers are lowest mists and *garuas* or drizzling rains prevail on the coast. The deserts are divided from each other by forty valleys of great fertility, and the cultivable area on the coast might be considerably extended by irrigation. The coast has few protected anchorages, and the headlands are generally abrupt and lofty. This region is subject to frequent and severe earthquakes, the most destructive in modern times having been that of 1868, which nearly destroyed Arequipa and Arica, and that of 1877. Since 1570 there have been about a hundred destructive earthquakes recorded on the west coast of South America.

The Peruvian Andes contain peaks attaining heights of 21,000 and 22,000 feet; but they have never been measured with scientific accuracy. The mountain-system consists of three chains or *cordilleras*. Two of these chains, running parallel and near each other, are of identical origin. The western one is the maritime cordillera and comprises the volcanoes. The eastern cordillera is a magnificent and almost continuous range, in great part of Silurian formation, with clay-slates and eruptive granitic rocks. The western cordillera is cut through by several streams which flow into the Pacific, and the eastern cordillera by six tributaries of the Amazon, but the central chain is an unbroken water-parting. It consists mainly of crystalline and volcanic rocks, on each side of which are strata of aqueous, in great part of Jurassic, rocks. The valleys and plateaus between these ranges form the *Sierra* of Peru, and include every variety of climate and scenery. They may be divided, from a geographical point of view, into four sections, commencing from the north. The first, 350 miles long by 100 broad, comprises the upper basins of the Marañón and Huallaga. The second extends for 200 miles from Cerro Pasco to Ayacucho, including the lake of Chinchay-cocha and the valley of Jauja. The third extends for 250 miles to the knot of Vilcañota, comprising the upper valleys of the Apurímac, the Vilcamayu, and the Pancartambo. Here is Cuzco, the capital of the Incas, the centre and heart of Peru. The fourth section is the basin of Lake Titicaca, about 150 miles in length and breadth. The lake itself is 80 miles long, and 12,545 feet above the level of the sea. A number of rivers, which are of con-

siderable volume during the rainy season, fall into it, and it is drained by the Desaguadero flowing out of the south-west angle. But a great proportion of the water is also taken up by evaporation, and the waters are gradually receding. The Sierra of Peru is the original home of the potato. Its lofty heights also produce several other edible roots and the grain called *quinoa* (*Chenopodium Quinoa*), while splendid crops of maize are grown in the valleys. The animals which specially belong to the Peruvian Sierra are the domestic llamas and alpacas, and the wild vicuñas. The llamas were the beasts of burden in the time of the Incas, each carrying a weight of about 100 lb. Alpacas have always been prized for their long and soft wool, and are tended with great care, being kept in large flocks. The other animals of the Peruvian Sierra are the *taruco* or deer, two rodents called *viscachas* and *chinchilla*, a native dog, and a fox. The largest bird is the condor, and there is another bird of the vulture tribe called *alcornari*. Partridges, called *yutu*, and plovers are met with on the lofty plateaus. The large and handsome geese called *huachra* and *huallata*, several ducks, a gull, flamingoes, and other wading-birds frequent Lake Titicaca and the banks of the rivers. In the valleys there are many kinds of finches, and a green parakeet has been seen at a height of 12,000 feet above the sea.

The *Montaña* is the region of tropical forests within the basin of the river Amazon, including the wooded slopes of the eastern watershed of the Andes, which may be called the subtropical portion of the *Montaña*. This part of Peru is traversed by great navigable rivers. Here the Marañón and Huallaga, after separate courses of 600 and 400 miles respectively, unite and flow eastward to the Brazilian frontier. At 150 miles from their point of junction they are increased by the waters of the Ucayali, a great navigable river with a course of 600 miles. The forests drained by the Marañón, Huallaga, and Ucayali form the northern portion of the Peruvian *Montaña*. The southern half is watered by streams flowing down from the eastern Andes in the Sierra sections of Cuzco and Titicaca, and forming the Madre de Dios, a great tributary of the Bolivian river Beni. The whole length of the Peruvian *Montaña*, from the Marañón to the Bolivian frontier, is 800 miles. In the subtropical portion, comprising the eastern slopes of the Andes, which sometimes extend for a distance of 60 or 80 miles before they subside into the Amazonian plain, there are very important products. This is the region of the quinine-yielding cinchona-trees, and of the coca (*Erythroxylon Coca*), and here coffee and cacao of the finest quality are cultivated. From the forest-covered plains come india-rubber, sarsaparilla, and a great variety of useful and ornamental timber. The *fauna* of the forests is naturally much more numerous and varied than that of the Sierra. Here are the silver-gray monkey, the largest in South America, and other species. Bats of several kinds are numerous, and there are flocks of coatis. The Andean bear, called *ucumari*, is found on the upper borders of the forests. The puma also roams over the higher slopes, where he has an almost undisputed hunting-ground. Lower down there are jaguars, and several kinds of wild cats. Squirrels and other rodents swarm, and the heavy tapir, called *danta* or *gran bestia*, reposes in the soft marshy lands. Deer frequent the open ground, and herds of peccaries traverse the forests. The chief game-bird is the large black curassow, and there are several pigeons. Spoonbills, ibis, cranes, snipe, and curlew frequent the lagoons, while parrots, toucans, and other birds of bright plumage are innumerable. Snakes abound among the dense

underwood, frogs raise their far-sounding voices through the night, and insects swarm in myriads.

Productions and Commerce.—The chief crops of the fertile coast valleys are sugar, cotton, and grapes. Peruvian cotton is chiefly grown in the valleys of Piura and Ica, and is a perennial. The vine has been a profitable industry ever since the Spanish conquest, in several valleys on the coast, and also in the Sierra. Good wine is made at Pisco and Ica, and also a famous spirit from the grape, called *Pisco* and *Italia*. There are also grown cinchona, coca, and other medicinal plants. Rice of excellent quality is raised in the coast-valley of Lambayeque. Olives are grown in the Tambo valley near Arequipa. The rocky islets and barren deserts of the coast were once a source of enormous wealth to Peru, and some Guano (q.v.) is still got. Petroleum has become the chief mineral product. It is worked in the extreme north, but occurs elsewhere, as about Lake Titicaca.

The staple exports of the Sierra of Peru are copper, silver, and wool. The mines extend along the whole length of the cordilleras, and are worked here and there, the great centre of mining industry being at Cerro Pasco. Other minerals are gold, vanadium (of which Peru is the chief source), coal and iron (not much worked), mercury, bismuth, and borax.

From the Montaña the exported products are cinchona bark, coca, coffee of the finest quality, cacao, tobacco, india-rubber, sarsaparilla and some other medicinal roots. Rubber is sent down the Amazon from Iquitos. The atrocities of the trade in the Putumayo district were notorious in 1908-13. Plantations are now superseding the collection of wild rubber. Other Peruvian products are tobacco, maize, wheat, fruits, balata, and castor-oil.

Public Works.—The system of railways consists of a dozen short lines in the coast-valleys—varying in length from 80 to 20 miles, constructed to bring the produce down to the seaports—and of two long lines across the Andes. The first of these, from Callao and Lima to Oroya, in the lofty valley of Jauja, was begun in 1870. It threads the intricate gorges of the Andes by a winding path along the edges of precipices, through tunnels, and over bridges that seem suspended in the air. It tunnels the Andes at an altitude of 15,645 feet, and the bridge of Verrugas (q.v.), 250 feet high, spans a chasm 580 feet wide. Oruro is the junction for Huancayo and Cerro de Pasco. The other line across the Andes runs from the port of Mollendo by Arequipa to Juliaca and Cuzco, while from Juliaca a branch goes to Puno on the shores of Lake Titicaca. The summit is crossed at a height of 14,660 feet. In 1874 steamers were first launched on Lake Titicaca. To supply the port of Mollendo with water, a pipe was laid alongside the line from Arequipa for 85 miles, discharging 433,000 gallons in twenty-four hours—one of the longest iron aqueducts in the world.

The People.—The bulk of the Peruvian population is composed of the aboriginal Inca Indians, whose language, called Quichua, is still spoken in the Sierra. The Incas had attained to a high state of civilisation before the arrival of the Spaniards. They cultivated many of the arts, and had some knowledge of astronomy. They had domesticated the llama and alpaca, had brought under cultivation maize and quinoa, potatoes and many other edible tubers, understood mining and the working of metals, and excelled as masons, weavers, potters, and farmers. They brought the science of government to a high pitch of perfection. The Incas composed songs and dramas; and as soldiers their skill and prowess enabled them to conquer and consolidate a vast empire. Four centuries

of oppression under Spanish rule have debased the character of the Inca Indian, but he is still industrious and honest, and retains some of the virtues of his ancestors. The wild Indians of the Montaña were never subjugated by the Spaniards. Spanish administration caused a rapid diminution of the population. The Indians of the coast-valleys disappeared altogether. Negro slaves were then introduced to cultivate the estates in these valleys, and this system continued during Spanish colonial rule, and until 1855, when slavery was abolished.

Church and Education.—The constitution of 1920 declares absolute religious liberty, the state religion being Roman Catholic. When the Spaniards conquered Peru the Catholic religion was enforced on all natives, and a determined attempt was made to crush out the modes of thought, traditions, and culture of the Inca civilisation, and to substitute new ideas and beliefs. This destructive system was resolute and well organised, and was in great part successful. Education and literature were in the hands of an intolerant priesthood. The cruel Friar Valverde was made Bishop of Cuzco in 1534. The archbishopric of Lima was created in 1541, the bishoprics of Guamanga, Arequipa, and Trujillo were added in 1612 and 1614, and others later. Swarms of clerics followed the bishops, numerous monasteries were founded, and an inquisitorial system of catechising and punishing penetrated into every village and hamlet in the land. Schools were established in the towns for the education of young Spaniards and half-castes; and the university of San Marcos at Lima, the most ancient in the New World, was founded in 1551. It had professorial chairs of medicine, philosophy, rhetoric, Latin, mathematics, divinity, and for a short time of Quichua. The college of San Carlos at Lima, which still flourishes, was founded in 1770, and the school of medicine was established in 1792. At Cuzco the university of San Antonio Abad was founded in 1598, and the viceroy, Prince of Esquilache, also endowed the college of San Borja there, for the education of noble Indians. At Arequipa the college of San Jerónimo was founded in 1616, for teaching Latin and theology, and similar colleges were founded at Trujillo in 1621 and at Guamanga in 1680. There are now four universities: Lima, Cuzco, Arequipa (1827), and Trujillo. Education is (nominally) compulsory for both sexes and is free in the municipal public schools, yet but a fraction of the population has attended any school. Peru can make a respectable show in literature. In recent times it has produced José Santos Chocano and José María Eguren.

Constitution.—Under the constitution of 1920 Peru has a president elected for five years and re-eligible for a second term; a senate of 35 members and a house of representatives of 110 members, both directly elected by male citizens for five years.

History.—From very ancient times there were agricultural communities in the Sierra of Peru, gradually advancing in the arts of government and of peace, and there were people of a different race in the coast-valleys, who were also civilised. The plants they had brought under cultivation, and the animals they had domesticated, are among the proofs of the great antiquity of Peruvian civilisation. Eventually all the different communities were united under one empire, and the Incas, in the course of some five centuries, developed a highly centralised system of government. Civilisation never attained to such a height among any other of the indigenous races of America. The Incas attempted the administration of a purely socialistic government, and their attempt was successful. The great Inca Huayna Capac died, after a long and prosperous reign, at

about the time when Pizarro first visited Tumbes. On his death there was a war of succession between his two sons, which had just terminated in favour of Atahualpa when Pizarro (q.v.) landed a second time and marched into the interior. Peru was soon overrun by the Spaniards, and the beneficent rule of the Incas came to an end. At about the time of the assassination of Pizarro the representations of Las Casas (q.v.) respecting the cruel treatment of the Indians had obtained a hearing, and the 'New Laws' were promulgated. The grants conceded to the conquerors were not to be hereditary, all men who had been engaged in civil wars were to be deprived, and personal service from Indians was forbidden. Blasco Nuñez Vela was sent out to Peru as viceroy to enforce these reforms. He landed in 1544, and proclaimed the 'New Laws.' The Spanish conquerors were thrown into a state of exasperation and dismay, and appealed to Gonzalo Pizarro (q.v.) to leave his retirement and protect their interests. The result was that the viceroy was defeated and killed, and Gonzalo virtually became governor of Peru. But he was not recognised by the Spanish government, and an ecclesiastic named Pedro de la Gasca was despatched to Peru, with a commission to restore order. Gonzalo Pizarro was defeated near Cuzco, and beheaded on the battlefield. Gasca reversed the humane legislation advocated by Las Casas, and made a hasty distribution of grants to his followers. The announcement of his awards caused much discontent, but Gasca hurriedly sailed for Spain in January 1550, leaving the country in a most unsettled state, in the hands of the four judges who were his colleagues. He had arranged that the emperor's decree against forced labour should be promulgated after he was safe out of the country. This gave rise to a formidable rebellion, led by Francisco Hernandez Giron. The judges made head against it, but it was not put down until two pitched battles had been fought, and Giron had been beheaded at Lima in December 1554.

The Marquis of Cañete arrived as viceroy of Peru in May 1555. His policy was to employ the unquiet spirits among the Spanish settlers on expeditions of discovery into unknown regions, and to treat the natives with liberality and justice. During the five years of his government he restored order among the conquerors, and established the heir to the Incas in a dignified retirement. But it was Don Francisco de Toledo, the viceroy from 1569 to 1580, whose legislation finally fixed the colonial policy of Spain in this part of the New World. He reversed the kindly treatment of the ancient dynasty which had distinguished the Marquis of Cañete, and unjustly beheaded young Tupac Amaru, the last of the Incas, at Cuzco in 1571. At the same time he wisely based his legislation on the system of the Incas. His elaborate code, called the '*Libro de Tasas*,' was the textbook of all future viceroys. He fixed the amount of tribute to be paid by the Indians, exempting all males under the age of eighteen and over that of fifty. He recognised the position of the native chiefs, assigning them magisterial functions, and the duty of collecting the taxes and paying the money to the Spanish officials. But he enacted that one-seventh part of the population of every village should be subject to forced labour, generally in the mines. This was called the *Mita* system.

It was the habitual infraction of the rules established by Toledo, and the abuse of the *Mita*, which caused all the subsequent misery and the depopulation of the country. Compliance with the continual demand for treasure from Spain, a demand which was insatiable, was incompatible with humane treatment of the people. For more than

two centuries the people of Peru toiled and died. At length their sufferings became intolerable. They rose as one man in the autumn of 1780, and a descendant of the Incas, taking the revered name of Tupac Amaru, placed himself at their head. After a long and formidable resistance the insurgents were finally subdued, and their leader was put to death under circumstances of revolting cruelty. But he did not die in vain. In his fall he shook the colonial power of Spain to its foundation. From the cruel death of the Inca Tupac Amaru may be dated the rise of that feeling which ended in the expulsion of the Spaniards from South America. Some of the demands of the Inca were conceded soon after his death. He was the foremost pioneer of the independence of Peru. The desire for liberty among Peruvians of Spanish descent had its birth in Lima; but Lima was the residence of the viceroy. Here the power of Spain was concentrated. Consequently it was in the more distant colonies of Buenos Aires, Caracas, and Chile that insurrectionary movements first broke out and that independence was first secured.

At length a fleet under Lord Cochrane (see DUNDONALD), equipped in Chile, brought the Argentine General San Martín to Peru with troops, and the independence of the land of the Incas was proclaimed at Lima on the 28th of July 1821. Another liberating force, from Colombia, under General Bolívar, embarked at Guayaquil, and when the Liberator arrived at Lima, in September 1823, San Martín retired. The Spanish viceroy, La Serna, with his army, retreated into the interior, and the patriots followed on his heels. On 9th December 1824 the decisive battle of Ayacucho was fought, the Spanish viceroy and all his officers were made prisoners, and the colonial government finally gave place to a free republic. Bolívar and his Colombians left the country in 1826, but it was eighteen years before the government became settled. In August 1829 General Gamarra, a native of Cuzco and a hero of Ayacucho, was elected president of Peru, but at the end of his term of office there were troubles which culminated in an attempt to form a Peruvian-Bolivian Confederation under General Santa Cruz. This was defeated by Peruvian malcontents, aided by a Chilean army, the cause of Santa Cruz and his confederation having been ruined after the decisive battle of Yungay on 20th January 1839. Gamarra again became president, the confederation was dissolved, and a constitution was proclaimed. But Gamarra fell in a deplorable war with Bolivia, and the contentions of his officers caused a succession of civil wars until 1844.

At length a man arose who restored peace to the distracted country. Ramón Castilla was a native of Tarapacá, and was a veteran of Ayacucho. He was brave as a lion, prompt in action, and beloved by his men. His firm grasp of power secured a long period of peace. He was elected constitutional president of Peru in 1844, and ten years of peace followed. Castilla commenced the payment of interest on the foreign debt in 1849. A revised constitution was promulgated in 1856, and the slaves were emancipated. Castilla retired from office in 1862, and died in 1866. The next important event was the election of Colonel Balta. This president held office from 1868 to 1872, during which time public works were undertaken on a gigantic scale with the aid of foreign loans. Don Manuel Pardo, a scholar and a man of letters as well as a statesman, was the first civilian president. He held office from 1872 to 1876, and inaugurated a policy of retrenchment. But it was too late to save the credit of the state, and the payments of interest on the loans ceased in 1876. Pardo reduced the army, regulated Chinese immigration, promoted the exploration of navigable rivers in

the Montaña, organised an efficient plan for the collection of statistics, and actively encouraged literature and education. He was the best president Peru had ever known, and in August 1876 he was peacefully succeeded by General Prado.

In 1879 Peru was confronted with the overwhelming misfortune of a Chilean invasion. Chile coveted the nitrate deposits in the Peruvian coast province of Tarapacá. A successful defence of Peru depends on the mastery of the sea. Peru had two old-fashioned ironclads. Chile had two new ones. One of the Peruvian ships was wrecked. The other, commanded by the heroic Admiral Grau, a native of Piura, was captured, after a most gallant defence, maintained against the combined attack from the two Chilean ships. On the 8th October 1879 he and nearly all his officers fell in defence of the *Hudscar*, the ship on which the fate of their country depended. Tarapacá was occupied after the loss of two well-contested battles. In 1880 the battle of Tacna sealed the fate of that department; and, after the two desperate battles of Chorrillos and Miraflores in 1881, Lima itself was occupied. Public works were demolished and private estates devastated along the coast, and in Lima the valuable public library was destroyed. General Cáceres still kept up a resistance in the interior.

In 1883 the Chileans induced one of the Peruvian leaders, Iglesias, to submit to their terms. In October he signed a treaty of peace and was allowed to enter Lima. Tarapacá was ceded to Chile; Tacna and Arica were to be held by Chile for ten years, after which a popular vote should decide their fate, the country chosen paying the other \$10,000,000; and there were some articles, favourable to Chile, respecting the guano-deposits. The Chileans evacuated Peru in August 1884, and their nominee, Iglesias, followed them in December 1885. On 3d June 1886 General Cáceres, who had gallantly defended his country against the Chileans from first to last, became constitutional president of Peru. His policy was retrenchment and the protection of the Indian population. Payment of interest of the foreign debt had become impossible. But a scheme was arranged in 1890 by which the foreign bondholders formed a company to receive all the railways for a term of sixty-six years (since extended), with mining, and other privileges. In return the company is to complete the railway system, and cancel the debt through the profits. Peru was slowly recovering from the disastrous effects of a great calamity, when in 1894-95 another insurrection broke out, and a new government was established. Negotiations as to the method of voting for or against the retrocession of Tacna and Arica fell through. Constitutional reforms followed a revolution in 1919. The long-standing dispute with Chile was submitted to President Coolidge's arbitration in 1922. In 1925 he gave his award. The Chileans had not wilfully prevented the holding of the plebiscite, nor had their administration made a fair plebiscite impossible. The river Sama was the northern boundary of the area, the province of Tarata being unquestionably Peruvian. General Pershing and representatives of both countries were appointed to supervise the plebiscite, but found it impossible to carry out owing to the kidnapping and assassination of voters by the Chileans.

For the history of the Incas and their civilisation, see the works of Cieza de Leon, Molina, Balboa, Garcilaso de la Vega, Montesinos, and Acosta, all, except Montesinos, translated into English for the Hakluyt Society; also Rivero's *Antigüedades Peruanas* (with Von Tschudi, Wien, 1851), of which an English translation appeared at New York, Joyce's *South American Archeology* (1912), Bingham's *Inca Land* (1923), Lehmann and Doering's *Art of Old Peru* (trans. 1923); and the histories of

Robertson, Prescott, Helps, Winsor (vol. i.), and Markham (1892, 1910), and the travels of D'Orbigny, Squier, Wiener, and Reiss and Stübel. For the Conquest, see, besides Robertson, Prescott, and Helps, the narrative of Xeres, Pizarro's secretary (Eng. trans. Hakluyt Soc.), and the writings of Herrera, Gomara, Zarate, Pedro, Pizarro, and Fernandez. For the period of the viceroys, see Figueroa's *Life of the Marquis of Cañete*, the *Chronicle of Culancha*, and the *Memorias de los Virreyes*; also the works of Don Ricardo Palma, published at Lima, and Saldamando's *History of the Jesuits in Peru*. The documents relating to the great rebellion of Tupac Amaru were published by Angelis at Buenos Aires, and there are further particulars in the work of Dean Funes; see also Weddell's *Voyage dans le Nord de Bolivie*, and Markham's *Travels in Peru and India* (1862). For the war of independence, see works by Stevenson, the Chilean author Vicuña Mackenna, General García Camba, the Memoirs of General Miller (Lond. 1828), the Autobiography of the Earl of Dundonald, and the great biographical work of General Mendiburu; for the war with Chile, narratives from the Chilean point of view by Barros-Arana and Mackenna, and from the Peruvian by Paz-Soldán, and Markham's *History of the War between Peru and Chili* (1888). For the geography, the *Geografía del Peru*, by Paz-Soldán, and the 3 vols. on Peru by Raimondi are important works. See also Von Tschudi's *Kechua Sprache* (1853), Markham's *Quichua Grammar and Dictionary* (1863), Middendorff, *Die einheimischen Sprachen Perus* (1890 et seq.).

Peru. (1) a city of Illinois, at the head of navigation on the Illinois River, 100 miles by rail WSW. of Chicago. It has zinc-works, and makes ploughs and ice. Pop. 9000.—(2) Capital of Miami county, Indiana, on the Wabash River, and on the Wabash and Erie Canal, 75 miles by rail N. of Indianapolis. Pop. 12,000.

Perugia, a city of Italy, stands (1617 feet above sea-level) on the right bank of the Tiber, 11 miles E. of the Lago Trasimeno (anc. *Lacus Trasimenus*) and 127 miles by rail N. of Rome. It is surrounded by mediæval walls, which in part coincide with and in part extend beyond the ancient Etruscan enceinte, several of the gates of which still exist, notably the so-called Arcodi Augusto. The broad Corso, which contains the handsomest edifices, unites two squares, in one of which stands the Gothic cathedral of St Lawrence, dating from the 14th and 15th centuries, and adorned with many works of art. The church of St Dominic (1632) contains the tomb of Pope Benedict XI. (author unknown) and a magnificent stained-glass window (1411-59); the remarkable church of St Peter (11th century) has granite pillars, and pictures by Perugino, &c., and other works of art; these are only two out of several noteworthy churches. In the cathedral square stand also the Gothic municipal palace (1281-1443), with the valuable art gallery, especially rich in productions of the Umbrian school; the great fountain, adorned with statues by Niccolò and Giovanni Pisano; the statue of Pope Julius III. (1555); and the old money-changers' hall (1452-57), decorated with some of Perugino's best works. In the vicinity of the city a number of Etruscan tombs were discovered in 1840; they contained cinerary urns, lamps, vases, bronze armour, ornaments, &c. The tomb of the Volturni (3d century B.C.) is interesting. The university (1307) has a botanical garden, an observatory, a valuable antiquarian museum, and a library (1852) of 30,000 vols. There is also an academy of fine arts, with an art school. Silk and woollen goods, wax-candles, chocolate, and liqueurs are manufactured. Pop. (1921) 72,998. Perugia, the ancient *Perusia*, was one of the twelve Etrurian republican cities. It was besieged and captured by the Romans in 310 B.C., and again in 40 B.C., and by Totila (549). At different periods during the next thirteen centuries it was subjected to the popes, especially after the middle of the 16th cen-

tury; at other times it was independent, though in the power of native despots. In the 15th century it became the centre of the Umbrian school of painting. See *The Story of Perugia*, by Miss Symonds and Miss Duff Gordon (1898), and Cruickshank's *Umbrian Towns* (1901).

Perugia, LAKE OF. See TRASIMENE LAKE.

Perugino, a celebrated Italian painter, whose real name was PIETRO VANNUCCI, was born at Citta della Pieve in Umbria, in 1446, but established himself in the neighbouring city of Perugia (see G. C. Williamson's *Perugino*, 1900). He executed important works, no longer extant, at Florence, Perugia (1475), and Cerqueto (1478). At Rome, whither he went about 1483, Sixtus IV. employed him in the Sistine Chapel; his fresco of 'Christ giving the Keys to Peter' is the best of those still visible—others by him being destroyed to make way for Michelangelo's 'Last Judgment.' During his next sojourn at Florence (1486–99) he had Raphael for his pupil. Here he was fined for waylaying and assaulting a citizen, and became somewhat too fond of money, repeating his works and leaving much of the execution to pupils. At Perugia (1499–1504) he adorned the Hall of the Cambio, with the assistance of Raphael and other pupils; but after 1500 his art visibly declined. In his second Roman sojourn (1507–12) he also, along with other painters, decorated the Stanze of the Vatican; and one of his works there, the Stanza del Incendio, was the only fresco spared when Raphael was commissioned to substitute his works for those formerly painted on the walls and ceilings. The new school, with Leonardo da Vinci, Michelangelo, and Raphael, was now in the ascendant, and Perugino's popularity waned. He was again at Perugia in 1512, and painted a number of pictures there. He was painting frescoes in a church at Castello di Fontignano, near Perugia (one of which frescoes is now at South Kensington), when he was seized by the plague, of which he died in 1524.

Perugino's art was religious, though he is said by Vasari (biased in all regards by Michelangelo's contempt for Perugino) to have been an open disbeliever in the immortality of the soul. In his figures, very unequally drawn, there is a peculiar tenderness of expression verging on mawkishness; his execution was delicate, his colour admirable. But he is not remarkable for originality or intensity.

Peruvian Bark. See CINCHONA.

Peruvian Gooseberry. See WINTER-CHERRY.

Pervigilium Veneris, a Latin poem of singular beauty, with the irregularly recurring refrain 'Cras amet qui nunquam amavit, quique amavit cras amet.' Author and date are unknown—perhaps 1st century A.D., perhaps 5th. Translated into English by Thomas Stanley and by Thomas Parnell, it has been edited by Bücheler (1859), Clementi, Dobson, Mackail, Fort (1922), and Postgate (1924), the four last with translations.

Pes'aro (the ancient *Pisaurum*), a town of Italy, stands on the right bank of the Foglia, here crossed by an ancient bridge, 1 mile from the Adriatic and 37 miles NW. of Ancona by rail. Its streets are broad, and adorned with palaces and churches, and the town is surrounded with walls and defended by a citadel (1474) and a fort. It is a bishop's seat; there are two cathedrals, one new, the other old. Silks, pottery, iron, and leather are manufactured; and an active trade is carried on in these goods and in wine, olive-oil, and fruits. Pop. 30,000. The city is associated in literary history with the name of Tasso, some of his MSS. being preserved in one of the town museums; it is

also the birthplace of the composer Rossini. Made a Roman colony in 184 B.C., it was destroyed by the Goths; then, having been rebuilt by Belisarius, it became one of the cities of the Pentapolis. From 755 to 1285 it belonged to the popes, then to the Malatestas till 1445, then to the Sforzas (who built the fine Villa Imperiale, outside the town) and Della Roveres, in 1631 again to the popes, and finally in 1860 to Italy.

Pescadores Islands. See FORMOSA.

Peschiera, on the site of the ancient Arilica, a fortress of Italy, a member of the Quadrilateral (q.v.), stands partly on an island in the Mincio and partly on the right bank of that river, at its outlet from the Lake of Garda, 14 miles by rail W. of Verona and 77 E. of Milan. The fortress played a prominent part in the warlike events which have taken place in North Italy, especially after the Napoleonic wars began down to 1859, but it is now without military value. Pop. 3000.

Peshawar, or PESHAWUR, a town of India, the capital of the North-west Frontier Province, 10½ miles from the entrance of the Khaiber Pass, 190 E. by S. of Kabul. Although occupying a strategic position of the utmost importance, its only defences are a wall and a small fort; but 2 miles west of the city are cantonments. The population in 1921 was 104,452, including the cantonments. Peshawar is the seat of extensive commerce between Afghanistan and India; gold, silver, lace, hides (all four from Bokhara), horses, mules, fruits, woollen and skin coats (all five from Kabul) being exchanged for tea, English piece-goods, wheat, salt, rice, butter, oil-seeds, oil, and sugar.

Peshito (Syriac *pēshittā*, 'the simple'), the Syriac Vulgate. See BIBLE.

Peshwa. See MAHRATTAS.

Pessimism is the doctrine that on the whole the world is bad rather than good. It does not necessarily mean that the world is the worst possible of all conceivable worlds, as the fact of its being the verbal opposite to Optimism, the term employed to describe the Leibnitzian philosophy, would seem to imply; it means simply that the world is so bad that it would be better if it did not exist. Pessimism presents itself in a twofold aspect—(1) as a settled attitude of mind or permanent mood of feeling, and (2) as a philosophical system. The former springs out of the contemplation of the antagonism that exists in the world between natural laws and moral laws, between the world as it actually is and the world as it ought to be; it is the outcome of reflection, and is largely conditioned by individual temperament. Thus it is coeval with the dawn of conscious intelligence, and early found fit literary expression. The problem of the existence of evil, the connection between suffering and sin, is the burden of the ancient Hebrew Book of Job; and the Jewish thinker who wrote Ecclesiastes rings the changes upon the nothingness of life, and sums up his plaint in the hopeless refrain, 'Vanity of vanities, saith the Preacher, all is vanity.' Different forms of the same temper of mind are given utterance to with more or less of moral indignation in Innocent III.'s *De Misericordia Humanae Conditionis*, and the satirical works of Juvenal and Carlyle and others. The same 'world-sadness' (*Weltschmerz*), though expressed in more personal and passionate language, colours deeply the poetry of Omar Khayyam, Leopardi, Heine, and Byron; and the negation of the problem, 'Is life worth living?' forms an undercurrent in much of our best modern literature. But the pessimistic temper, culminating in the persuasion of the nothingness and vanity of human life, has had more than an individual expression; it has entered deeply

into the substance and structure of two of the world's greatest religious beliefs—viz. Christianity and Buddhism. The Christian is familiar with the doctrine that this earthly life is a vale of tears and woe, and that its pleasures and joys are illusory, being always accompanied with sin and suffering and evil, from which he can only escape by fixing his hopes upon a better life in the world to come. Buddha's practical teaching (see **BUDDHISM**) turns in great part upon the desire to escape from the sorrows of life and the deceptive illusions of existence (*maya*).

But here, in this latter point, the pessimistic mood assumes something of a philosophical character. It also enters, though principally as an unconscious element, into the philosophical doctrines of the Stoics and the Neoplatonists, in that they regarded man's sensual (sense) nature as opposed and inferior to his intellectual. The mediæval mystics (Eckhart) combined the religious with the philosophical tendencies of the mood that 'despiseth the earth,' but not in a conscious, deliberately philosophical fashion. But it is only in the most recent times that pessimism has been elaborated into a philosophy or complete theory, in the systems of Schopenhauer (q.v.) and his successor, E. von Hartmann (q.v.). Schopenhauer is generally considered to be the father of philosophical pessimism: he regards the world principle as an omnipotent, blindly struggling and striving Will, which is incapable of satisfying itself or of delivering itself from its eternal cyclic misery. Hartmann formulates as world principle the Unconscious, whose primal error, for which it eternally atones in the endless misery of the world, was its kindling—just as Schopenhauer's Will did—a light for itself in the brain, or the consciousness of organised life. Both philosophers build on the pain and misery and struggle which they see everywhere in the world, from chemical decomposition and stellar movement up through the endless struggle of organisms for existence to the acute suffering exhibited in the many forms of human passion, and chiefly of all in exalted passionate love or sexual desire (*Romeo and Juliet*, or *Kabale und Liebe* of Schiller); and to both all this is only the outward expression of the terrible, irrational, or non-logical cosmic agency. It is extremely difficult to state shortly the metaphysical grounds of pessimism; they are far from being merely superficial, and may be said to be rooted in the old antitheses between nature and man. Nature thwarts man at all points, and modern science has shown us what a small twig human life is on the great tree. Both Schopenhauer and Hartmann lay a firm hold on the fact (emphasised especially by Schopenhauer in opposition to Hegel and to theism) that not only the Idea or Logos must be used in replanning the world, but also Force, Impulse, Will, Strife. Thus in a sense they represent the substitution of the scientific or cosmic attitude towards the world for the merely introspective attitude of a Descartes or a 'common-sense' moralist. It is not, of course, in the least to be assumed that what we call 'naturalism,' as opposed to speculation or supernaturalism, leads to pessimism, mental and spiritual facts being just as ultimate as chemical protoplasm. The full force of pessimism lies in the assertion that all the ends and aims of life are illusory, that life, in fact, brings only illusion; the illusion of illusions being man's innate and inveterate belief that he is born to be happy and to have pleasure. There are here two main contentions: (1) All ends are illusory, even cosmic ends, for nothing is ever attained in the world, seeing that the essence of the world—that which holds it together—is strife and change. Pessimism, that is, really denies teleology, as Darwinism does, in the old sense of the term.

(2) In the case of the individual life there is excess of unhappiness and pain over happiness and pleasure. But there is no reason for despising the realisation of certain ends because there always arises a limitless number of new ends to be realised; of course we do not wish to limit the world process. Pessimism thus really comes to stake its case on the individual, which (let us say) to a certain extent we do immediately know. The natural man wants to fill infinity, to gratify all his desires, to embrace in himself all the ends of the world, and because he cannot do this, but even fails to get immediate ends gratified, he votes the world execrable. The pessimists in the end do not escape the all-embracing human standpoint of anthropomorphism, anxious though Schopenhauer is to avoid the errors of metaphysicians and 'transcendental idealism.' They examine man, and what they find to be true of man they predicate of the world: he 'measures' all things—is the microcosm. Still, we must concede that, if to man the world brings only illusion, it is a failure—for him. The central position, then, of pessimism inevitably comes to be that living beings have as matter of fact an excess of pain over pleasure.

To this position the psychologist answers: (1) That pleasure and pain are not things that can be balanced one against the other. Both are *degrees of feeling*, which, though itself a constant element of experience, is only one element; and what we do as matter of fact measure and are conscious of is the amount of change or transition in our feeling, there being of course no absolute measure of amount of pleasurable or painful feeling. (2) Even if by the help of memory and calculation, and observation and reflection (for there is really enormous difficulty in the matter), we allow ourselves to think of sums of pleasures and sums of pains (there are writers who say the phrases are the purest nonsense), yet no one standard of pleasurable or painfulness, no 'hedonistic calculus' or universal method of measuring pain against pleasure, can be fixed upon. (3) Even supposing we had an estimate of pleasures and pains, it is not psychologically legitimate to regard feeling of any kind as the *end* of action; it is only its relative and individual index or measure (i.e. whether normal or abnormal), while there are absolute measures of action in the ends or things accomplished. (4) There are actions which have a final value apart from their pleasurable character, although also as matter of fact the attainment of ends brings (as *accompaniment* and not as *end*) a feeling of immediate pleasure—e.g. the adaptation of the eye to a pleasing object or healthy muscular exercise in general. Schopenhauer went so far as to say that pleasure is only the absence of pain, pain alone being the positive and preponderating element in a sensitive consciousness. This is simply not true: pleasure—if we take the liberty of talking of pleasure as a thing—is as positive as pain is, and the strife which exists in all life is not necessarily painful.

If we ask the pessimist if there is any freedom or release from the 'bondage of man,' we are answered: (1) The light which the Unconscious Will has kindled for itself in the brain of man (pessimism has of course a pronouncedly naturalistic side) confers on us at least one advantage; employing this light, we may for brief moments pause, and survey with pity the awful slavery and strife of life. In a word, artistic perception, the insight into things of the man of genius, of the emancipated intellect, is freedom: art, asceticism, quietistic sympathy, is each the oasis and salvation in the howling wilderness of life. (2) While individual suicide is to be deprecated as the acme of the selfish assertion of the Will to be happy, it is to be hoped

that some day the human race will be educated enough to see the contemptible character of life, and, by a united act of enlightened will, will shake off life and throw the world back into its primeval state of innocence, ignorance, and mere potentiality, and thus become the 'saviour' of the world. There is a basis of moral perception in all this, but it is fantastical: it is the exaggerated statement of the intellectual conditions of salvation often stated in philosophy, as in Aristotle's 'life of contemplation,' the gods of Epicurus, and Spinoza's view of things 'in the light of eternity.' If we demur that it is, then, only the few who can be saved, we are told that the lot of life is one; my life is the same as that in the plant or the planet, and there is, as matters at present stand, not the least fear that the 'will to live' will die out with the death of my life in quietism, agnosticism, and mysticism.

To the metaphysic of pessimism we may also say: (1) That it is not necessary to have a theory of the world in order to make action possible: no one lives because he chooses to live, but because he must, and this apart from the question whether a theory of life is attainable or already attained. (2) That the value of life cannot be measured altogether by the expectations or equations of the individual as to his own happiness, and that therefore pessimism is overthrown with the rejection of empirical Hedonism or the theory of ethical conduct that makes happiness the end of life. (3) Pessimism has done good in showing up the illusions to which an acceptance of the Hedonistic or the Epicurean ethic leads in theory and practice; it might be held in fact to give a negative account of man's perfection as consisting not in happiness for happiness' sake, but in the pursuit of ends which are absolutely real, apart from man's desire or aversion to them: to the self-seeking self everything is foreign and negative, and also to the perfection-seeking self the ends of appetite and desire are illusory. The various forms of pessimism—the practical, the biological, the sociological, the poetical, are all of value as provisional accounts of the ethical end. The unconditioned sympathy with all forms of life inculcated in modern pessimism is a valuable contribution to ethical theory and history, although of course it is not exactly original to pessimism. (4) The world which Schopenhauer and Hartmann theoretically conceive of is a world which baffles the individual, because in the first instance it appears to them that the world is incomprehensible. Both, in fact, tend to erect our ignorance of the world into a positive principle—the Unconscious; but this is an old metaphysical fallacy. The world which the individual does know—i.e. the small sphere of it he knows—is not a sphere in which he cannot realise himself, but in Kantian language a moral kingdom; it will baffle him if he is only bent on his own happiness. Thus it has been indicated how in a sense the pessimists are not to be held down to an Epicurean theory of morals, although they take their start from that.

BIBLIOGRAPHY.—Schopenhauer's chief work is the *World as Will and Idea* (Eng. trans. 3 vols. 1883-86). His ethic is contained chiefly in the fourth book, on the *Assertion and Denial of the Will to Live*. The appendices contain many exceedingly readable and lucid presentations of the main points of his system, and so do many of the sections of the *Parerga und Paralipomena*, which have a high literary value. See translations of these in T. B. Saunders's 'Schopenhauer' series (1890 et seq.). Hartmann's views are expounded in *Philosophy of the Unconscious*, which is also translated into English (1884). An admirable short account of his system for the laic mind is that of Dr A. Drews (*Ed. v. Hartmann's Philosophie*, 1890). E. Wallace's account of pessimism in the *Westminster Review* (1876) is eminently instructive, and has chief reference to Hartmann. An introductory

treatise is also that of A. Taubert, *Der Pessimismus und seine Gegner* (1873). Sully's *Pessimism* (1877) is an admirable and careful psychological criticism of pessimism, and contains a good historical sketch. In it there is a list of pessimistic literature. As an introduction to pessimism some account of Leibniz's philosophy ought to be read, and after it Voltaire's vigorous and drastic criticism of the same in *Candide*; the latter will help one to understand what Schopenhauer meant when he called optimism a 'wicked and otiose shallow philosophy.' The religious aspect of pessimism is touched on in an essay in Seth and Haldane's *Essays in Philosophical Criticism* (1883), and also in Professor Tulloch's *Modern Theories* (1884).

Pestalozzi, JOHANN HEINRICH, educational theorist, was born at Zurich, 12th January 1746. Eccentric, quixotic, eager to be an adjuster of social wrongs from his youth, he sought to realise his aims through educating the young. He shares with Rousseau, whose *Emile* greatly influenced his mind, the honour of conceiving a method which is the corner-stone of all sound theories of primary education. From his day onward two ideas of education co-existed—the older one, applicable to the children of the classes; his, applicable to the children of the masses; the former being in many ways improved by an encroachment of the latter upon its traditional domain. Pestalozzi, living during the period of the French Revolution and the wars of Napoleon, found in his disturbed country, in the misery inflicted by war, opportunity for the display of self-sacrifice, devotion to the oppressed, and that unselfish love of the children of the very poor which especially distinguished him. Illiterate, ill-dressed, a bad speaker, and a bad manager, Pestalozzi was unfit for the everyday business of life, and all his undertakings resulted in practical failure, though rousing the admiration of Europe, and calling forth down to the present day in many countries, more especially in Germany, a crowd of disciples, who have carried out the principles of their master with great enthusiasm. Although he was totally unable to cope with the world, Pestalozzi's personality was instinct with a loving sensibility; he awoke men to a sense of responsibility to childhood, and ushered the 19th century upon the stage of history as the educational age *par excellence*.

His life is soon told. Believing justly in the moralising virtue of agricultural occupations and rural environment, he chose a farm upon which to dwell with his collected waifs and strays as a father among his own. The farm Neuhof, in the canton Aargau, stranded on a faulty domestic economy after a five years' struggle (1780). Pestalozzi withdrew then from practical life, to think out the educational problem. His *Evening Hours of a Hermit* was the first fruit of his meditations, and develops the following thoughts: before undertaking to educate man, learn to know him; the method whereby to educate man should be founded upon his own nature; in his nature are hidden the forces that draw out his faculties, exercise them; exercise, the instrument of education, connects the wants of our nature with the objects that satisfy them; to rejoice in the fullness of your strength, make your education answer to your needs and to the inner call of your soul. Then came a social novel, *Leonard and Gertrude*, in four volumes. The former is a drunken stone-mason, the latter his wife, and a good one; the scene, a village given over to corruption. At last the minister, the schoolmaster, Gertrude with a few peasant-women, set about the reform of the village. This story created much attention, and was followed by a long period of literary activity on the part of its author. In 1798 he plunged into action again by opening his orphan school at Stanz. The picture he there makes of a moneyless, helpless, homeless lover of children,

gathering homeless, helpless children around him in an old convent in a township ruined by war, and set upon by a hostile and ignorant peasantry, is a noble and pathetic picture. But times and men proved too hard for Pestalozzi. At the end of eight months this establishment was broken up.

He next wended his steps to the people's school at Berthoud (Burgdorf), in canton Bern, only to be ejected from his subordinate position there, at the age of fifty-five, by the jealous and bigoted senior master. He knew then the bitterest pangs of poverty, and had even to keep away from church for want of clothes. In partnership with others, and under the patronage of the Swiss government, he opened an experimental school of his own at Berthoud. While there he published *How Gertrude Educates her Children*. Germany greedily devoured the book. It is the recognised exposition of the Pestalozzian method, and sets forth that the development of human nature should be in dependence upon natural laws, with which it is the business of every good education to comply; in order to establish a good teaching method, learn first to understand nature, its general processes in man, and its particular processes in each individual; observation, the result of which is a spontaneous perception (intuition) of things, is the method by which all objects of knowledge are brought home to us. This last affirmation, containing in essence the whole theory of so-called *intuitive* education, is the corner-stone of the German Volksschule ('folk-school'), the guiding principle of numberless books written for children, and the subject of numberless treatises on education.

In 1805 Pestalozzi moved his school to Yverdon, which here drew upon him the eyes of all Europe; in spite, however, of this his greatest moment of popularity and promise of worldly success, he entered upon a course of mistakes that led him to the grave, a disappointed and unsuccessful man. Deviating from the field of primary teaching, he applied his method in a large secondary school for the sons of notable Europeans attracted by his fame. His old incapacity in practical affairs brought the school down step by step till it was closed in 1825, and Pestalozzi, aged eighty, distracted by the enmity of some of his former colleagues, sinking under difficulties of his own making, an object of mingled pity and respect, addressed to mankind the *Song of the Swan*, a last educational prayer, and withdrew to Brugg (Aargau), where he died, 17th February 1827. Pestalozzi's books are all written in German.

See Pestalozzi's *Educational Writings*, ed. Green and Collie (1912); also the article 'Pestalozzi' in *Quick's Essays* (1890); Morf, *Zur Biographie Pestalozzis* (4 vols. 1864-89); De Guimp's monograph, translated by John Russell (1890); Krüsi's *Pestalozzi* (New York, 1875); *Leonard and Gertrude* (Eng. trans. 1825); J. Guillaume, *Pestalozzi, Étude Biographique* (1890); Green, *Pestalozzi, his Life and Work* (1913).

Pesth. See BUDAPEST.

Pestilence. See EPIDEMIC, BLACK DEATH, CHOLERA, PLAGUE, SWEATING SICKNESS, &c.

Pétain, HENRI PHILIPPE OMER. French marshal, was born at Cauchy la Tour (Pas-de-Calais) 24th April 1856. A colonel in 1914, he took command of the Second Army in June 1915. From February 1918 he organised the defence of Verdun, and in May he took command of the armies of the north and north-east. He was made a marshal in November 1918.

Petal. See FLOWER.

Petard, an instrument for blowing open the gates of a fortress, demolishing palisades, &c., consisting of a half-cone of thick iron filled with powder and ball; this was firmly fastened to a plank, and

the latter was provided with hooks to allow of its being attached securely to a gate, &c. The petard, which was lighted by a slow match, was superseded by the use of powder-bags. See BOMB, and SHELL.

Petasites. See BUTTERBUR.

Petavius, DIONYSIUS, the name by which the great Catholic theologian Denys Petau is usually known. Born at Orleans, 21st August 1583, he studied at Orleans and Paris, became a teacher in the university of Bourges in 1602, in 1605 entered the order of Jesuits, and 1621 was made professor of Theology in the university of Paris. This post he held for twenty-two years, but in 1646 he retired and devoted himself to the completion of a remarkable series of works in philology, history, and theology. Of his 49 works among the best known are editions of Synesius (1611) and Epiphanius (1622); *De Doctrina Temporum* (1627); *Tabulae Chronologicae* (1628); *Rationarium Temporum*, an outline of universal history (1634); and *De Theologicis Dogmatibus*, a history of doctrines (1644-50; new ed. by Thomas, 8 vols. 1864 *et seq.*); besides polemical works against Grotius and Salmasius. He died in Paris, 11th December 1652.

Petchenga. See PETSAMO.

Petchora, a large river of Russia, rises on the western slope of the Urals, flows north through the eastern parts of the governments of Vologda and Archangel, then south-west for 150 miles, and finally sweeping northwards into an estuary 30 miles wide and full of islands, falls into the Arctic Ocean, after a course of 975 miles. It is navigable by boats for upwards of 700 miles. The country through which the river flows is thinly peopled and quite uncultivated; dense forests extend on both sides, and the character of the scenery is wild, sombre, and melancholy. See Seebolin's *Siberia in Europe* (1881).

Petechiae. This term is given to spots of a dusky crimson or purple colour, quite flat, with a well-defined margin, and unaffected by pressure, which closely resemble flea-bites. These spots result from a minute extravasation of blood beneath the cuticle. They occur most frequently on the back, at the bend of the elbow, and in the groin. They indicate an altered state of the blood, and are characteristic of the disease called *purpura*; but are often symptoms of very serious diseases, as of typhus fever, plague, scurvy, &c. They likewise occur in very severe cases of smallpox, measles, and scarlet fever, when their presence must be regarded as indicative of extreme danger.

Peter, ST, the disciple and apostle of Jesus Christ, originally bore the name of Simon or Symeon, Peter being the Greek form of the name bestowed upon him by Christ (Cephas = rock or stone). His father's name was John, and he was the brother of Andrew. He was married and lived in Capernaum. His occupation was that of a fisherman. He was first of all a disciple of John the Baptist, and subsequently responded to the call of Christ. He became a leader of the band of disciples, and played a prominent part in the gospel narrative. It was he who was the first to recognise the real character of Christ and to make the great confession, 'Thou art the Christ, the son of the living God.' Just before the Crucifixion he was guilty of a great act of disloyalty in denying his master. According to the account given by Paul in 1 Cor. xv., it was to Peter that Christ appeared first of all after the Crucifixion. Peter became one of the first champions of the Christian faith in Jerusalem. In Acts we find him acting as spokesman of the rest on the day of Pentecost and afterwards. It was he who

pronounced sentences on Ananias and Sapphira, and together with John visited the converts in Samaria. He was the first to recognise the right of the Gentiles to a place in the Christian Church. He took a prominent part in the Council of Jerusalem, and subsequently went to Antioch, where he had a serious dispute with Paul on the question of the relations between Jewish and Christian converts. At this time our definite information ends, and the rest of Peter's life is obscure. We are entitled to deduce from the opening verses of 1 Peter (and the deduction seems to be valid whether we accept or reject the Petrine authorship of the epistle) that his missionary activity extended through the five provinces of Asia Minor, and if we take the reference to Babylon literally in 1 Peter 5-13 we should be driven to the conclusion that he also laboured in the far east. It is much more probable, however, that Babylon is used in this passage as in the Apocalypse to denote Rome. Whether Peter had any connection with Rome or not has always been a subject of controversy between Catholicism and Protestantism. The Catholic Church has always maintained that he was the first bishop of Rome, and therefore the founder of the papacy, and that his episcopate lasted from 42 to 67 A.D. The evidence has in recent years been re-examined by Sir W. Ramsay and others, and the conclusion which is now generally accepted seems to be this. There is sufficient testimony to make it extremely probable that Peter visited the Roman Church, that he was associated with Paul in the work, and that the two apostles suffered martyrdom in the city, but there is absolutely nothing to show that Peter was ever bishop in the technical sense of the term, and it is entirely contrary to the facts to suppose that he lived in Rome for twenty-five years. The grounds on which this conclusion is reached may be summarised as follows: (a) The references in Clement of Rome and in Ignatius seem to imply that both Peter and Paul were known to the Roman Church; (b) Dionysius of Corinth (c. 171 A.D.) attributes the origin of the Roman Church to the work of the two apostles, and his statement is supported by Irenæus (180); (c) Tertullian and Caius of Rome definitely speak of the 'double martyrdom' of the two apostles; (d) the first definite reference to Peter's episcopate is found in Eusebius (325), and is far too late to be of any value.

The fact of Peter's martyrdom seems to be well authenticated. (1) It is implied in the Gospel of John xxi. 18-19, and (2) definite evidence from at any rate the year 200 is found in the writings of the Fathers. Eusebius preserves a tradition that he was impaled or crucified with his head downward. The date usually assigned to this event is the year 67 A.D., but Sir W. Ramsay has recently advocated a theory that Peter lived till after the year 80. The basis of this theory is as follows. Sir W. Ramsay is convinced that Peter wrote the first epistle which is attributed to him, but he is equally certain that the epistle could not have been composed till the time of Domitian, because the facts which it gives with regard to the persecution prove that it is referring to the Domitianic persecution. The only way of reconciling these two positions is to prolong Peter's life beyond the traditional date. The theory, however, has not as yet won many converts. In later times (in addition to our two canonical epistles of Peter) a whole literature was ascribed to the apostle. The most interesting of these books are the 'Gospel of Peter' and the 'Apocalypse of Peter,' fragments of which were discovered at Akhmîm in Egypt in 1886, and subsequently edited by Robinson and James (1892). Other writings ascribed to the apostle include the 'Acts of Peter,' 'The Preaching

of Peter,' and 'The Journeys of Peter'—all of which are, of course, apocryphal.

There is no standard Life of Peter, but the best modern treatment of his career is to be found in Chase's article in *Hastings's Bible Dictionary*. See also H. A. Birks, *Studies in the Life and Character of St Peter* (1887), and Couard, *Simon Petrus der Apostel des Herrn*. On the relations between Peter and Rome, see Ramsay, *The Church and the Roman Empire*; Lightfoot, *Apostolic Fathers*, Clement II., pp. 481 ff.; Sanday and Headlam, *Romans*, pp. xxviii. f.; Littledale, *Petrine Claims* (1889). The most important modern books on the Catholic side are Allies, *St Peter* (2d ed. 1871); Dollinger, *First Age of the Church* (3d Eng. ed. 1877); and Johann Schmid, *Petrus in Rom*. For the apocryphal literature attributed to Peter see Lipsius, *Die apokryphen Apostelgeschichten und Apostellegenden* (1893-1900), and Tischendorf's text of the *Acts of Peter and Paul*.

Peter, THE EPISTLES OF, two of the Catholic Epistles in the New Testament. The first epistle is by far the best authenticated. It was accepted as canonical without any question from the earliest times. It was written to the churches of the five provinces of Asia Minor, to encourage them to be steadfast in a time of 'fiery persecution.' Unvarying tradition ascribes the authorship of the epistle to Peter, but modern criticism has raised some objections to this position on the following grounds: (a) the data connected with the persecution belong to the age of Domitian; (b) the epistle is written in such a pure Greek style that it could not have been the work of one who is described in Acts as an 'ignorant and unlearned' man; (c) it has so many affinities with Pauline thought that it could only have been written by a disciple of Paul; (d) it is difficult to explain the complete absence of references to the life and teaching of Jesus if the epistle were the composition of one of his most intimate disciples. In order to meet these difficulties several suggestions have been made. (1) Zahn thinks that though the substance of the epistle came from Peter, the composition and diction are due to Silas, who was entrusted by the apostle with the task of putting his ideas into shape for the Asiatic churches. (2) Von Soden thinks that the epistle was written by Silas, who used Peter's name to give greater weight to his own words. (3) Harnack maintains that the opening and closing paragraphs of the epistle are a later addition, and that the main body of the letter was written by some prominent Roman teacher who was a disciple of St Paul. The objections which have been raised against the Petrine authorship, however, are none of them unanswerable, and are nothing like as serious as the difficulties raised by the modern theories. On the whole the balance of probability and the weight of modern scholarship are on the side of the traditional view. There is much diversity of opinion with regard to the date of the epistle. Renan and Zahn date it before the Neronian persecution, between 59 and 63. Hort, Lightfoot, and most English scholars put it immediately after the Neronian persecution, between 65 and 70; Swete and Ramsay date it between 70 and 80; Harnack (with some hesitation in favour of an earlier date), Von Soden and M'Giffert between 81 and 96. The most unique feature of the epistle is the reference to the preaching of Jesus to the dead in Hades, ch. iii. 19-22.

The second epistle stands on a different footing altogether. There is more doubt about its authenticity and canonicity than there is in the case of any other book in the New Testament. The epistle makes claims for itself which it is very difficult to substantiate. The external evidence in its favour is very weak. There is no clear trace of its existence till the time of Origen. There is no reference to it in the Muratorian Canon, or in

the writings of Tertullian and Cyprian. Eusebius regarded it as one of the disputed books, and says that the balance of evidence is against its admission to the canon, though he is willing to admit that it might be used with spiritual profit. The absence of the epistle from the old Syriac version is an additional reason for doubting its claim for recognition. It was not till the 4th century that it secured its place in the New Testament. The doubt is increased when we turn to the internal evidence of the epistle itself. There is a marked contrast between the first and second epistles of Peter. 'The Greek style of the first epistle is simple and natural,' as Chase says, 'without a trace of self-conscious effort. The style of 2 Peter is rhetorical and laboured, marked by a love for striking and startling expressions.' The difference extends also to the subject-matter and theology of the two books. Moreover, there is a close connection between 2 Peter and Jude. The whole of Jude has been incorporated in 2 Peter, and modern scholarship has decided that on the whole Jude seems the more original and primary of the two documents. There are points of contact between 2 Peter and the newly-discovered fragments of the apocryphal 'Gospel of Peter,' and 'Apocalypse of Peter,' though it is difficult to say in this case which is the earlier writing. Dr Sanday reaches the following conclusion: 'It is no doubt possible that the writer of the Apocalypse may have imitated the epistle, or that both may have been affected by some common influence. If there had been, on the whole, better reason than not for believing the epistle to be the genuine work of Peter, it would be natural to fall back on some such assumption. But as the balance of argument is really the other way, it is on the whole more probable that the two writings (i.e. the Apocalypse and the 2d Epistle) are by the same hand.' In spite of these arguments the epistle has some important supporters, and its genuineness has been defended in recent times by Zahn, Spitta, and Bigg. On the other hand, scholars like Harnack, Sanday, Ramsay, and Moffatt hold that the epistle was not written till towards the middle of the 2d century.

The best commentaries on the first epistle are by Masterman, Knopf, Gunkel, Bigg (*International Critical*), Bennett (*Century Bible*); and on the second epistle Mayor, Bigg, Von Soden, Knopf, Spitta, and Bennett. See also the articles by Chase in *Hastings's Bible Dictionary*; Robson, *Studies in the Second Epistle of St Peter*; O. D. Foster, *The Literary Relations of 1 Peter*. Leighton's *Practical Commentary on 1 Peter* is full of useful suggestions.

Peter the Cruel. See PEDRO.

Peter the Great. Peter I., Alexandreivich, emperor of Russia, was the son of the Tsar Alexei by his second wife, Natalia Narishkina, and was born at Moscow, 11th June 1672. His father died in 1676, leaving the throne to his eldest son, Feodor, Peter's half-brother. This prince, however, died in 1682 without issue, after naming Peter as his successor, to the exclusion of his own full brother, Ivan, who was weak-minded. This step immediately provoked an insurrection of the 'streltzi' or militia, fomented by Ivan's sister, the grand-duchess Sophia, who, after a carnage of three days, succeeded in obtaining the coronation (July 1682) of Ivan and Peter as joint rulers, and her own appointment as regent. Up to Peter's coronation his education had been greatly neglected, but after this time he had the good fortune to fall under the guidance of Lefort (q.v.), a Genevese, who initiated him into the sciences and the arts of civilisation, and by showing him how much Muscovy was in these respects behind the rest

of Europe, influenced the whole of his future career. Lefort also formed a small military company out of the young men of noble family who attended Peter, and he rendered the tsar himself all the while amenable to strict discipline. This course of training in all probability saved Peter from becoming the mere savage despot which his brutal and passionate disposition and indomitable energy inclined him to be; it also protected him from the jealousy of his half-sister, the regent Sophia, who thought him absorbed in military exercises, studies, and amusements. She, however, soon discovered her error, for Peter, contrary to her wishes, married (1689), by his mother's advice, Eudoxia Feodorovna Lopukhin; and in October of the same year called upon his sister to resign the government. In the ensuing contest Peter was at first worsted, and compelled to flee for his life; but he was joined by the foreigners in the Russian service, with Patrick Gordon (q.v.) and Lefort at their head; and the streltzi flocking to his standard, Sophia resigned the contest, and was shut up in a convent, whence, till her death in 1704, she did not cease to annoy him by her intrigues. On October 11, 1689, Peter made his public entry into Moscow, where he was met by Ivan, to whom he gave the nominal supremacy and precedence, reserving the sole exercise of power for himself. Ivan only enjoyed his puppet sovereignty till 1696.

Peter's first care on assuming the government was to form an army disciplined according to European tactics, in which labour he was greatly aided by Gordon and Lefort, both of whom were military men. He also laboured to create a navy, both armed and mercantile; but at this period Russia presented few facilities for such an attempt, for she was shut out from the Baltic by Sweden and Poland, and from the Black Sea by Turkey, leaving only the White Sea and the Arctic Ocean, with the solitary port of Archangel, available for the Russian navy. Peter, thinking the possession of a portion of the Black Sea would best supply the required facilities of accessible seaboard and port, declared war against Turkey, and took (1696) the city of Azov at the mouth of the Don, after a long siege. Skilled engineers, architects, and artillerymen were now invited from Austria, Venice, Prussia, and Holland; ships were constructed, and the army further improved both in arms and discipline. Many of the young nobility were ordered to travel in foreign countries, chiefly in Holland and Italy, and to take special notice of all matters in connection with shipbuilding and naval equipments; others were sent to Germany to study the military art. Peter was eager to see for himself the countries for which civilisation had done so much; and, after repressing a revolt of the streltzi and dispersing them among the various provinces, he left Russia in April 1697, in the train of an embassy of which Lefort was the head. In the guise of an inferior official of the embassy he visited the Baltic seaboard, Prussia, and Hanover, reaching Amsterdam, where, and subsequently at Zaandam, he worked for some time as a common shipwright; and to his practice of shipbuilding and kindred trades he added the study of astronomy, natural philosophy, geography, and even anatomy and surgery. On receipt of an invitation from William III. he visited England, and for three months, spent partly in London and partly at Deptford, laboured to amass all sorts of useful information. While in England he received the honorary degree of D.C.L. from the university of Oxford. He left England in April 1698, carrying with him English engineers, artificers, surgeons, artisans, artillerymen, &c., to the number of 500, and next visited Vienna, for the purpose of inspecting the emperor of Austria's army, then the

best in Europe. He was about to visit Venice also, when the news of a formidable rebellion of the streltzi recalled him to Russia. General Gordon had already crushed the revolt, and Peter finally broke up the institution that had given him so much trouble. The Empress Eudoxia, who was suspected of complicity in the conspiracy, which had been the work of the old Russian or anti-reform party, was divorced and shut up in a convent, and the great reforms were begun. Peter put the press on a proper footing, caused translations of the most celebrated works of foreign authors to be made and published, and established naval and other schools. Ordinary arithmetic was first introduced, accounts having been previously kept by means of the Abacus (q.v.). Trade with foreign countries, which was formerly punished as a capital crime, was now permitted, or rather, in the case of the principal merchants, insisted upon. Many changes in dress, manners, and etiquette were introduced and enforced on the people at large. Even the organisation of the national church could not escape Peter's reforming zeal.

In 1700 Peter, desirous of gaining possession of Karelia and Ingria, provinces of Sweden which had formerly belonged to Russia, entered into an alliance with the kings of Poland and Denmark to make a combined attack on Sweden; but he was shamefully defeated at Narva, his raw troops being wholly unable to cope with the Swedish veterans. Peter was by no means disheartened, but quietly appropriated a portion of Ingria, in which he laid the foundation of the new capital, St Petersburg, 27th May 1703. Great inducements were held out to those who would reside in it, and in a few years it became the Russian commercial depôt for the Baltic. In the long contest with Sweden the Russians were almost always defeated; but Peter saw that these reverses were administering to his troops a more lasting and effective discipline than he could have hoped to give them in any other way. He had his revenge at last, in totally routing the Swedish king, Charles XII., at Pultowa (q.v.), 8th July 1709, and in seizing the whole of the Baltic provinces and a portion of Finland in the following year. His success against Sweden helped much to consolidate his empire and to render his subjects more favourably disposed towards the new order of things. After reorganising his army he prepared for strife with the Turks, who, at the instigation of Charles XII. (then residing at Bender), had declared war against him (see TURKEY). In this contest Peter was reduced to such straits that he despaired of escape. But, according to a somewhat doubtful tradition, the finesse and ability of his mistress, Catharine, extricated him from his difficulties; and a treaty was concluded (1711) by which Peter lost only his previous conquest—the port of Azov and the territory belonging to it. He was thus shut out from the Black Sea, so the possession of a good seaboard on the Baltic became the more necessary to him, and the war against Sweden in Pomerania was accordingly pushed on with the utmost vigour. In 1712 his marriage with his mistress, Catharine (see CATHARINE I.), was celebrated at St Petersburg, and the offices of the central government were transferred to the new capital. His arms in Pomerania and Finland were victorious, and in 1713 the latter province was completely subdued. In 1716-17, in company with the empress, he made another tour of Europe, this time visiting Paris, and returned to Russia in October 1717, carrying with him quantities of books, paintings, statues, &c. It was soon after this time that his son Alexei (q.v.), who had opposed some of his father's reforms, was condemned to death, and died in prison—apparently

through having been repeatedly tortured. Many of the nobles who had been implicated in his treasonable plans were punished with savage barbarity. In 1721 peace was made with Sweden, which definitely ceded the Baltic provinces, Ingria, and part of Finland, with the islands off the coasts. In 1722 Peter commenced a war with Persia, in order to open up the Caspian Sea to Russian commerce, and secured three Caspian provinces along with the towns of Deibend and Baku. For the last years of his life he was chiefly engaged in beautifying and improving his new capital and carrying out plans for the more general diffusion of knowledge and education among his subjects. In the autumn of 1724 he was seized with a serious illness, and he died 8th February (28th January o.s.) 1725. Catharine succeeded him. The 'Testament of Peter the Great,' inciting the Russians to aim at domination in Europe, is a forgery, based probably on Lesur's *Progrès de la Puissance Russe* (1807), and, it may be, inspired by Napoleon.

See Russian Lives by Golikov (30 vols. 1797) and Ustrajlov (1863); English Lives by Barrow (new. ed. 1883) and Schuyler (2 vols. 1884); and for a vindication of the authenticity of the 'Testament,' W. J. Thoms in the *Nineteenth Century* (1878).

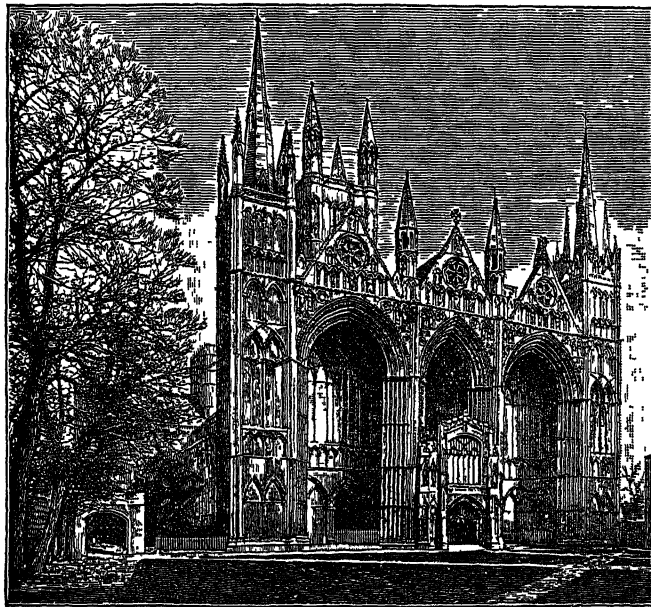
Peter II. (ALEXEIEVICH) of Russia, was the sole male representative of Peter the Great, being the son of the unfortunate Alexei (see above), and was born 23d October 1715 at St Petersburg. On the death of the Empress Catharine I. he ascended the throne (1727). Menschikoff, his guardian, affianced one of his daughters to the youthful tsar, but his power was overturned by the Dolgouki family. The tsar was seized with smallpox, and died at St Petersburg, 29th January 1730.

Peter III. (FEODOROVICH) of Russia, grandson of Peter the Great (being the son of his eldest daughter Anna Petrovna, wife of the Duke of Holstein-Gottorp), was born at Kiel, 29th January 1728, and in 1742 was declared by the Empress Elizabeth (q.v.) her successor on the throne of Russia. From the time of his being publicly proclaimed heir he lived at the Russian court; and in obedience to the wishes of the empress he married Sophia-Augusta, a princess of Anhalt-Zerbst, who on entering the Greek Church assumed the name of Catharina Alexeievna. Peter succeeded Elizabeth on her death in 1762; and his first act of authority was to restore East Prussia to Frederick the Great (whom he admired extravagantly), and to send to his aid a force of 15,000 men. He also recalled many of the political exiles from Siberia. When arranging in 1762 a campaign to take Sleswick from Denmark a formidable conspiracy, headed by his wife, and supported by the principal nobles, broke out against him—a conspiracy which originated in the general discontent at the tsar's liberal innovations, the preference he showed for Germans, his indifference to the national religion, and his servility to Frederick the Great. The tsar was declared to have forfeited his crown; his wife Catharine was proclaimed as Catharine II. (q.v.); and Peter, who supinely abdicated, was strangled by Orloff and some of the conspirators on the 17th July 1762. See Nisbet Bain, *Peter III.* (1902).

Peterborough, a city in the administrative county of the Soke of Peterborough, generally reckoned as part of Northamptonshire, on the river Nen, at the edge of the fen-country, 76 miles N. of London and 42 NE. of Northampton. Here, at Medeshamstede, in 655, the Mercian thane Saxulf founded the great Benedictine abbey of SS. Peter, Paul, and Andrew, which, destroyed by the Danes in 870, was restored in 966, plundered by Hereward in 1069, and again burned down in 1116. Its noble church, the cathedral since 1541 of a new diocese

carved out of that of Lincoln, was built between 1118 and 1528, and thus, whilst essentially Norman, offers every variety of architecture down to the Perpendicular. It is 471 feet long, by 202 across the transept, and 81 high. The Early English

city governors. In 1790 a new administrative body, known as the Peterborough Improvement Commissioners, was established. This was replaced by the Peterborough Corporation when the city was incorporated as a municipal borough in 1874. The citizens of Peterborough returned two members to parliament from 1547 till 1885, and thereafter one, but since 1918 the borough constituency has been merged in the Peterborough parliamentary division of Northamptonshire. The corporation are the undertakers for the supply of electricity in an extensive area surrounding the city. Pop. (1841) 6959; (1881) 22,394; (1901) 30,872; (1921) 35,533.—The administrative county of the Soke of Peterborough was created under the provisions of the Local Government Act of 1888, being a survival of the soke of the abbey. Over this area the Marquess of Exeter is lord paramount, and nominates the justices for the liberty of Peterborough, who exercise all the powers of a judge of assize. Area, 84 sq. m.; pop. (1921) 46,954.



Peterborough Cathedral—West Front.

west front (c. 1200–22) consists of three mighty arches, and 'is perhaps,' says Freeman, 'the grandest conception for a single feature which mediæval architecture has produced, a Greek portico translated into Gothic language.' Noteworthy also are the flat painted wooden ceilings of the 12th century, the portrait of 'Old Scalett' the sexton (1496–1594), the blue slab inscribed 'Queen Catharine, A.D. 1536,' and the grave for twenty-five years (1587–1612) of Mary Queen of Scots. In 1643 Cromwell and his troopers did hideous havoc to monuments, stained glass, and cloisters. In 1883 the fine central tower was condemned as unsafe; but it was lovingly rebuilt, and in 1890 the cathedral was reopened after restoration, resumed in 1895. Of the abbots may be mentioned Ernulf, Bishop of Rochester (1115); and of the bishops, Lloyd and White the non-jurors, Richard Cumberland, Archbishop Magee of York, and Mandell Creighton the historian. Paley was a native. Two ancient gateways, the bishop's palace and the deanery (once the abbot's and prior's houses), and the chancel of a Becket chapel make up the remaining objects of interest. A training-college for women (1864), a grammar-school, the town-hall (1671), the corn exchange (1848), a cattle-market of five acres (1867), and the bridge over the Nen (dating from 1140, but in its present form from only 1872) may be mentioned. Peterborough is the centre of a poor-law union, a county court district, and has a probate registry. The city is an important railway centre, has considerable engineering works, and carries on a large trade in malt, coal, farm-produce, &c. The adjoining suburb of old Fletton is the centre of a large pressed brick-making industry. The city was established on 4th September 1541 by letters patent of Henry VIII., and was governed partly by the dean and chapter as lords of the manor and partly by the Peterborough feoffees and

Peterborough, chief town of Peterborough county, Ontario, on the Otonabee River (here crossed by several bridges), 69 miles NE. of Toronto. It exports lumber, grain, and pork, and manufactures flour, woollens, farming implements, machinery, furniture, canoes, &c. Pop. 21,000.

Peterborough, CHARLES MORDAUNT, EARL OF, was born in or about the year 1658. All particulars of his boyhood, even to the place of his education, seem to have been lost. The first definitely recorded event in his life is his voyage as a volunteer in Sir John Narborough's expedition against the Algerine corsairs in 1674. From this voyage, in which he saw actual service, he returned early in 1677, to find himself in his twentieth year Viscount Mordaunt, his father, John, first peer of that title, which he owed to his services in assisting to bring about the Restoration, having died in 1675. The new viscount shortly afterwards married Carey, daughter of Sir Alexander Fraser, and in 1678 started on another maritime expedition, this time apparently in the capacity of a passenger. Returning after a year's absence, he again volunteered for naval service, and sailed with the fleet sent under Lord Plymouth for the relief of Tangier. On his return to England he began to take an active part in politics, identifying himself with the extreme Whig party throughout the whole of the three or four eventful years which closed with the ruin and flight of Shaftesbury, and the final triumph of the indolent and dissolute but shrewd and able monarch, against whom that restless agitator had pitted himself. At the accession of James II. Mordaunt became a prominent parliamentary opponent of the first unpopular measures of the new king, and one of the earliest intriguers for his overthrow. Indeed he went at once so fast and so far as to press upon William of Orange a premature scheme for the invasion of England, which that prince with his usual cool judgment rejected. After the Revolution, in the military operations connected with which Mordaunt exerted himself vigorously and with success, he rose into high favour with the new king. Honour and emoluments of a varied description, from the post of a privy-councillor to that of

a water-bailiff, were heaped upon him, and he was finally appointed First Commissioner of the Treasury, and created Earl of Monmouth. On William's departure for the campaign in Ireland the new earl was nominated of the committee of nine who formed the Queen's Council of Regency. In the House of Lords he was an extreme and active Whig, but it was probably as much his zealous anxiety to supplant William's ministers suspected of Jacobitism as to combat Jacobite designs themselves that led to his embroilment in those intrigues arising out of the Assassination Plot, and the Fenwick trial, which ultimately resulted (January 1697) in his committal to the Tower. He was liberated in less than three months, and for several years thereafter he seems to have played no prominent part in public affairs.

In 1701 the war of the Spanish succession broke out, and in 1705 Peterborough (for by his uncle's death he had succeeded to that title shortly after his release from imprisonment) was appointed to the command of an army of 4000 Dutch and English soldiers, with which he proceeded to Barcelona, there to begin the extraordinary campaign which has made his name famous in history. After successfully resisting the solicitations to attack the city which were addressed to him by the Prince of Hesse-Darmstadt, fresh from the capture of Gibraltar, and the Archduke Charles, the claimant to the Spanish throne, for whom the allies were fighting, Peterborough succeeded by a pretended retreat in surprising and capturing the strong fort of Monjuich on the south side of Barcelona, from which position of vantage he soon managed to reduce the city. The Catalan towns one after another now declared for Charles; Gerona, Tarragona, Tolosa, and Lerida opened their gates to Peterborough, who, marching southward in the depth of winter and driving his foes before him, reached Valencia early in February 1706. Meanwhile an army under the Duke of Anjou, the French claimant to the throne (afterwards Philip IV.), and Marshal Tessé had entered Catalonia, and was closely investing Barcelona, which was at the same time blockaded by a fleet under the Count of Toulouse. Hurrying back to the scene of his former exploit, and seeing that it was from the side of the sea that the town must be relieved, Peterborough threw himself on board one of the ships of the English squadron, took command in virtue of his commission, which gave him supreme control over the British forces at sea as well as on land, sent his orders to the admiral, and drove Toulouse and his fleet from before the port. This success was followed by the raising of the siege, and the retreat of Tessé's force. Encouraged by the splendid successes of Peterborough on the east coast, Galway, the British commander on the Portuguese frontier, advanced into the heart of Spain, and in June entered Madrid. Peterborough wished to march from Valencia, whither he had now returned, and to effect a junction with Galway, but the archduke dallied irresolutely at Barcelona. Precious time was lost, Berwick rallied his forces, and compelled Galway to evacuate the capital, and when at last Charles advanced and summoned Peterborough to join him, it was too late. A plan formed by him for the recovery of Madrid was rejected, and in disgust he obtained permission to depart for Genoa to raise a loan on the Spanish revenues. Returning with success from his mission, he acted for some time as a sort of adviser to his military successors in Spain, but his imperious temper seems to have unfitted him for anything but supreme command, and his differences with Lord Stanhope and others led to his recall in March 1707.

His career thenceforward till his death at Lisbon

on 25th October 1735 is interesting only to the student of letters and not to the politician. He was, as is well known, an intimate friend of Pope, with whom he was in constant communication almost up to the last day of his life, and whose genuine esteem for him may satisfy us that under the somewhat theatrical exterior which he presented to the world there lay qualities which justly endeared him to his friends. In 1722 he was, it is said, privately married to the famous singer Anastasia Robinson, but the lady was not publicly acknowledged as his countess till shortly before his death. Recent military criticism has made an elaborate endeavour to show that Peterborough's fame as a conqueror rests wholly on a basis of imposture, and that the whole credit of his conquest of Valencia must be distributed among others. This extreme view, however, has been shown by Mr Stebbing in his judicious and impartial monograph to be untenable. His verdict is that 'the figure of the hero remains much where it was, though its pedestal may have been somewhat lowered.'

See the Memoir by Russell (2 vols. 1887), and Stebbing's *Peterborough* ('English Men of Action' series, 1890).

Peterhead, a seaport and burgh of barony of Buchan, Aberdeenshire, on a peninsula, 32 miles by road, but 44 by a branch-line (1862), NNE. of Aberdeen. Founded in 1593, it is somewhat irregular in plan, but clean and largely built of the celebrated 'Peterhead granite,' whose reddish variety is much used for monumental purposes. The Keiths, Earls Marischal, were superiors of the place till the rebellion of 1715, when the Old Pretender landed there, after which their forfeited estates were purchased by the Edinburgh Merchant Maiden Hospital, to whose governors many improvements are owing. Of Marshal Keith (q.v.) a bronze statue was presented to the town in 1869 by King William of Prussia; and the market-cross, a granite Tuscan pillar (1833), bears the arms of the Earls Marischal. The public buildings include the town-hall (1788), with a spire 125 feet high; the parish church (1803), with one of 118 feet; the free library and museum (1891); the academy (1846); and convict-prison (1889). Industries are woollen manufacture, boat-building, and granite-polishing. Peterhead was made a head-port in 1838. From 1788 it gradually became the chief British seat of the seal and whale fisheries, until in 1852 it sent out 30 ships; but whaling is now extinct. At present Peterhead is chiefly important for its great herring-fishery. The south harbour was begun in 1773, and the north harbour in 1818, a canal being formed between them in 1850; whilst a new harbour was formed under acts of 1873 and 1876, and the south harbour deepened and improved from time to time. Their three basins, hewn out of the solid rock, together cover about 22 acres; but all three are as nothing compared with the great harbour of refuge, designed by Sir John Coode in 1886. The south area has been completed. In the neighbourhood are the ruins of Inverurie, Ravenscraig, and Boddam castles, all strongholds of different branches of the Keiths; Buchan Ness, the most easterly point of Scotland, with a lighthouse (1827); and the Bullers of Buchan (q.v.). From 1833 to 1918 Peterhead united with Elgin, &c. to return one member to parliament. Pop. (1801) 3264; (1851) 7298; (1911) 13,613; (1921) 13,003.

Peterhof, a palace of the emperors of Russia, now a museum, on the southern shore of the Gulf of Finland, 18 miles W. of St Petersburg, was built by Peter the Great in 1711, contains a fine collection of paintings, and is surrounded by beautiful parks and gardens laid out on the model of those at Versailles, with cascades, terraces, and

summer-houses. The town of Peterhof has 15,000 inhabitants.

Peter Lombard. See LOMBARD.

Peterloo Massacre, the name popularly given to the dispersal of a large meeting by armed force in St Peter's Field, Manchester, Monday, 16th August 1819. The assemblage, consisting chiefly of bodies of operatives from different parts of Lancashire, was called to consider the question of parliamentary reform, and the chair, on open hustings, was occupied by 'Orator' Hunt (q.v.). The dispersal took place by order of the magistrates; several troops of horse, including the Manchester Yeomanry, being concerned in the affair. Eleven persons (men, women, and children) were killed, and some 600 wounded. St Peter's Field is now the site of the Free-trade Hall. 'Peterloo' was a name suggested by Waterloo. See *Three Accounts of Peterloo*, ed. F. A. Bruton (1921).

Peter Martyr, the patron saint of the Inquisition, a Dominican of Verona, who, for the severity with which he exercised his inquisitorial functions, was in 1252 slain at Como by the infuriated populace. His death formed the subject of a masterpiece by Titian, destroyed by fire at Venice in 1867.

Peter Martyr (Ital. *Pietro Martire Vermigli*), Reformer, was born in Florence, 8th September 1500, entered at sixteen the order of the canons regular of St Augustine at Fiesole, studied at Padua, became abbot of Spoleto, and later prior of St Peter ad Aram near Naples. Here he was drawn into the doctrines of the Reformers by the teaching of Juan Valdes and Ochino, yet was appointed visitor-general of his order in 1541. His rigour made him hateful to the dissolute monks, and he was sent to Lucca as prior of San Frediano, but soon fell under the suspicions of the Inquisition, and had to flee to Zurich (1542). At Strasburg he was welcomed by Bucer, and made professor of the Old Testament. In 1547 he came to England on Cranmer's invitation, lectured at Oxford on 1 Corinthians and Romans, and took an active part in the great controversy of the day. Mary's accession drove him back to Strasburg, now too Lutheran for his tastes, and in 1555 he repaired to Zurich, where he died, 12th November 1562. For his *Loci Communes* (printed at London in 1575) see the study by Schmidt (1858), and the article 'Vermigli' in the *Dict. Nat. Biog.*

Peter Martyr Anglerius, historian, was born in 1459 at Arona, on the Lago Maggiore, of an ancient family belonging to Anglera, obtained a footing at the court of Ferdinand and Isabella in 1487, and rose to high ecclesiastical preferment in Spain. He died at Granada in 1525. He wrote *De Orbe Novo* (1516), giving the first account of the discovery of America, and an *Opus Epistolarum* (1530). The *De Orbe*, translated in 1577, and printed by Arber in 1885, was retranslated by MacNutt in 1913. See monograph by Bernays (1890).

Petersburg, a city of Virginia, on the south bank of the Appomattox River, 23 miles by rail S. of Richmond. The falls above supply water-power for foundries, cotton, flour, and paper mills, and especially tobacco-factories. Petersburg is a well-built place, and contains a fine park. In the campaign of 1864 Grant, failing to take Richmond, besieged Petersburg, and was repulsed in several attacks by General Beauregard, with heavy loss. Pop. 31,000.

Petersburg. See ST PETERSBURG.

Petersfield, a market-town of Hampshire, 20 miles NNE. of Portsmouth by rail, has a Norman church. Till 1832 it returned two members, till 1885 one. Pop. 4000.

Peter's-pence (*denarius S. Petri*), the name given to a tribute offered to the Roman pontiff in

reverence of the memory of St Peter. From an early period the Roman see had been richly endowed; but the first idea of an annual tribute came from Anglo-Saxon England. It is ascribed by some to Ina (721 A.D.), king of Wessex, by others to Offa of Mercia, and by Lingard to Alfred the Great. It was extended to Ireland by Henry II. The tribute consisted in the payment of a silver penny by every family possessing land or cattle of the yearly value of 30 pence, and it was collected during the five weeks between St Peter's and St Paul's Day and August 1. The tax, also called Rome-scut, varied greatly in amount, but continued to be paid with intervals till the reign of Henry VIII. By Gregory VII. it was sought to establish it for France; and traces of a similar payment appear also in Denmark, Sweden, Norway, and Poland. This tribute differed from the payments of the feudatory kingdoms, such as Naples, Aragon, and England under the reign of John. The tribute practically ceased at the Reformation. The pope having suffered a considerable diminution of his own revenue since the revolution of 1848, an effort was made in several parts of Europe to revive the payment of Peter's-pence, not as a tribute but by the collection of free-will offerings. In some countries it proved very successful; and after the total annexation of the Papal States to the kingdom of Italy the tribute was largely increased in France, Belgium, England, and Ireland. Later it fell off considerably.

Peter the Hermit, a preacher of the first crusade, was of gentle birth, and a native of Amiens, where he was born about the middle of the 11th century. He served some time as a soldier, became a monk, and is usually said to have made a pilgrimage to the Holy Land before 1095, when he joined in the preaching campaign which was to render him famous, and leave such a mark on history. But it should be noted that the scheme of a crusade originated with the pope, not with the hermit, who was only one of many preachers; that his importance has been greatly exaggerated; and that much of his story is legendary. The article CRUSADES gives an account of the preaching, its results, and of poor Peter's faint-hearted attempt at desertion during the siege of Antioch. After the end of the crusade he returned to Europe, and founded a monastery at Huy in the Low Countries, where he died, 7th July 1115. His remains were translated to Rome in 1634.

Peter the Wild Boy was found in July 1724 in a wood near Hameln in Hanover; 'he was walking on his hands and feet, climbing up trees like a squirrel, and feeding upon grass and moss of trees.' He was taken to George I., brought over by him to England in 1726, and placed under the care of the celebrated Dr Arbuthnot, who had him baptised 'Peter.' He was fond of music, but could never be taught to articulate more than 'Ki Sho,' 'Qui Ca,' and 'Hom Hen,' for 'King George,' 'Queen Caroline,' and 'Tom Fen'—the last a Hertfordshire farmer with whom he lived after 1737. He would sometimes ramble away, on one occasion as far as Norwich, so was provided with a brass collar inscribed 'Peter the Wild Boy, Broadway Farm, Berkhamstead.' Lord Monboddo visited him in 1782, and in his *Origin of Language* describes him as only 5 feet 3 inches high, now about seventy years of age, quite tame, bearded, and fresh and healthy. But on the farmer's death Peter took to his bed, refused food, and in a few days died, in August 1785. See *Notes and Queries* for 11th October 1884, and works there cited.

Peterwardein (Serb. *Petrovaradin*), now in Yugoslavia, once one of the strongest fortresses in the Hungarian dominions, is situated in a marshy, unhealthy locality on the right bank of the Danube,

opposite Neusatz (Novi Sad). The most ancient part of the defences, the Upper Fortress, is situated on a rock of serpentine, which on three sides rises abruptly from the plain. The fortress was held by the Turks from 1526 to 1687. In 1688 the fortifications were blown up by the imperialists, and the town was soon after burned to the ground by the Turks; but at the peace of Passarowitz (1718) it remained in the possession of the emperor. Here, on 10th August 1716, Prince Eugene obtained a great victory over the Grand Vizier Ali. The Hungarians were compelled to yield the fortress to the Austrians in September 1849.

Petiole. See LEAF.

Pétion de Villeneuve, JÉRÔME, a prominent figure in the French Revolution, was the son of a *procureur* at Chartres, and was born there in 1753. He was practising as an advocate in his native city when he was elected in 1789 its deputy to the *Tiers État*. An ardent republican and fluent speaker, he quickly became popular, although essentially windy, verbose, and of mediocre understanding. He was a prominent member of the Jacobin Club, and as 'Pétion the Virtuous' became a great ally of 'Robespierre the Incorruptible.' He was sent along with Barnave and Latour-Maubourg to bring back the fugitive royal family from Varennes, and in the execution of this commission he acted in a brutal and unfeeling manner. He afterwards advocated the deposition of the king, and the appointment of a popularly elected regency, and along with Robespierre received, 30th September 1791, the honours of a civic crown. On the 14th of November he was elected mayor of Paris in Bailly's stead, the court favouring his election to prevent that of Lafayette. The invasion of the Tuileries by the mob and the atrocious September massacres both fell within his year of office. He became the first president of the Convention, and was made ridiculous as 'roi Pétion' through Manuel's proposal to give the president the same authority as the president of the United States. On the triumph of the Terrorists Pétion's popularity declined, and he cast in his lot more and more with the Girondists, having become a *habitué* of Madame Roland's *salon*. Like them he voted at the king's trial for death, but with delay of execution and appeal to the people. He was elected to the first committee of general defence in March 1793, and on 12th April he headed the fatal because unsuccessful attack on Robespierre. Proscribed among the twenty-two, on the 2d of June, he escaped to Caen, and on the failure of the attempt to make armed opposition against the Convention fled to the Gironde with Guadet, Buzot, Barbaroux, Salle, and Louvet, and hid in a grotto at St Emilion. At length they were tracked and obliged to flee. The bodies of Pétion and Buzot were found in a cornfield, partly devoured by wolves. They were supposed to have died by their own hands.

His *Œuvres* fill 3 vols. (1792). See J. J. Regnault-Warin's hyper-eclogistic life (1792); C. A. Dauban's *Mémoires inédits* (1866); and C. Vatel's *Charlotte Corday et les Girondins* (3 vols. 1872).

Petit de Julleville, Louis (1841-1900), born in Paris, wrote an *Histoire du Théâtre en France* and edited a monumental *Histoire de la langue et de la littérature françaises*.

Petition, a supplication preferred to one capable of granting it. The right of the British subject to petition the sovereign or either House of Parliament for the redress of grievances is a fundamental principle of the British constitution, and has been exercised from very early times. The earliest petitions were generally for the redress of private wrongs, and the mode of trying them was judicial rather than legislative. The earlier petitions were generally addressed to the House of

Lords; the practice of petitioning the House of Commons first became frequent in the reign of Henry IV. Since the Revolution of 1688 the practice has been gradually introduced of petitioning parliament, not so much for the redress of specific grievances, as regarding general questions of public policy. Petitions must be in proper form and respectful in language; and there are cases where petitions to the House of Commons will only be received if recommended by the crown, as where an advance of public money, the relinquishment of debts due to the crown, or compensation for losses out of the public funds is prayed for. A petition must, in ordinary cases, be presented by a member of the House to which it is addressed. The system is, however, not without its disadvantages, as when the attempt is made to over-ride the courts of law by popular agitation—vast numbers of petitions being presented on behalf of murderers convicted after fair trial. For election petitions, see PARLIAMENT.

In the United States the right of the people to petition government is expressly secured by the First Amendment of the Constitution, and is thoroughly interwoven with the ideas and usages of the nation—although, during the conflicts on slavery, it was resolved that petitions relating to slavery or the abolition thereof should be laid on the table without being printed or read, and finally that such petitions should not be received at all.

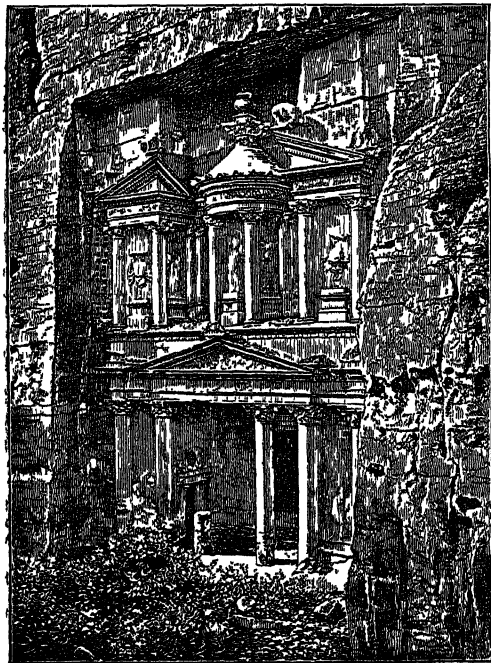
Petition of Right, a declaration of certain rights and privileges of the subject obtained from King Charles I. in his third parliament—the first statutory restriction of the powers of the crown since the accession of the Tudor dynasty. It was so called because the Commons stated their grievances in the form of a petition, refusing to accord the supplies till its prayer was granted. The petition professes to be a mere corroboration and explanation of the ancient constitution of the kingdom; and after reciting various statutes that recognise the rights contended for, prays 'that no man be compelled to make or yield any gift, loan, benevolence, tax, or such like charge, without common consent by act of parliament; that none be called upon to make answer for refusal so to do; that freemen be imprisoned or detained only by the law of the land, or by due process of law, and not by the king's special command, without any charge; that persons be not compelled to receive soldiers and mariners into their houses against the laws and customs of the realm; that commissions for proceeding by martial law be revoked.' The king at first eluded the petition, expressing in general terms his wish that right should be done according to the laws, and that his subjects should have no reason to complain of wrongs or oppressions; but at length, on both Houses of Parliament insisting on a fuller answer, he gave an unqualified assent on the 26th of June 1628. The text of the Petition will be found most conveniently in Gardiner's *Constitutional Documents of the Puritan Revolution, 1628-60* (1889). See also his *History of England*, vi. 274-309.

Petitiō Principiī ('a begging of the principle or question') is the name given in Logic to that species of vicious reasoning in which the proposition to be proved is itself assumed in the premises of the syllogism.

Petőfi, SANDOR, Hungarian poet, born on 1st January 1823 the son of a butcher, at Kis-Kőrös, was successively actor, soldier, and literary hack. His first poem, published in 1842, was followed by a volume in 1844 which secured his fame as a poet. He diligently studied German, French, and English, translated Shakespeare's *Coriolanus*, but in 1848 threw himself heartily into the revolutionary cause, writing numerous popular war-songs. He fell in

the battle at Schässburg (Segesvár), 31st July 1849; but it was long believed by the Hungarians that he had escaped, and would reappear. His lyrical poetry breaks completely with the old pedantic style, and, warm with human and national feeling, began a new epoch in Hungarian literature. The first collected edition appeared in 1874; selections have been translated into English by Bowring and others. There are lives by Opitz (1868) and Fischer (1888).

Petra (the Greek equivalent of the Heb. SELA, both names signifying 'Rock'), anciently the stronghold and treasure-city of the Nabatæans (q.v.), situated in the desert of Edom in north-western Arabia, near the points of intersection of great caravan-routes from Palmyra, Gaza, Egypt, and the Persian Gulf, four days' journey from the Mediterranean and five from the Red Sea. It is approached by a chasm or ravine, which in some places is only 12 feet wide, while the rocky walls of red sandstone tower more than 100 feet above. Along this ravine are the most famous ruin of Petra, the Hazne or 'treasury of Pharaoh,' and a theatre, both shaped out of the solid walls. All along the face of the rocks that overlook the valley are rows of cave-tombs hewn out of the solid stone, and ornamented with façades. The floor of the



Rock Temple at Petra: El Hazne.

valley, about two miles across, is strewn with ruins. The earliest name was, according to some, Ilekem; hence Petra has been identified with Kadesh Barnea, and as the place where Moses struck the rock so that water flowed out. The little stream that descends the ravine, flowing eastwards, has its origin in a spring called at the present day the Fountain of Moses. Petra was captured by the Romans in 105 A.D., and thereafter decayed, its place as a commercial centre being taken by Palmyra (q.v.). Nevertheless it continued to exist as a town; most of the remains belong probably to the first century of its decay. From Petra Arabia Petræa gets its name.

See works by Brünnow and Domaszewski (1904), Musil (1907-8), Dalman (1908), Sir A. Kennedy (1925); and those cited at EDOM.

Petrarch. Francesco Petrarca, one of the earliest and greatest of modern lyric poets, was the son of a Florentine notary, Petracco (diminutive of Peter) di Messer Parenzo. Petrarch's father was exiled from Florence (1302) along with Dante during the struggles between the two factions of the Bianchi and Neri, when the latter party obtained the upper-hand. He took refuge with his family in Arezzo, where, on the 20th July 1304, Francesco was born. The poet's infancy was passed in Tuscany until 1312, when his father determined to go to Avignon, whither the papal court had lately been transferred. There and in the neighbouring small town of Carpentras Petrarch's studies began, and were continued later at Montpellier and Bologna. His father intended him to enter the legal profession; but instead of jurisprudence he devoted himself with enthusiasm to the study of the classics, his favourite authors, on whose style he afterwards strove to model his own, being Cicero and Virgil. It was only later in life that he tried to learn Greek, in which he never attained to any proficiency. After his father's death, whom his mother did not long survive, Petrarch returned to Avignon (1326). As was the custom of the time, more especially at the papal court, he and that brother Gherardo, being without means, became ecclesiastics; but Francesco never took holy orders. His chief source of income became the small benefices conferred on him by his many powerful patrons; but in after-life he refused higher preferment, declining even the much-coveted post of papal secretary, rather than compromise his independence. Petrarch is reported to have been a handsome young man of winning manners, fond of rich clothing and all the refinements of court-life. It was at this period of his life that he first saw Laura, the lady whose name he was to immortalise in his lyrics, and who inspired him with a passion which has become proverbial for its constancy and purity. The meeting took place on April 6, 1327, in the church of St Clara at Avignon. This date, as well as that of Laura's death on the same day in the year 1348, stands recorded by Petrarch's own hand on the fly-leaf of his Virgil, now amongst the treasures of the Ambrosian Library at Milan. The identity of Laura has been a subject of much discussion, the most generally accepted hypothesis is that of the Abbé de Sade, who identified the poet's love, on somewhat slender evidence, with a member of his own family, Laure de Noves, married in 1325 to a Hugo de Sade; she became the mother of eleven children, and died in April 1348. It was also at this time that Petrarch's friendship began with the powerful Roman family of the Colonnas, and especially with Jacopo Colonna, Bishop of Lombez.

The dawn of the new birth of letters and art which was to illumine the following century was already altering the status of the poet and artist, and as the fame of Petrarch's learning and genius grew his position became one of unprecedented consideration. His presence at their courts was competed for by the most powerful sovereigns of the day, and such was the exceptional position he enjoyed that he has said of himself that princes had lived with him, not he with princes. His chief patrons were Pope Clement VI., the Emperor Charles IV., King Robert of Naples, the Viscounts of Milan, Jacopo da Carrara, Lord of Padua, Azzo da Correggio, Lord of Parma; in Venice the senate bestowed a palace on him in return for his promise to leave that town his library; Florence offered him the restoration of the confiscated possessions of his family if he would reside there, and in Arezzo the house where he was born was held as a sanctuary. When wearied by court-life he sought retirement and quiet in his country-house at Vaucluse, near Avignon. He travelled repeatedly in

France, Germany, and Flanders, wherever he went searching diligently for manuscripts to enrich his collection. He made some valuable bibliographical discoveries, finding in Liège two new orations of Cicero, in Verona a collection of letters of the same writer, and in Florence a then unknown Institution of Quintilian's. In the cosmopolitan society of the papal court Petrarch became acquainted with learned men of all countries, whom he interested in his unwearied search for valuable manuscripts. The example given by Petrarch in his loving preservation of books probably gave the first incentive to the collection of manuscripts which bore such rich fruits in the following century. But the most glorious moment of Petrarch's honoured career was when, invited by the senate of Rome on Easter Sunday, 1341, he ascended the capitol clad in the robes of his friend and ardent admirer, Robert of Anjou, king of Naples, and there, after delivering an oration on poetry and the significance of the laurel, he was crowned poet-laureate amid the acclamations of thousands. After this pagan ceremony he went to leave his crown on the altar of St Peter's. In 1353, after the death of his beloved Laura and his friend Cardinal Colonna, he left Avignon for ever, disgusted with the corruption and vice of the papal court. The remaining years of his brilliant life were passed in various towns of Northern Italy, and in the retirement of a country-house at Arquà, near Padua, the only one of his many habitations still in existence. There, tenderly cared for by his natural daughter, Francesca, and her husband, and occupied to the last in his favourite studies, he quietly ended his life, 18th July 1374.

Petrarch may be considered as the earliest of the great humanists of the Renaissance and the founder of modern classic culture. His passionate admiration for antiquity and the classic authors was no longer that of Dante and the earlier writers, whose erudition was incorporated with the feelings and needs of their own time and stamped with their own individuality. The more contemplative and less original mind of Petrarch lent itself rather to an entire withdrawal from and disdain for all that later times had produced, and his constant effort was to imitate as closely as possible the modes of thought and expression of the great Latin writers. He attained to a surprising purity of style in his Latin works, and the admiration which these writings excited in his contemporaries was boundless. Petrarch himself chiefly founded his claim to posthumous fame on his epic poem *Africa*, the hero of which is Scipio Africanus, and his historical work in prose, *De Viris Illustribus*, a series of biographies of classical celebrities. His other important Latin works are the eclogues and epistles in verse; and in prose the dialogues *De Contemptu Mundi* (or the *Secretum*) and the treatises *De Otio Religiosorum* (written while visiting his brother, who had joined a Carthusian brotherhood) and *De Vita Solitaria* (written at Vaucluse); and particularly important for historical and biographical purposes is the numerous collection of letters divided into *Familiares*, *Varie*, *Ad Veteres Illustres*, *Seniles*, and *Sine Titulo*.

Petrarch was an ardent patriot, but he had little practical influence on the political life of his time. His ideas were those of a poet, and not of a statesman. However great his merits as patriot or student, his name would be little remembered now; it is by his lyrics alone that his fame has lasted for six centuries. His title-deeds to fame are in his *Canzoniere*, in the sonnets, madrigals, and songs written in Italian, almost all inspired by his unrequited passion for Laura, in which the character of the man and the reality of a strong sentiment find their expression. The history

of Petrarch's love presents few incidents; its entire interest is psychological. In these poems we see the picture of a human soul in all its contradictions, pains, and struggles. Such self-analysis was unknown in mediæval writers, and Petrarch has therefore been called the first *modern man*. His last work was an allegorical poem in 'terzine,' *I Trionfi* ('Triumphs'), also in Italian, and is of unequal merit, the only remarkable passages being those which refer to the beginning of the poet's love ('Triumph of Love') and to Laura's death ('Triumph of Death'). Few of Petrarch's lyrics treat of other subjects, but amongst these few are three of his finest efforts—one, the famous address to his country (*Italia mia*), in which he reproaches the Italian princes for their dissensions, and for calling to their aid the mercenary 'barbarians' who were the scourge of Italy, words repeated by Machiavelli in his *Prince*, a century and a half later, and in our own day in the struggle for freedom from Austria; the second (*Spirto Gentil*), which some commentators consider to be addressed to the young Colonna, and others to the famous Cola di Rienzi, whose wild attempt to resuscitate the ancient forms of republican government in Rome had fired Petrarch with enthusiasm; and the third (*O Aspettata in Ciel Beata e Bella Anima*), addressed to his friend Jacopo Colonna, to incite him to join the crusade of Philip of France against the infidels. Petrarch was in constant correspondence with his great contemporary, Giovanni Boccaccio (*Lettere di Boccaccio*, ed. by Corazzini, Florence, 1877), and translated into Latin his friend's tale of Patient Griselda (*De Obedientia ac Fide Uxoraria*). Chaucer alludes to this when he says of his Clerk's Tale:

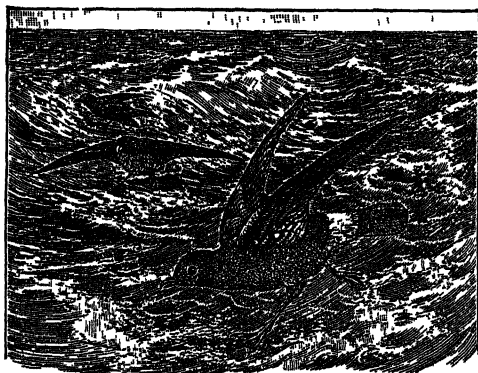
Lerned at Padowe of a worthy clerk,
 Fraunceys Petrark, the laureat poete,
 Eighte this clerk, whose rethorike swete
 Enlumned al Itaille of poetrye.

The earliest complete edition of Petrarch's works is *Francisci Petraracha Opera Omnia* (Basel, 1554, fol.). His Italian lyrics were published as early as 1470 (Venice, 4to), and have since gone through innumerable editions with or without commentary. Marsand's text (Padua, 1819, 4to) was used by Leopardi for his important edition and commentary (Milan, 1826), often reprinted. The letters have been edited by Fracassetti, and partly translated into Italian, with a valuable commentary (Florence, 1859-63-69). There is a concordance by K. Mackenzie (1912). See the Abbé de Sade, *Mémoires de Pétrarque* (1764); Mézières, *Pétrarque* (1868); Koerting, *Petrarcas Leben und Werke* (1878); the little monograph by Henry Reeve (1878); also Gaspary, *Italianische Literatur* (Berlin, 1885); Bartoli, *Letteratura Italiana* (1884); De Sanctis, *Saggio sul Petrarca* (1869); Zumbini, *Studi sul Petrarca* (1878); Symonds, *Renaissance in Italy* (1875-86); books on Petrarch by Baldelli and by Fracassetti, by Robinson and Rolfe (1898), and Hollway-Calthorp (1907); Maud Jerrold, *Petrarca, Poet and Humanist* (1909); E. H. R. Tatham, *Francesco Petrarca: the First Modern Man of Letters: his Life and Correspondence* (vol. i. 1925, vol. ii. 1926).

Petre, an English Catholic family, descended from Sir William Petre, secretary of state in the reigns of Henry VIII., Edward, Mary, and Elizabeth. The most notable member was Edward Petre the Jesuit (1631-99), who shared the captivity of his kinsman Lord Petre in the Tower in connection with Oates's 'Popish Plot.' After his release by James II., he sat in the Privy Council. He was abhorred as James's evil genius, and escaping at the Revolution became rector of St Omer.

Petrel (*Procellaria*), a genus of sea-birds of the family Procellariidae, which includes the albatrosses, shearwaters, fulmars, and petrels proper, but is not near the gulls (*Laridae*). The true petrels, of which there are eighteen widely distributed species, are long-winged birds of powerful

flight; the tail is broad and of medium length; the hind-toe is very small; the claws are narrow and pointed; the bill is short and slender, and the tube-like nostrils are set close together. They are strictly oceanic, and visit coasts and islands only for breeding purposes. The best-known species is the Storm Petrel (*P. pelagica*) or Mother Carey's Chicken (q.v.), which is scarcely larger than a lark, and is the smallest web-footed bird known. The head and back are sooty-black, the wings black, with streaks of white, the under surface grayish black, the bill black, and the feet reddish brown. The name Petrel—a diminutive of Peter—refers to its apparent walking on the water, the lightness of its body enabling it to skim up and down the waves, even in a storm, with only enough motion of the wings to keep the feet from sinking under the surface. Because of its frequent occurrence before or during stormy weather, when the molluscs and other animals upon which it feeds are driven to the surface, and possibly also because of its blackness, it is regarded by sailors as a bird of evil omen.



Storm Petrel (*Procellaria pelagica*).

Its flesh is so oily that the Faeroe islanders, it is said, draw a wick through the body to make a lamp. See FULMAR.

Petri, LAURENTIUS, Swedish Reformer, was born at Örebro in 1499, studied under Luther at Wittenberg, was made professor of Theology at Uppsala, and in 1531 first Protestant Archbishop of Uppsala, and died in 1573. Along with his brother Olaus he was chiefly instrumental in converting Sweden to the Reformed doctrines, and with him superintended the translation of the Bible into Swedish (1541), a work that also helped to fix the language.—His brother **OLAUS**, born at Örebro in 1497, died at Stockholm in 1552, gained, a few years after his return (1519) from Wittenberg, the ear of Gustavus Vasa, who called him to the capital to preach the new doctrines, and eventually made him (1531) chancellor of the kingdom. This post he resigned in 1539, and spent the rest of his life as first pastor of Stockholm. He was a man of bold temperament, great activity, and powerful eloquence, and left several works, including memoirs, a mystery-play, hymns, and controversial tracts.

Petrie, GEORGE (1789–1866), Irish archæologist, born at Dublin, was trained a landscape-painter, but was early attracted by the old buildings of Ireland. In 1833–46 he was attached to the Ordnance Survey of Ireland, and from 1832 he contributed much to the *Dublin Penny Journal*. He wrote on Tara, Irish music, &c.; and his famous *Essay on Round Towers* proved that they were Christian ecclesiastical buildings. See the study by Stokes (1868).

Petrie, SIR WILLIAM MATTHEW FLINDERS, was born at Woolwich, 3d June 1853, and educated privately. His earliest explorations bore fruit in his *Stonehenge* (1880), and he next turned his attention to the pyramids and temples of Ghizeh (book, 1887), subsequently, with the aid of the Egypt Exploration Fund, to the forgotten city of Naukratis, and many Egyptian sites. For forty-two years he excavated in Egypt, besides occupying, from 1892, the chair of Egyptology in University College, London. He has written some sixty archæological works, mainly on Egyptology, on which he is a supreme authority.

Petrograd. See ST PETERSBURG.

Petrography is that branch of geological science which deals with rocks viewed as aggregates of mineral matter. It is a study, therefore, which is carried on chiefly indoors, its object being to ascertain the mineralogical composition, the texture, and other physical characters of rocks, for which various appliances and apparatus are required. Although petrography is properly only a description of rocks, it is hardly possible to describe rocks without reference to their geological relations and mode of origin. Hence by many geologists the term Petrology is preferred as a name for this branch of their science, while others use Lithology in a similar sense. For a general account of rocks from the point of view of their origin, reference may be made to the section Petrology under GEOLOGY.

Petrographers are hardly yet agreed on any particular classification of rocks, not certainly from the want of materials, for a very large number of so-called rock-species have been described. But in the case of the crystalline igneous rocks so many gradations exist between one kind and another that the definition of rock-species is often very difficult. As careful descriptions multiply and comparisons are made it is probable that many of the igneous rocks which flourish at present as species will come to be included as mere varieties of a few well-marked types.

In examining a rock the petrographer notes first those characters which can be seen by the naked eye (*macroscopic characters*), such as its structure (whether *crystalline*, *vitreous*, *compact*, or *clastic*, &c.); its state of aggregation or relative hardness; its colour; its composition; and specific gravity—which may vary from 0.6 among the hydro-carbon compounds to 3.1 among the basalts, the average specific gravity of rocks in general being about 2.5 or a little more. In the case of many coarse-grained rocks, especially those belonging to the derivative division, it is hardly requisite to go beyond a macroscopic examination. But when the rock appears to be homogeneous it is necessary to subject it to closer scrutiny. Thin slices are therefore prepared for microscopic study, after which it is frequently found that the apparently smooth compact mass turns out to be composed wholly or largely either of crystalline or of fragmental materials. Even in the case of rocks which are manifestly crystalline, and the mineral ingredients of which can be determined macroscopically, it is necessary that a microscopic examination should be made. When this is done the rock will sometimes be shown to contain minute crystalline granules and crystals, or small quantities of non-differentiated matter and glass which quite escape the unassisted eye. The minute structure of the various rock-forming minerals is likewise investigated by means of the microscope, and the chemical changes which they may have undergone since the time of their formation are carefully studied. In this way much light has been thrown on the genesis of rocks and the changes which these have subsequently experienced.

Of the minerals known to science comparatively

few are rock-formers; the larger number of these are practically confined to the igneous and schistose rocks, very few entering into the formation of the derivative class. The mineral constituents of the igneous rocks are grouped as *essential*, *accessory* or *adventitious*, and *secondary*. The essential minerals are the most important, as it is upon their presence that the various species of rocks depend. Accessory minerals are accidental ingredients, the presence or absence of which does not affect the specific character of a rock; if sufficiently prominent or remarkable they merely give rise to varieties. Secondary minerals are the products of chemical changes subsequent to the formation of the rock in which they occur—the essential and accessory minerals being *primary* or *original* constituents. Among the more important original constituents of *Igneous* rocks are quartz, feldspars, pyroxenes, amphiboles, biotite, olivine, nepheline, and leucite—the two last named being of less importance than the others. All the minerals mentioned are essential ingredients of some rocks and only accessory constituents in others. Now and again such minerals as muscovite, sodalite, haüyne and nosean, garnet, schorl, and sphene play the part of essential constituents, but they are more commonly met with as accessories. Besides these there are many other adventitious minerals, but only a few need be named—apatite, iron oxides, zircon, rutile, &c. Amongst the secondary minerals and decomposition products in igneous rocks are quartz, calcite, zeolites, iron oxides, chlorite, muscovite, serpentine, epidote, kaolin, &c. The more notable constituents of *Schistose* rocks are quartz, feldspars, micas, amphiboles, chlorite, serpentine, garnet, &c. Less prominent ingredients are andalusite, staurolite, kyanite, magnetite, pyrite, schorl, epidote, &c. The *Derivative* rocks having been formed out of the debris of pre-existing rock-masses, whether igneous, schistose, or sedimentary, it is obvious that they may contain many of the minerals already mentioned. Thus, there are some sandstones composed of quartz, feldspar, and mica—the debris of granite or gneiss. But most of the minerals which aqueous rocks have derived from crystalline igneous and schistose rocks are more or less altered—the feldspars are kaolinised, the micas are reduced to non-elastic scales or folia of a dull gray colour and much diminished lustre, the pyroxenes, amphiboles, olivine, &c., are either unrecognisable or represented by decomposition products. Quartz, as might have been anticipated, owing to its resistance to the chemical action of water and its superior hardness, is the most common mineral constituent of derivative rocks. The clay-rocks consist in large measure of the insoluble residue of the various silicates of alumina and the alkalis and alkaline earths of which igneous and schistose rocks are so largely composed. The readily soluble and readily precipitated minerals calcite, dolomite, rock-salt, and gypsum are also important rock-formers in certain groups of derivative rocks. As binding materials (i.e. the mineral cements which hold the grains of many sedimentary rocks together) we have quartz, chalcedony, opal, &c., calcite, hæmatite, and limonite, dolomite, siderite, &c. The rocks which are mainly composed of organic debris necessarily consist chiefly of calcareous and carbonaceous materials.

For purposes of description rocks may be grouped in the three following divisions: (I.) *Igneous Rocks*; (II.) *Derivative Rocks*; and (III.) *Metamorphic Rocks*.

I. *Igneous Rocks* (q.v.).—Of these there are two series—(a) *crystalline* and (b) *fragmental or pyroclastic*. The crystalline series includes hemi-crystalline and vitreous or glassy rocks, some of the more

important characters of which may be noted. The vitreous rocks usually contain crystallites and microlites, and they often show perlitic and spherulitic structures. Some varieties are highly porous and froth-like (see PUMICE). Others are more or less homogeneous, closely compact, and smooth like bottle-glass; while yet others are markedly porphyritic, usually with crystals of sanidine (see FELSPAR). Although vitreous rocks occasionally occur as independent masses, either in the form of lava-flows or of intrusive sills, dykes, and veins, they more usually appear as the crusts or superficial parts of hemi-crystalline lavas, or as selvages or marginal portions of intrusive hemi-crystalline rocks. They are frequently discharged during volcanic eruptions as loose ejecta—cinders, slags, and scorix. The hemi-crystalline rocks are composed of crystalline minerals and glassy matter in very variable proportions. The crystalline ingredients often show minute inclusions of other minerals (*endomorphs*) or of glass, &c., which have been caught up while the crystal was growing in its molten magma. Frequently also the crystals contain minute cavities which may be empty or filled with some liquid or gas. The holocrystalline rocks contain of course no glass or non-differentiated matter. It is in this class of rocks—many of which are of plutonic origin—that liquid cavities are of most common occurrence in the constituent minerals. In the minerals of hemi-crystalline and crystalline rocks, which have been erupted at or near the surface, liquid cavities are less common. In vitreous, hemi-crystalline, and crystalline rocks alike, the mineral ingredients are not seldom disposed in lines or bands. This is called *fluxion* or *fluidal* structure—the ingredients having arranged themselves in this manner while the igneous rock was fluid and in motion. Although not unknown in some holocrystalline rocks, it is a structure which is more characteristic of the vitreous and hemi-crystalline rocks which have been poured out at the earth's surface as lavas. The appearance of the original mineral constituents of many igneous rocks shows that they did not all separate out from the molten magma at one and the same time. In most cases they belong to two stages in the consolidation of the rock of which they form a part. Thus, in many crystalline and hemi-crystalline rocks, we readily distinguish a crystalline or hemi-crystalline ground-mass, scattered through which occur larger crystals, many of which may be broken and corroded. These latter are believed to have crystallised while the molten rock was still at a considerable depth below the surface. Afterwards, when the molten mass was poured out at or near the surface, and cooled rapidly, the smaller minerals and glassy matter of the ground-mass were formed. Although these two classes of minerals can be seen most clearly in volcanic rocks with a porphyritic aspect, yet even in granitoid rocks evidence of two stages or periods of consolidation can often be detected. The general character of fragmental igneous rocks is discussed under AGGLOMERATE, TUFF, and IGNEOUS ROCKS. Most of the rocks mentioned in the following tables have separate articles assigned to them.

(a) CRYSTALLINE (INCLUDING VITREOUS) ROCKS.

1. Rocks with alkali feldspar as the dominant constituent: granite, quartz-porphry, rhyolite, pitchstone, obsidian, syenite, orthoclase-porphry, trachyte, phonolite.
2. Rocks with soda-time feldspar as the dominant constituent: diorite, andesite, gabbro, dolerite, basalt.
3. Rocks with feldspathoids as the dominant constituents: nepheline-basalt, leucite-basalt.
4. Rocks without either feldspars or feldspathoids: peridotites, limburgite, augite.

(b) FRAGMENTAL OR PYROCLASTIC ROCKS.

Volcanic agglomerate, volcanic breccia, tuff; volcanic sand, ash, and dust, scorix, lapilli, blocks, and bombs.

II. *Derivative Rocks*.—As water has played a

very prominent part in the formation of this great division of rocks, these are frequently termed *aqueous* or *sedimentary*. Such being the origin of by far the greater number, we find that they generally occur in layers or beds, hence the name by which they are also widely known—*stratified* rocks. Some of the members of this division, however, are not of aqueous origin, while others do not occur in beds. But they are all alike in so far as the materials of which they consist have been derived by epigene agents from the degradation of pre-existing rocks, minerals, and organic bodies.

(a) MECHANICALLY-FORMED ROCKS.

1. *Subaerial and aeolian rocks*: soil and subsoil, rock-rubble, rain-wash, &c., laterite, terra rossa, blown sand and dust, some sandstones.
2. *Sedimentary rocks*: conglomerate, sandstone, greywacke, clays (many varieties), shales, mudstones.
3. *Glacial rocks*: rock-debris, moraines, boulder-clay or till, tillite.

(b) CHEMICALLY-FORMED ROCKS.

Stalactites, stalagmites, calc-sinter, some magnesian limestones, rock-salt, gypsum, siliceous sinter, flint, some ironstones.

(c) ORGANICALLY-FORMED ROCKS.

Limestones (many varieties), carbonaceous rocks (peat, lignite, coal, &c.), guano, bone-breccias, coprolites, some ironstones.

III. Metamorphic Rocks.—The commonest rocks in this division are more or less crystalline and schistose or foliated (see FOLIATION). Some metamorphic rocks, however, show faint traces of either crystalline or foliated structure, while others, although crystalline, may be wholly devoid of foliation. Certain types, again, are characterised by *cataclastic* structure—they have been crushed into fragments, and in many cases even pulverised, without acquiring a thoroughly crystalline and schistose structure.

- (a) **SCHISTOSE ROCKS**: schistose conglomerate, quartzite, quartz-schist, clay-slate (numerous varieties), phyllite, mica-schist, chlorite-schist, talc-schist, amphibole-schist, gneiss (many varieties), eclogite, marble, serpentine, &c.
- (b) **CATACLASTIC ROCKS**: mylonites, friction-, crush-, and fault-breccias.

See the larger text-books of Geology, and for greater detail the following works: Hatch, *Text-book of Petrology*; Harker, *Petrology for Students*; Weinschenk, *Grundzüge der Gesteinskunde*; Rosenbusch, *Elemente der Gesteinslehre*. More advanced treatises are the following: Teall, *British Petrography*; Fouqué and Lévy, *Minéralogie micrographique-Roches Éruptives Françaises*; Rosenbusch, *Mikroskopische Physiographie der Mineralien und Gesteine*; Zirkel, *Lehrbuch der Petrographie*; Iddings, *Igneous Rocks*.

Petrol, known also as '680 spirit' (from its specific gravity, '680'), 'motor spirit', 'motorine,' and 'carburine,' is a product, by distillation, of Petroleum (q.v.), largely used in the internal combustion engines of automobile vehicles and aircraft. It is also made of the specific gravity of '700, especially for motors.

Petroleum ('rock-oil'; Lat. *petra*, 'rock,' *oleum*, 'oil'), an inflammable substance, essentially liquid in form, composed of carbon and hydrogen, and found impregnating the rocks of the earth's crust, or as a superficial exudation. In its narrow sense the term is restricted to the liquid phase of the material; but there are gradations both to the solid and gaseous condition, and the term is often used broadly to cover both these variations.

(1) *General History*.—Perhaps some of our earliest references to petroleum are from the Middle East. The ruins of Nineveh and Babylon show that petroleum was in use at the dawn of history; the asphaltic mortar used in their buildings was made from a partially evaporated petroleum, obtained, doubtless, from the springs of Is, on the Euphrates. This is probably the 'slime' of the Old Testament Scriptures (Gen. xi. 3). Herodotus (i. 119; iv. 195), 500 B.C., writes of the springs in the island of Zante, 'I have myself

seen pitch drawn out of a lake and from waters in Zacynthus,' &c. Strabo (xvi. 2) refers to the bitumen found in the valley of Judea, and sold to the Egyptians for embalming. Diodorus describes the same products obtained from a lake in Sicily, and sold for the same uses. Pliny, Plutarch, Aristotle, and Josephus mention the deposit in Albania on the Adriatic Sea. The holy fires of Baku on the Caspian Sea, worshipped for ages by the people dwelling near, and the goal of pilgrimages even from India (see Vigne's *Travels in Kashmir*), have been sustained by apparently inexhaustible petroleum stores. In the Far East there are indications of a very early petroleum industry, both in China and Burma. In the former natural gas was used as a source of heat in the salt-panning trade, while from the latter the old Rangoon oil was a well-known article of commerce long before the modern petroleum industry came into being. This Burma oil was obtained from hand-dug wells near the banks of the Irawadi, and relics of this old industry still exist side by side with the modern derricks at the present day. In Europe there are occasional references to petroleum in early mediæval literature, and the *Ægean asphalt* was a well-known occurrence from which material was obtained for caulking the bottoms of ships. The North American Indians collected what was known as Seneca oil from petroleum springs, and the indications are that long before them the Mound Builders, who worked the copper-mines of Lake Superior, the lead-mines of Kentucky, and the mica-mines of North Carolina, not only gathered the oil coming from natural springs that appeared on streams, but even dug numerous wells in Pennsylvania, Ohio, and Canada, and dipped up the oil that flowed into them. Trees now growing in the earth thrown out in digging the wells, or in the wells themselves, show that the work was done from 500 to 1000 years ago.

(2) *Natural History*.—The question of the origin of petroleum has been the subject of acute controversy, but whereas there is no doubt that hydrocarbons in various forms may have had very diverse modes of formation, yet it is generally agreed that the commercial supplies of petroleum have been formed from organic matter. The old theories of Berthelot and Mendelejef, though interesting, are now no longer held seriously. The organic matter from which the petroleum is produced has been entombed in the sediments and changed into hydrocarbons either practically contemporaneously by bacteriological decomposition or later by destructive distillation. The question whether this organic matter was originally terrestrial vegetation, marine vegetation, or marine animal matter, is still debated. There is a certain amount of evidence favouring the idea that it is its fatty constituents that have given rise to the hydrocarbons, and it is significant that in the few cases where geological evidence is available it should have pointed to diatoms and foraminifera, both of which are known to contain such fatty matter.

Agreeing that hydrocarbons have been formed from the entombed organic matter contained in argillaceous or calcareous sediments, there must ensue a process of migration whereby the oil and gas are driven into the porous sandy or dolomitic strata and there trapped in suitable reservoirs. The forces governing this movement are probably the compaction of the sediments, moving currents of sea-water, the relative density of gas, oil, and water, the vehicular action of gas, changes in temperature, and capillarity. Later, when the rocks are deformed in the folds and fault blocks, the trapped hydrocarbons are redistributed so that the gas and oil are held in the higher portions of

the geological structures and underlain by the salt water. Hence the anticlinal theory of oil occurrences, which states generally that the oil and gas occur on the crests of the anticlines or domes, and that the salt water lies in the contiguous synclines. This sweeping statement needs some reservations, and it is qualified by the known lenticularity of many oil strata, but broadly it is no doubt fundamentally true. There are, however, many oil pools which are not located on anticlines; such structures as geological terraces, monoclinical noses, salt domes, fault blocks, and a number of others are all of importance in determining the localisation of oil pools, while it must be admitted that in certain cases of relatively horizontal beds the localisation of the oil pools is rather a question of the texture of the rock than of actual general structure. In the search for new oil and gas pools the geologist is largely guided by the geological structure of the region, the lithology of the underlying formations, and the superficial oil indications. These latter are really examples of oil or gas escaping from the underground reservoir. They occur in the form of gas, oil, or viscous asphalt. In the form of gas, there are the continuous flows of gas bubbles in running and stagnant water, and the mud volcanoes which form such spectacular features on the landscape in countries like Trinidad and Colombia. The oil usually forms thin films on running streams or pools, and gas and oil are often associated. Often this oil, especially when asphaltic, thickens and hardens on exposure to the surface, and leaves a cake or layer of pitch. The area around the Pitch Lake in Trinidad (q.v.) is an excellent example of such an occurrence.

(3) *The Growth of the Industry.*—Although petroleum has been known from very early times it was not until the refining of the crude material to produce a usable lamp oil was successfully accomplished that any serious progress was made to found the modern petroleum industry. This was first accomplished by a German chemist in the case of the crude Galician oils, and the illumination of the old station at Prague is probably the first instance of the use of refined crude petroleum in industry for illuminating purposes. At approximately the same time the shale industry of Scotland had come into being, and it is interesting that when the Drake well started the flood of oil in America several refineries were already in being in that country which had been originally constructed to deal with shale oils. The Drake well of 1858-59, so called because E. L. Drake was superintendent of the Pennsylvania Rock Oil Company which conducted the drilling operations, was by no means the first oil well in the United States. Many such wells had produced petroleum inadvertently when salt water was looked for, but the Drake well can justly claim that it was the first well which was drilled in the United States intentionally for petroleum. It was drilled in Oil Creek, and after many difficulties, caused by caving sands, it succeeded in striking oil on 28th August 1859. The discovery was followed by a stampede of drilling, and the market was soon glutted. Oil boom followed oil boom. Rapidly expanding oilfields cropped up where previously had been virgin country, and many of these fields disappeared again and are now the home of quiet agricultural activities. New townships rose almost in a night, fortunes were won and lost, and all the evils of a primitive community attended each successive oil boom. In these early days the market, though growing, was limited. The refinery capacity also was limited, and every new field meant a fall in oil prices until the flow had diminished sufficiently or demand had again overtaken supply. This early industry showed in its worst form all the symptoms

of a disease which has attended it ever since. McKean, Warren, Elk, Forrest, Erie, Crawford, Venango, Clarion, Butler, Washington, and Greene counties are only some of the famous oil pools which made the Pennsylvanian fields justly famous. Soon, however, the wild-catter went farther afield. Canada and Ohio were early rivals, but never attained the production in quality and quantity of the Pennsylvanian oilfields. The 20th century saw the wave of production extending westwards. Kansas, Oklahoma, the Gulf States, and California soon became successful rivals, and it was not long before Pennsylvania was left far behind in the race. Nowadays the Mid-Continental field and California account for the main bulk of the oil production in the United States. These two groups of oilfields are responsible for practically half the oil supplies of the world. They are still growing in importance, and it is impossible to say how long this process will last. Other fields also show signs of increase, and the Rocky Mountain oilfields have grown into importance. This rise of petroleum production has been obtained by almost unrestricted wild-cating and competitive drilling, with rapid price fluctuation following each new big oil discovery, yet the demand has continually increased, and supply has had to increase correspondingly. The demand of the automobile industry, which soon over-towered every other demand, has shown no signs of diminution, and indeed the increase of petroleum production and the increase in automobiles in the States have gone hand in hand.

At the same time other countries have joined in the race, and some have attained great importance. In 1900 Russia more than outstripped the United States, and became for a short period the prime producer, to be left hopelessly behind, however, in a few years, when the Mid-Continental oilfields came into being. Mexico, perhaps, has had a more spectacular history than any other oilfield. Few areas can show such phenomenal wells, such rapid growth in output, and, finally, such a sudden check to further growth. The unrestricted flow of oil in this area brought its own Nemesis, for water troubles, elsewhere usually slow in their incidence, were a rapid disturbing factor in Mexico, and in 1922 she received a rude shock. Galicia, Rumania, the Dutch East Indies, Peru, and Burma have all added their quota to the flood of oil, while on the horizon at the present moment loom Persia and Venezuela, both of them countries of large wells, both of them apparently with large untapped resources, and with the possibilities of an ultimate production which may be of primary importance to the world. Meanwhile the United States production has grown and grown. The limits prophesied by scientists to its ultimate production have all been exceeded, and there is as yet no sign of a wane. We have not yet reached a state when increased demand cannot quickly produce an increase of supply, and with the improvement in drilling technique and the application of scientific geological methods in the search for new pools, it is difficult at the moment to say how long this increase will last. Nowadays commercial production can be obtained from 4000 and 5000 feet, and although the cost of such wells is much greater than those of 2000 or 3000 feet, the enhanced supply of oil that is often obtained more than counterbalances the increase in expense.

(4) *Methods of Production.*—The early methods of drilling in China and Burma were by hand-dug wells or by a primitive percussion system. The latter system is the basis of the modern standard system. For this and for the rotary system, see MINING. There are many modifications, particularly of the standard system. In

Canada, for instance, they use ash poles instead of the drilling line, while in Rumania and Galicia these poles are replaced by iron rods. Diamond drilling has been introduced by several oil companies, but largely for exploratory rather than for production purposes. See BORING.

In most oilfields in their early stages of development the oil is under sufficient gas-pressure to drive it up the casing to the surface of the ground, and indeed in some cases the pressure is so great that the oil gets out of control and breaks loose as an oil gusher, often flooding the countryside. Thus the famous Potrero Del Llano No. 4 of Mexico is said to have wasted 8 million barrels, and the La Rosa well of Maracaibo Gulf flooded the countryside with over 1 million barrels of oil in about ten days. Such gushers cause great waste. They often lead to oilfield fires, and their owners may be involved in large claims for compensation. Nowadays the drilling in of a well under such conditions is carried out with great care in order to maintain control of the flow in every phase of the operation. When, however, a field gets old its pressure diminishes, the oil no longer rises to the surface, and it has to be lifted either by means of a bailer, or more usually by means of steam or electric pumps. Of recent years compressed air has been utilised with marked success in maintaining production in deep wells, and in some cases water-pressure has been used to increase production in some of the older fields. However, the introduction of water into an oil sand is an exceedingly dangerous process, and in most cases ruins its production. All oilfields ultimately die down in their productivity, and either the wells change to salt water by the rise of the edge water which surrounds most oil pools, or the oil flow becomes so small as to be hardly worth pumping. It is interesting, however, to note that it is probable that when an oilfield has ceased production more than 50 per cent. of the original oil still remains underground, and one of the problems of the future is how economically to extract this large residuum. It may be even that the oil producer of the future will resort to processes of mining similar to those now carried out at Pechelbronn in Alsace, though many difficulties have to be overcome before such mining methods will be applicable in the larger oilfields.

(5) *Refining*.—Crude oil as obtained direct from the wells varies greatly in its density, colour, viscosity, and volatility. Oils of good quality, such as the Pennsylvanian oils, are usually light brown or green in colour, mobile, volatile, and have a specific gravity about .85. Medium quality oils are darker and more viscous, while the heavy oils are usually dark brown to black viscous liquids, ranging from .9 to 1 in specific gravity, and containing only small quantities of the lighter fractions which are generally most in demand. Other factors governing the value of a crude oil are its asphaltic and paraffinous nature, and the percentage and form of the sulphur-bearing impurities. Most oils have to undergo some process of refinement before they are placed on the markets, though in the case of the poorer asphaltic oils this refinement may be merely for the purpose of extracting the small percentage of the volatile oils, and selling the rest as crude fuel. Further, the process of refinement depends to a large extent on the quality of the oil and the needs of the local market, and the refinery is able to adapt itself to changing conditions by altering its refinery technique and producing variable proportions of refined products. This is well displayed in the increasing proportion of petrol which is now obtained to supply the demands of the automobile industry. Before 1900 the main refined product from crude petroleum was the

kerosene used for illuminating purposes. Nowadays the pivot of the industry is petrol. The process of obtaining these various refined products is primarily dependent on fractional distillation. The crude oil is heated in stills of different sizes and shapes. The most common one adopted is a horizontal cylinder made of iron or steel plates $\frac{1}{2}$ -inch to $\frac{3}{4}$ -inch thick, partly enclosed in brickwork, and heated usually by a fuel oil-burner. An upper outlet carries the vapours over into a long series of pipe or worm condensers, which are either cooled by air or immersed in cool water to get a more efficient condensation. The first products of distillation are the lighter hydrocarbons, which are almost completely volatilised by ordinary temperatures. These form the petroleum-ether portion of the distillates. Then follow in order the various types of petrol, beginning with the more volatile aviation spirits and merging towards the benzine types, which are intermediate products between petrol and kerosene. The illuminating oil distillates are then distilled over, and in this phase of the distillation a certain amount of steam is usually introduced into the still to facilitate distillation at a lower temperature. If the distillation is carried to completion after the kerosene distillate we have various types of gas oils, and should the oil be suitable for the production of lubricating oils, these latter form the final distillates. However, in such cases the final phases of the distillation are usually carried out in some sort of a pot still, and the residual coke is left finally in the pot still, to be extracted mechanically when the latter is cool. The yields of the various products vary greatly according to the grade of the crude, and also according to the different products which the manufacturer finds it most desirable to make. The losses in distillation are usually less than 5 per cent. From the various crude distillates specialised products can be produced by further distillation, but before these distillates are redistilled they are usually treated with sulphuric acid and caustic soda in large vertical stills. These mixing chambers usually have a conical bottom, the oil is charged into the container, the chemical is added in known quantity, and the oil is agitated usually by means of a strong air-blast. The tar produced by the interaction of the acid or the soda on the oil sinks to the bottom, and the purified oil can be removed, when it has separated out from the tar. The distillate so treated is usually washed with water, and is ready for use. The heavy oils left in the primary still after distillation often contain both lubricating oil-stock and a certain amount of paraffin wax. To extract the wax from the heavy oil the residuum is subjected to cooling processes, and is then passed through a filter press, wherein the oil is pressed out of the crystallised wax. The crude wax so obtained is usually re-treated in sweating-houses kept at certain constant temperatures, whereby the paraffins of different melting-points are segregated and purified. The cylinder oil-stock is usually redistributed either under a vacuum or by means of some quite special stills, and is separated into different types of lubricating stocks, which are afterwards blended to produce the lubricants of commerce. To avoid the use of sulphuric acid and caustic soda some refineries utilise various types of absorbents such as bauxite, fuller's earth, and floridin. These materials have the power of extracting the darker particles which discolour oils, and are extremely useful in clarifying various types of lubricants. In general we may divide up the petroleum refineries into four main types, though it is admitted that any such classification is to a certain extent artificial. The first type is the crude, simple refinery, which is often built close to an oilfield. In this case the plant consists essentially

of simple stills, usually of the horizontal boiler type, and the oil is distilled into its three main fractions, petroleum, kerosene, and fuel oils. Though the technique is usually crude, some of these refineries have an enormous through-put, and they depend for their profits on a cheap local fuel, and on the universal demand for petrol. The second type of refinery is the specialised complete refinery, built more usually on the main lines of transport and in close touch with the main markets. Those of the Atlantic sea-board of the United States are good examples. The refineries employ a much more complicated plant. They are built to have a large through-put, they employ a large technical staff, and they differentiate their products in order to produce a large number of specialised distillates, according to the needs of the market. They are essentially the refineries from which the main bulk of the lubricating oil is obtained in commerce; and although they find it difficult with their large overhead costs to compete with the more crude refineries in the production of petrol, they get their profits largely from their concentration on the lubricating oils. The third type of refining plant is called a skimming plant, which is essentially designed to treat a poor crude and obtain from it all its most volatile constituents with the least waste of heat energy. The design of such plants is specialised, but they all attempt to obtain a rapid through-put, and to utilise the cool incoming oil to condense the vapours of the volatile distillate, so that the heat loss is largely reduced by this interchange. Fourthly, we have the cracking processes, of which perhaps the Burton and the Cross are the best known. A heavy fuel oil is destructively distilled at a high temperature and pressure. This causes the breaking up of the molecules into simpler and more volatile hydrocarbons. The paraffins are broken up into olefins and more volatile paraffins, and at a still higher temperature the benzene hydrocarbons are broken up similarly to paraffins and olefins. These cracking plants are largely designed to meet the growing demand for petrol. Their products are a cracked spirit and residual fuel oil with a certain amount of carbon. The cracked spirit is treated chemically to remove its rather disagreeable odour, and is then usually blended with straight-run spirit, and is sold on the market in this intermixed condition. There is no space within the limits of this article to deal with the whole series of by-products, such as greases, waxes, medicinal oil, lamp-black, &c., which are all produced from crude petroleum; but it is sufficient to say that the products of this material can be numbered in hundreds, and enter intimately in all directions into the various needs of modern civilisation.

(6) *Transport and Storage*.—Petroleum is a liquid, and in many of its forms it is highly volatile and inflammable. Hence the transport of the crude and of its refined products has involved special problems, and has had to be done by specialised means. There has grown up, therefore, in the petroleum industry a section dealing only with the transport, and large companies dealing merely with this side of the subject, and commanding an immense capital, have been formed to carry the oil from the oilfields to the markets and to deal with its storage. In the early days the crude was carted in barrels or transported in barges. On the railways crude barrel transport soon gave place to the specially constructed tank-car, but it was in the development of the pipe-line transport that the greatest advance was made. Samuel Van Syckle of Titusville, Pennsylvania, put down the first successful line, extending from Pithole to Miller's Farm, a distance of 4 miles. His pipe-line threatened the old oil transporters with unemployment, and riots followed. The same

trouble occurred when the first pipe-line was constructed from the Caspian to the Black Sea. However, the new system was so economical that it grew by leaps and bounds. Oil can be pumped into a branch line in the Mid-Continental oilfield and appear later at a tank farm on the Atlantic sea-board, over 1500 miles away. The large transporting companies at the same time have constructed immense tank farms for storage purposes. They have become, in fact, the buyers of crude oil, and as buyers their interests have often clashed with the producers'. As a result there have been many economical battles between these two sides of the industry, with serious disturbances in the normal trend of production. A normal pipe-line usually consists of long lines of 4-inch, 6-inch, 8-inch, or 10-inch steel tubing, screwed together by means of collars in 20-foot lengths, and laid either in covered trenches or exposed on the surface of the ground. At intervals of 15 to 50 miles there are constructed pumping-stations, which intercept the oil coming along the pipe and pump it forward at a pressure often as high as 800 lb. to the square inch to the next station. Sometimes, when the crude is exceedingly viscous, the oil is heated in its passage in order to reduce its viscosity. Railway transport is largely concerned with refined products, and the modern tank-car, with its specially built undercarriage and its safety-valves, is one of the best-built units of the freight-train. The convenience of carriage in bulk soon led to the construction of the oil-tanker, a specially built ship with oil storage in large bulkheads, and engines and boilers placed astern. These have grown until the modern types have a capacity of 15,000 to 20,000 tons, and, with the introduction of the semi-Diesel engine, fire-risks have been greatly reduced.

For storage, the modern tank farm, as it is called, is usually a collection of 25,000-barrel or 55,000-barrel steel tanks, built in separate units, each usually surrounded with a small wall. Such tanks, of course, are built in all sizes, but it is found that the 55,000-barrel tank is the most economical. In California immense concrete-lined reservoirs, roofed over with a board or a felted roof, have been built, capable of storing as much as 2,000,000 barrels.

Finally, any short statement of the petroleum industry would be inadequate which failed to draw attention to its self-containedness. It has kept control of every branch of the activities associated with petroleum, and has developed an enormous marketing system which reaches to the most remote parts. From the earth to the consumer seems to have been the ideal of the industry, and in attaining this aim it has built up great organisations like the Standard and the Shell, whose interests are world-wide, and whose activities extend far beyond the obvious rôles of production, transport, and refining. The command of petrol and fuel-oil resources is essential to a nation in time of war, and the clashing interests of various nationalities, all eager for a share in these essential fuel resources, have added one more element to the causes of strife, already far too many.

Pétroleuse, a name given to the women of the French Commune of 1871, because they helped to burn the Tuileries, Hôtel-de-Ville, and other public buildings by pouring petroleum on them.

Petrology. See GEOLOGY, PETROGRAPHY.

Petromyzon. See LAMPREY.

Petronel, an ancient and clumsy pistol.

Petronius, surnamed 'ARBITER,' from his supposed identity with the Gaius Petronius whom Tacitus calls 'arbiter elegantie' at the court of

Nero, is generally believed to be the author of the satirical romance or collection of satires of which the 15th and 16th books have, though in a fragmentary state, come down to us. The work seems to have been a novelty in Latin literature, consisting of prose and verse, and depicting the licentious life in Southern Italy of the upper or moneyed class. Its artistic merit is great, in strength of portrayal and colour anticipating Zola, with a vein of humour as original as it is refined, though the coarseness underlying is very patent. Bücheler and Friedländer, its best editors, Cesareo and Collignon, amongst recent critics, support the long-prevalent view that its author was no other than the Petronius above referred to—a pro-consul of Bithynia and afterwards consul, a past master in all the arts of the voluptuary, the aider and abettor of Nero and the *jeunesse dorée* of the 1st century in every form of sensual indulgence. The favour he enjoyed at court aroused the jealousy of another confidant of the emperor's, Tigellinus, who had influence enough with their common master to procure his disgrace and banishment. He had proceeded as far as Cumæ, when Nero's casual presence in Campania precipitated his determination to destroy himself. True to the cynical side of his philosophy he set about his suicide in the most leisurely fashion, so as to glide out of existence 'without indecent haste.' He opened his veins at intervals and then rebanded them, discoursing the while not on immortality or the hollowness of life, but on the gayest of topics, and listening to songs and *vers de société* when not transacting business or taking a siesta. Shortly before expiring he drew up, signed, sealed, and sent to Nero a summary of the tyrant's amours and excesses, much of which is supposed to have been embodied in his satires. The *Satyricon* of Petronius, of which the *Cena Trimalchionis* is the chief piece, gives a vivid picture of the 1st century on its seamiest side, and in style touches the high-water mark of silver-age Latinity.

See editions by Bücheler (1904), Friedländer (1890), and Heseltine (with translation, 1913); Collignon's *Étude sur Petronius* (1892); J. M. Mitchell, *Petronius Leader of Fashion* (transl. and notes 1924).

Petropavlovsk, a town of western Siberia, on the river Ishim and the Siberian railway, 190 miles WNW. of Omsk; pop. 36,000.—PETROPAVLOVSK KAMCHATSKY, in Kamchatka (q.v.) has an admirable harbour.

Petropolis, a town of Brazil, 25 miles N. of Rio. It was originally a colony of Germans (1845), and was capital of the state of Rio de Janeiro in 1894–1903. Its hill scenery and climate attract Rio people in summer. Pop. about 30,000.

Petrovsk, a town of Russia, 65 miles NW. of Saratov, on the tributary of the Don. Pop. 20,000.

Petrozavodsk, renamed KALININSK, capital of Karelia, on the western shore of Lake Onega, 300 miles NE. of St Petersburg. Peter the Great started an iron-work in 1703. Pop. 14,000.

Petrus Alfonsus. See FABLES.

Petsamo (Russ. *Petchenga*), an ice-free Arctic port of Finland, in a tongue of territory ceded by Russia in 1920, whereby Russia is now cut off from contact with Norway.

Pettenkofer, MAX VON, chemist, was born near Nennburg on the Danube, 3d December 1818; studied at Munich, Würzburg, and Giessen; and in 1847 became professor of Chemistry at Munich. He made many valuable contributions to science on subjects as various as gold-refining, gas-making, ventilation, clothing, the influence of soils on health, epidemics, and hygiene generally. His

Handbuch der Hygiene (1882) was famous. He resigned in 1894, and shot himself 10th February 1901.

Pettie, JOHN, painter, was born at Edinburgh, 17th March 1839, was brought up at East Linton, studied art at Edinburgh, and died at Hastings, 21st February 1893. 'The Prison Pet' was exhibited at Edinburgh in 1859, and 'The Armourers' at the Royal Academy in 1860. But the first work which showed his characteristic qualities of strong imaginative grasp of his subject, effective composition, and vigorous treatment was the 'Drum-head Court-martial' (1864). Among the hundreds of later pictures, including portraits, may here only be named 'An Arrest for Witchcraft' (1866), 'Scene in the Temple Gardens' (1871), 'Juliet and Friar Laurence' (1874), 'The Death Warrant' (1879), 'The Vigil' (1884), and 'The Chieftain's Candlesticks' (1886). Pettie was elected A.R.A. in 1866, and R.A. in 1873. See his *Life and Paintings*, by Martin Hardie (1908).

Petty, SIR WILLIAM, a man of singular versatility, best known as a political economist, was born at Romsey in Hampshire on 26th May 1623, and educated partly at Caen, partly at the universities of the Netherlands, and at Paris. His versatility and talent are evidenced by the positions he successively held, and the subjects he interested himself in: he taught anatomy and chemistry at Oxford (1648), and was made professor of Anatomy there (1651); was professor of Music at Gresham College, London; was physician to the army in Ireland (1652), executed a fresh survey of the Irish lands forfeited in 1641, started ironworks, lead-mines, sea-fisheries, and other industries on estates he bought in south-west Ireland; was secretary to Henry Cromwell when he was lord-lieutenant of that island; was made surveyor-general of Ireland by Charles II., who knighted him; invented a copying-machine (1647) and a double-keeled sea-boat (1663); and in early life took much interest in education. In political economy he claims a place as one of the most important precursors of Adam Smith, on the strength of his *Treatise on Taxes and Contributions* (1662) and his *Political Arithmetic* (1691), the latter a discussion of the value of comparative statistics. He died in London on 16th December 1687. His *Economic Writings* were edited by C. H. Hull (1899).

Petty Bag Office, one of the branches of the Court of Chancery, was abolished in 1874.

Petty Officers in the Navy hold a similar rank and position to the non-commissioned officers in the Army. They are the backbone of the service, as the efficiency, smartness, and morale of a ship's company depend in no small measure upon the zeal and discretion of the petty officers. They are now a most highly trained and valuable body of men, and all the warrant-officers and some commissioned officers are drawn from their ranks. They are divided into three classes—viz. chief petty officers, petty officers, and leading seamen—and into seven branches—military (seaman class), engineer, artisan (shipwrights, plumbers, armourers), medical, accountant (ship's stewards and writers), regulating (ship's police), officers' stewards. A chief petty officer can only be disgraced with the sanction of the commander-in-chief, and in the case of a chief engine-room artificer his disgracing must be specially reported to the Admiralty, and he can only be restored to his rank by Admiralty order. All other petty officers can be appointed or disgraced by the captain of the ship, except in the case of gunnery or torpedo instructors, who are rated as such for their special qualifications in the gunnery and torpedo schools. See WARRANT-OFFICERS.

Petunia, a genus of plants of the natural order Solanaceae, natives of the warmer parts of America. They are herbaceous plants, very nearly allied to Tobacco,



White Petunia.
(*Petunia nyctagyniflora*).

and with a certain similarity to it in the general appearance of the foliage, which has also a slight viscosity, and emits when handled a disagreeable smell; but the flowers are very beautiful, and varieties improved by cultivation are amongst the favourite ornaments of British greenhouses and flower-borders. The petunias, although perennial, are very often treated as annuals, sown on a hotbed in spring, and planted out in summer, in which way they succeed very well even in Scotland. They are tall plants, with

branching weak stems, and may readily be made to cover a trellis. Though, when treated as greenhouse plants, they become half-shrubby, they live only two or three years. The name is from the Tupi *Petun*. The first petunia was introduced into Britain in 1831. There are now many garden varieties with double flowers, individually more durable than the single-flowered kinds.

Petuntze. See FELSPAR, POTTERY.

Petworth, a market-town of Sussex, on an eminence near the West Rother River, 14 miles NNE. of Chichester. Petworth House (18th century) has a fine park and many portraits and other relics of the Percies and Wyndhams.

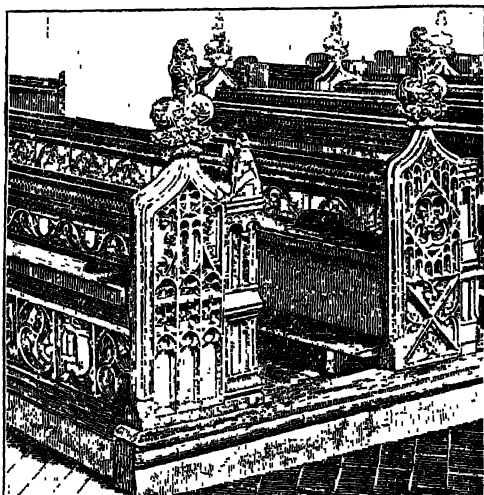
Peucedanum. See DILL, PARSNIP, SULPHUR-ROOT.

Peutinger, CONRAD (1465–1547), a scholarly citizen of Augsburg, and keeper of the archives. He published a series of Roman inscriptions; and at his death the so-called *Tabula Peutingeriana* was in his possession, in course of being prepared for publication. This remarkable Itinerary (q.v.) is really a Roman map of the military roads of the 3d century A.D., though his copy was probably a 13th-century one. The document was sold by his family, bought by Prince Eugene in 1714, and is now in the National Library at Vienna. It was edited and published by Scheyb (1753), Mannert (1824), and Desjardins (1869).

Pevensey, a village of Sussex, stands on the English Channel, 12 miles by rail W. by S. of Hastings. The Romans built here a castle, whose walls enclose a Norman keep. The church is Early English. William the Conqueror landed on the shore of Pevensey Bay. An ancient borough and 'limb' of the Cinque Ports, Pevensey had a mayor and corporation till 1886.

Pews (anciently *pues*; Old Fr. *puyes*; Dutch *puyes*; Lat. *podium*, 'anything to lean on'—*s'appuyer*), enclosed seats in churches. Church-seats were in use in England some time before the Reformation, as is proved by numerous examples still extant, the carving on some of which is as early as the Decorated Period—i.e. before 1400 A.D.; and records as old as 1450 speak of such seats by

the name of *pues*. They were originally benches, usually facing east, with partitions of wainscoting about three feet high, and ends of the width of the seat, panelled or carved; these ends often rising above the wainscoting, and ending in fleurs-de-lis or 'poppy-heads,' as shown in the illustration.



Pews, Fressingfield Church, Suffolk.

The benches here are in Fressingfield Church, Harleston, Suffolk, and date from the later half of the 15th century. The back of the one in the engraving is quite a 'poor man's Bible,' being carved with the emblems of the Passion, from the cock crowing to the seamless coat. In later times pews grew into large and high enclosures, containing two or more seats, lined with baize, and fitted with doors, desks, and cushions; but these will soon have all been swept away in England under the influence of the restoration movement and of the Free and Open Church Association founded in 1865 for the abolition of appropriated seats. Pews were early assigned to particular owners, but at first only to the patrons of churches. A canon made at Exeter, in 1287, rebukes quarrelling for a seat in church, and decrees that none shall claim a seat as his own except noblemen and the patrons. Gradually, however, the system of appropriation was extended to other inhabitants of the parish, to the injury of the poor, and the multiplication of disputes.

The law of pews in England is briefly this. All church-seats are at the disposal of the bishop, and may be assigned by him, by faculty, to persons owning property in the parish. Long occupation may give an owner of property a prescriptive title to a pew. Subject to rights acquired by faculty or prescription, the churchwardens are required to find seats for the parishioners, according to their degree; they may assign a pew to a parishioner, but the right thus conferred may at any time be recalled. In new churches pews may be assigned and pew-rents levied under several acts of parliament. See Dale's *Clergyman's Handbook*. It appears that by common law every parishioner has a right to a seat in the church, and the churchwardens are bound to place each one as best they can. The practice of letting pews, except under the church-building acts or special local acts of parliament, and, much more, of selling them, has been declared illegal.

In Scotland pews in the parish churches are assigned by the Heritors (q.v.) to the parishioners, who have accordingly the preferable claim on them; in towns the practice is to let them annually. As

is well known, pews in dissenting churches are rented as a means of revenue to sustain general charges. In some parts of the United States pews in churches are a matter of annual competition, and bring large sums. In England, there has been some discussion as to the injudicious exclusive character of the 'pew system,' and in many churches the open seats or chairs are unappropriated and free to all. In a good many Ritualistic churches the sexes are divided. In Catholic churches abroad pews are seldom seen.

Pewter, a common and very useful Alloy (q.v.) of tin and lead. It was once largely used for making mugs, plates, and the like; but the poisonous character of the lead brought it into disfavour, and some governments prohibited its use. Old pewter is now prized by collectors.

Pézenas, a town of France (dept. Hérault), on the river Hérault, 32 miles SW. of Montpellier; pop. 7000.

Peziza, a large genus of Discomycete Fungi (q.v.), growing on decaying wood and elsewhere. Its often brightly coloured cups may be stalked or sessile. *P. Willkommii* is the cause of larch canker. *P. aeruginosa* on dead oak branches stains the wood green.

Pfäfers, hot springs in the canton of St Gall, Switzerland, in the deep and gloomy gorge of the Tamina torrent, which joins the Rhine at Ragatz, 2½ miles to the north. They were discovered towards the middle of the 11th century, and have been used ever since. Patients used formerly to be let down by ropes, but they can now approach by a good road. The water (97° F.) is conducted in pipes to Ragatz, though there are bath-houses (1704) in the ravine. Near the village of Pfäfers, which stands above and outside the ravine, is a Benedictine abbey, founded in the 8th century, but converted into a lunatic asylum after its dissolution in 1838.

Pfalz, the German name for the Palatinate (q.v.).

Pfalzburg. See PHALSBURG.

Pfitzner, HANS, German conductor and composer, born at Moscow, 5th May 1869. He has taught and conducted at Coblenz, Mainz, Munich, Berlin, and Strasburg. Somewhat Wagnerian in spirit, he has composed operas (*Der arme Heinrich*, 1895; *Die Rose vom Liebesgarten*, 1901; *Palestrina*, 1917), and many pieces for orchestra, strings, and voices. He has also written books on musical subjects.

Pfleiderer, OTTO, a great philosophic theologian of Protestant Germany, was born at Stetten, near Kannstadt, 1st September 1839; studied under Baur, at Tübingen, from 1857 till 1861, and next paid a visit of study to England and Scotland; became pastor at Heilbronn in 1868, and superintendent at Jena in 1870, an office which in the same year he exchanged for the chair of Theology there. In 1875 he was called to be professor of Systematic Theology at Berlin. In New Testament criticism Pfeleiderer belonged to the critical school which grew out of the impulse given by Baur. But he was not the less an independent thinker, acute, suggestive, and profoundly learned. He died 20th July 1908.

His brother, EDMUND PFLEIDERER (1842-1902), born at Stetten, studied at Tübingen, and after a short experience as a pastor was made professor of Philosophy at Kiel in 1873, whence he was called to Tübingen in 1878.

Pforzheim, the chief manufacturing town of Baden, stands at the northern border of the Black Forest, 20 miles SE. of Karlsruhe by rail. It contains the remains of an ancient castle, from 1300 to 1565 the residence of the Margraves of

Baden-Durlach, and was the birthplace of Reuchlin. The town is famous for the manufactures of gold and silver ornaments, and has further chemical and iron works, machine-shops, tanneries, paper and other factories. There is a trade in timber, cattle, ornaments, &c. The town was burned by the French in 1689. Pop. (1871) 19,801; (1900) 43,351; (1925) 78,859.

Phædrus (or PHÆDER, according to some scholars), author of a translation of Æsop's fables in Latin verse, was, by his own account, a Macedonian, who from his childhood was imbued with Greek culture. While still young he came to Italy, and in Rome or some other city attended school where he studied Ennius, whom he quotes in the epilogue to his third book. From the title of the entire work, *Phædri Augusti Liberti Fabulæ*, it appears that from a slave he became the freedman of Augustus, either the first of that name or his successor Tiberius. Under the reign of this latter he published the first two books of his fables, but his biting though veiled allusions to the tyranny of the emperor (in the fable of the frogs asking a king) and to his minister Sejanus (in that of the jay dressed in peacock's plumage) caused him to be hated at court, then accused, and finally condemned—to what punishment is unknown. On the death of Sejanus he resumed publication, and dedicated his third book to one Eutychus, freedman of the Emperor Claudius, counting his protection from enemies and accusers. In the last years of his life, to which the fourth and fifth books belong, he seems to have regained liberty of pen as well as of person. He died probably at an advanced age. Phædrus was more than he claims to be—a reproducer of Æsop; he invented fables of his own, and gave an Æsopic turn to contemporary events. That the five books traditionally ascribed to him are his cannot without large deductions be maintained—not a few of them may be of the same authorship as the *Fabulæ Novæ* commonly added as an appendix to the five books, and found in an anthology attributed to Nicola Perotti, a scholar of the 15th century. The merits of Phædrus are his clear succinct narrative, his pure Latinity, and his skill in versification. There is a good edition by Postgate (1922).

Phæthōn ('the shining'), in the writings of Homer and Hesiod, a frequent title of Helios the sun-god, and subsequently employed as his name.—Phaethon, in Greek mythology, is also the name of a son of Helios, famous for his unfortunate attempt to drive his father's chariot. Scarcely had the presumptuous youth seized the reins, when the horses, perceiving his weakness, ran off, and, approaching too near the Earth, almost set it on fire. Whereupon the Earth cried to Zeus for help, and Zeus struck down Phaethon with a thunderbolt into the Eridanus or Po. His sisters, the Heliades, who had harnessed the horses of the Sun, were changed into poplars, and their tears into amber.

Phagedæna. See ULCERS.

Phagocytes, amœboid cells which devour intruding microbes and other cells, or ingest irritant particles, or carry disintegrated nutritive material from one part of the body to another. They are found in almost all multicellular animals from sponges to mammals; and in backboneed animals they are particular kinds of white blood corpuscles or leucocytes, which are able to leave the blood-vessels. They are active in inflammation, which is an attempt to deal with invading microbes or poisoning or other abnormal conditions; they sometimes take part in the metamorphosis of an animal, or in the regeneration of a lost part, or in degenerative processes. The manifold rôle of phagocytes was first made clear by the researches

of Metschnikoff, and it is interesting to notice that it was his pupil Bordet who discovered the complementary rôle of the serum of the blood in destroying bacteria. See BLOOD.

Phaistos. See CRETE.

Phalacrocorax. See CORMORANT.

Phalanger, a group of small arboreal marsupials, of which many species are found in Australia and the islands to the north of it. All the species have long, prehensile tails, and many grasp their food and convey it to the mouth with their forepaws. They feed usually on the young shoots and leaves of the trees in which they live, but in captivity they do not refuse animal food. Phal-



Vulpine Phalanger.

anger (*Phalangista*) is a book name, 'opossum' being the (inaccurate but) popular appellation; the common opossum of Australia being *Trichosurus vulpecula*. The cuscus is a true phalanger. The Dormouse Phalanger (*Dromicia nana*), which is only six inches in length, resembles the common dormouse in habits and appearance. Closely allied are the Flying Phalangiers. See FLYING ANIMALS. The Wombat and Koala belong to kindred groups.

Phalanstère. See FOURIER.

Phalanx, the ancient Greek formation for heavy infantry, was a series of parallel columns standing close one behind the other, the whole owing to its depth and solidity capable of penetrating any line of troops. The oldest phalanx was the Lacedæmonian or Spartan, in which the soldiers stood four, six, or, more generally, eight deep. The arms of the men were swords, shields, and long pikes or spears.

Phalaris, tyrant of Agrigentum, in Sicily, who flourished about the middle of the 6th century B.C., was born on a small island near Cnidus, in Asia Minor, and whilst building a temple in the citadel of Agrigentum made himself master of the city. He greatly embellished it, and extended his power over large districts in Sicily. But after holding power for sixteen years he was overthrown, for his cruelties, by noble families of the island, and roasted alive in his own invention, the brazen bull. The tradition points probably to the religious sacrifice of human victims to Baal or Moloch (q.v.). Later ages represent Phalaris as a humane and enlightened ruler. But the 148 letters bearing his name were proved by Bentley (q.v.) in 1697 and 1699 to be spurious, and to have been composed several centuries after Phalaris died. See Bentley's *Dissertation*, edited by W. Wagner (Lond. 1883).

Phalarope (*Phalaropus*), a genus of wading-birds, related to sandpipers, dunlin, redshanks, and the like, noteworthy for the foot-like toes with lobed webs suited for both swimming and running, and for the fact that the female courts the male, who is of duller plumage, and the male performs most of the duties of incubation. The beautiful Red-

necked Phalarope (*P. hyperboreus*) is a rarity in Britain, still nesting in the Shetlands, Orkneys, and Outer Hebrides, breeding plentifully in the Far North. The Grey Phalarope (*P. fulicarius*) is a winter visitor to Britain; it breeds in the Far North, both in Eurasia and America.

Phallus, the Greek term for the symbol of generation which figures in the rites and ceremonies of most primitive peoples, and appears as a survival amongst civilised peoples. At the time when Mythology (q.v.) was universally considered to contain the teaching of ancient sages couched in the form of allegory, and everything in mythology was considered to be 'symbolical' of some profound and hidden truth, phallic worship was naturally conceived to conceal some esoteric teaching as to the mystery of the transmission of life. But this view of mythology is dissipated by an examination of the manner of life and mode of thought of those savage peoples in whom the scientific observer recognises primitive man. The savage leads not a speculative but a practical life, and his rites and ceremonies are practical. He lives in the midst of dangers, which as a practical man he wishes to avert; he has a variety of needs, which as a practical man he wishes to satisfy. Amongst the most important of his needs is the need of fruitful flocks, of fertile fields. Amongst the means which he employed to secure fertility were some which we should discriminate as magical, though probably to him they originally seemed to be not more supernatural or less rational than ploughing. Thus, it was proved to demonstration by Mannhardt (*Baumkultus*) that one of the beliefs most widely spread amongst primitive men is the belief in a spirit of vegetation. The tree is regarded first as having life like a man, then as being the abode of a spirit, and finally the spirit ceases to be permanently attached to the tree. The savage has special means for promoting the vigour, for preventing the decay, for averting the displeasure of these spirits on whom the fertility of his crops depends. These various means are usually of the nature of what has been termed 'sympathetic magic.' When the savage wishes flocks to multiply, his 'sympathetic magic' inevitably takes the form of a ritual which to us may seem obscene, but is to him as harmless and necessary as the act of generation itself.

Phallus, a genus of fungi. See FUNGI.

Phalsbourg, or PFALZBURG, a town of Lorraine, stands on the north-west shoulder of the Vosges, 25 miles NW. of Strasburg. It was fortified by Vauban in 1680; invested, but not taken, by the Allies in 1814-15; and bombarded and taken by the Germans in 1870, after which they razed the fortifications. It was the birthplace of Erckmann, and is widely known through *Le Blois* and others of the Erckmann-Chatrian novels. Pop. 4000.

Phanariots. See FANARIOTS.

Phanerogamia, or SPERMAPHYTES, are those plants which produce seeds. For the differences and the resemblances between the flowering and seeding of Phanerogams and the reproduction of Cryptogams, see CRYPTOGAMIA, FLOWER, GYMNOSPERMS, SEED. The group includes the following sets of plants: A. Gymnosperms (q.v.), with naked ovules—e.g. conifers; B. Angiosperms (q.v.), with ovules enclosed in ovaries: (1) Monocotyledons (q.v.), with one cotyledon—e.g. lilies, grasses, orchids; (2) Dicotyledons (q.v.), with two cotyledons—e.g. buttercups, roses.

Pharaoh, the English spelling of the name given by the Hebrews to the monarch ruling in Egypt at the time, sometimes as if it were a proper name, though really an official title (from the

Egyptian *Peraa* or *Phouro*). The greatest difficulties have been encountered in attempting to determine the particular monarchs who pass under this name in the Scriptures. See EGYPT.

Pharisees (*Perashim*, 'separated'), a so-called 'Jewish sect,' more correctly a certain Jewish school, which probably dates as a distinct body or party from the time of the Syrian troubles, and whose chief tendency it was to resist all Greek or other foreign influences that threatened to undermine the sacred religion of their fathers. They most emphatically took their stand upon the Law, together with those inferences drawn from its written letter which had, partly from time immemorial, been current as a sacred tradition among the people. They originated as the Chasidim (q.v.), and became known as Pharisees in the time of John Hyrcanus (see MACCABEES). Principally distinguished by their most scrupulous observance of certain ordinances relating to things clean and unclean, they further adopted among themselves various degrees of purity, the highest of which, however, was scarcely ever reached by any member of their community. For every degree a special course of instruction, a solemn initiation, and a novitiate was necessary; all of which, together with a certain distinction in dress, seems to have been imitated from them by the Essenes (q.v.). The name of Pharisees or Perashim was probably at first bestowed upon them in derision by the Sadducees or Zadokites, the priestly aristocracy and their party, who differed from them politically, and to some extent also in religious matters. The Pharisees had no articles of creed different from the whole body of Jews. The Bible, as interpreted by the traditional Law, was their only code. Obedience to this Law, strictest observance of all religious and moral duties, submission to the Divine will, full confidence in the wisdom and justice of Providence, firm belief in future reward and punishment, chastity, meekness, and forbearance—these were the doctrines inculcated in their schools. They were, in fact, nothing more nor less than the educated part of the people, who saw in the rigid adherence to the ancient religion, such as it had developed itself in the course of centuries, the only means of saving and preserving the commonwealth, notwithstanding all its internal and external troubles. Hence they wished the public affairs, the state and all its political doings, to be directed and measured by the standard of this same Divine Law; without any regard for the priestly and aristocratic families, the Sadducees (q.v.), and the heroes and sagacious statesmen, who had brought the Syrian wars to a successful issue, and had, by prudent negotiations with other courts, restored the nation to its former greatness. The latter held that religion and state were two totally different things; that God had given man the power of taking his matters into his own hands; and that it was foolish to wait for a supernatural interference, where energy and will were all that was required.

Naturally enough, the political difference between the two parties by degrees grew into a religious one. And the more the Sadducees lost their influence (the people siding with the Pharisees), the more the religious gulf must have widened between them; although the divergence between them, as far as our authorities (Josephus, the New Testament, and the Talmud) go, does not seem to have been of so grave a nature as is often assumed. Thus, the Pharisees assumed the dogma of immortality; while the Sadducees held that there was nothing in the Scripture to warrant it, and, above all, that there was no need of any future reward. While the Pharisees held all the traditional ordinances in equal

reverence with the Mosaic institutions, the Sadducees rejected, or rather varied some of these according to the traditions of their own families: these ordinances chiefly relating to priestly and sacrificial observances, certain laws of purity, and some parts of the civil law. It may perhaps even be assumed (as by Geiger) that the Pharisees were the representatives of a newer Halacha, inspired by an oppositional and religious and national zeal which carried them far beyond the original boundaries. Certain other legal differences between the two parties, such as the application of the laws of inheritance to daughters, or of the responsibility of the master for his servants, are nothing more than political party-views in a religious mask, which were meant to meet certain special isolated cases only. In general the Pharisees handled justice in a much milder manner than their antagonists, who took their stand upon the rigid letter, and would hear of no mercy where a violation of the code was clearly made out. Out of the midst of the Pharisees rose the great doctors and masters of the Law (Heb. *shoferim*; Gr. *nomodidaskaloi*, 'teachers of the law,' usually rendered 'scribes'), and to them were entrusted by the later rulers the most important offices. The greatest misconception has prevailed even among scholars respecting this patriotic, pious, learned, and national party of progress. That there were among them those who were a disgrace to their party none knew better than the Pharisees themselves; and, in bitterer words than were ever used by Christ and the apostles, the Talmud castigates certain fanatical members of their own community as the 'plague of Pharisaism.' Pharisaism—from which gradually branched off the wild democratical party of 'Zealots' (*Kannaim*) in the revolution of Bar Cochba (q.v.)—has, from the final destruction of the commonwealth to this day, remained the principal representative of Judaism as a creed.

The Pharisees were essentially the popular party—that is to say, they were of the people and for the people. Their views of life, reflected in their parables, legislation, and politics, make this abundantly clear. They were the party of progress, and it was their aim to render life under the Roman yoke compatible with fidelity to Judaism, and Judaism not too hard a sacrifice for its adherents. Thus, while the *Lex talionis* had probably never been observed for centuries, Pharisaic ordinances fixed the principle of compensation as henceforward paramount. Similarly, the enactment of the *Probul* was a great concession to the agricultural classes. The Pharisaic legislation aimed at preserving principles while modifying practices. To the Pharisees, inward religion and the fatherhood of God were fundamental; brotherly love was held to extend to the widest limits, including an almost unrestricted universalism, a belief which was complementary to that of the choice of Israel for the Law and Divine Mission. Naturally, a party which existed so long, and which underwent such striking vicissitudes, contained diverse elements, and verdicts on the Pharisees are often vitiated by stressing exceptional and extreme members and regarding them as typical. Pietists in all ages and in all religions have suffered in the same way. To-day secularists and newspapers of a certain class habitually pillory a professional clergyman who is convicted of a felony, or a man who, noted for outward religious observances, is discovered secretly to have committed a breach of social or moral law. Yet generalisations drawn from such isolated instances are recognised as devoid of value, and are usually based on ignorance, if not on malice. To a very great extent the Pharisees have suffered from similar misconceptions. The Pharisees who 'act like Zimri and await the

reward of Phineas' (*Sofah*, 22b), the 'shoulder' Pharisees (who wear their good deeds on their shoulder, in ostentation), the 'wait-a-while' Pharisees (who say, 'Wait while I do this good deed'), the 'bruised' Pharisees (who bruise themselves against a wall in their haste to avoid passing a woman), and other classes are as sternly castigated in the Talmud as in the Gospels. [See *Aboth de R. Nathan*, ed. Schechter, pp. 55, 62.] Yet this is but a part of the picture, and a small part. Jesus does not praise the true Pharisees, because such praise was self-evident and unnecessary in his day; at the present time some corrective is required because his denunciations have been misinterpreted and applied to the whole instead of to the minority. Thus writers, who ought to know better, charge the Pharisees with exclusiveness, forgetting their eagerness to traverse land and sea in order to make one proselyte. The Pharisees exerted themselves to bring the world under the wings of the Shekhinah; yet, because of their uncompromising opposition to idolatry and all thereby implied, they have been styled particularists. Naturally among the Pharisees there were some who loved Rome and Greece, who appreciated classical literature, art, and institutions, and who formed friendships with non-Jews. Equally naturally there were Pharisees to whom anything extra-Palestinian was hateful. It must be remembered that, for this attitude, environment was largely responsible. When Greek culture was exhibited merely by the sensuality of Antioch, when Roman institutions were exemplified by the gladiatorial conflicts, can it be regarded as surprising that rabbis warned their disciples against such a course of life as these examples represented? On the other hand, Pharisees who saw Rome and Greece at their best were not slow in expressing their appreciation.

In recent days, Graetz, the pioneer of modern Jewish historians, writing for a generation newly emerged into academic freedom, consequent upon the enlargement of the ghetto so largely due to Napoleon, takes too little note, perhaps, of the effect of Christianity. But Graetz was writing for Jews who had to be taught that they too possessed a history, and that there was such a thing as 'the science of Judaism.' The master work of Graetz, if it can be said to possess a shortcoming, errs on the side of concentration of Judaism; it has been described as 'Judaocentric.' But the work of the Christian school in Germany is vitiated by more serious faults. Schürer's gigantic and learned work (*History of the Jewish People in the Time of Jesus Christ*, Eng. trans. 1886-90) contains numerous mistakes, always to the detriment of the Pharisees, never to their credit. These were pointed out by the late Dr I. Abrahams in his presidential address to the Oxford Society of Historical Theology (*Jew. Quart. Rev.* xi. 626). Yet they persisted in the second edition. The cause of their bias is a pre-judgment of the issue or, more directly, the error of regarding Pharisaism as a foil to the Gospels, an error equally detrimental to a due appreciation of either. This error is characteristic of certain other scholars, such as Weber, whose book is described by Travers Herford (*Pharisaism*) as 'mischievous' (p. 77), 'abounding in flagrant misrepresentation' (pp. 125-26), though it contains 'much that is extremely valuable to those who know how to use it' (p. 235). This verdict, *mutatis mutandis*, applies to Bousset, and is reflected in such works as Glover's *Conflict of Religions in the Roman Empire*. To gain a correct idea of the Pharisees, and a true and balanced opinion of their merits and demerits, the reader is referred to the works of Travers Herford, Strack and Billerbeck, Wünsche, Box, Oesterley, Lukyn Williams, Danby, Foakes-Jackson, Lake,

C. G. Montefiore, I. Abrahams, and Schechter. The articles in *Ency. Brit.*, Hastings's *E.R.E.*, and *Jew. Ency.* (and their bibliographies) will serve to supplement the information given above, and lead the student further into a study of the subject. An account of a rival (?) sect may be read in Schechter's *Jewish Sectaries* (Camb. 1910), and a new theory of the relation of Pharisees and Sadducees in Gaster's *Schweich Lectures on The Samaritans* (Oxf. 1926).

Pharmacopœia. This term has been applied to various works, consisting for the most part of (1) a list of the articles of the *Materia Medica*, whether simple or compound, with their characters, their modes of preparation, and the tests for the determination of their purity; and (2) a collection of approved receipts or prescriptions, together with the processes for preparing articles in the *Materia Medica*. Almost every civilised country of importance has its pharmacopœia; those of the United States, Germany, and France deserving special mention. The earliest pharmacopœias were prepared by the Arabs from the 9th to the 12th century, and subsequently by the medical school of Salerno. The first pharmacopœia published under authority appears to have been that of Nürnberg in the year 1542. Valerius Cordus, afterwards professor at Wittenberg but then a student, showed a collection of medical receipts, which he had selected from the works of the most eminent writers, to the physicians of Nürnberg. The latter were so struck with its value that they urged him to print it for the benefit of the apothecaries, and obtained for his work the sanction of the city council. Before this time the books chiefly in use amongst apothecaries were the treatises: *On Simples* by Avicenna and Serapion; the *Liber Servitoris* of Balcham ben Aberazerim; and the *Antidotarium* of Nicolaus de Salerno, arranged alphabetically. This work was commonly called *Nicolaus Magnus*, to distinguish it from an abridgment known as *Nicolaus Parvus*.

Confining our remarks to the British Pharmacopœias, we may notice that the first edition of the London Pharmacopœia (or, more correctly speaking, of the Pharmacopœia of the London College of Physicians) appeared in 1618, and was chiefly founded on the works of Mezuze and Nicolaus de Salerno. Successive editions appeared in 1627, 1635, 1650, 1697, 1721, 1746, 1787, 1809, 1824, 1836, and 1851, and form an important contribution to the history of the progress of pharmacy and therapeutics during the last three centuries. The nature and the number of the ingredients that entered into the composition of many of the pharmaceutical preparations of the 17th and 18th centuries would astonish most of the practitioners and patients of the present day. In the earlier editions we find enumerated earthworms, snails, wood-lice, frogs, toads, puppy dogs, foxes ('a fat fox of middle age, if you can get such a one'), the skull of a man who had been hanged, the blood of the cat, the urine and excrements of various animals, &c.; and electuaries were ordered, containing 50, 62, and in one instance—Mathiolus, his Great Antidote against Poison and Pestilence—124 different ingredients.

The Edinburgh Pharmacopœia is more modern than the London, the first edition having appeared in 1699; while the Dublin Pharmacopœia does not date further back than 1807. The latest editions of these works appeared in the years 1841 and 1850 respectively.

Until the Medical Act passed in 1858, the right of publishing the pharmacopœias for England, Scotland, and Ireland was vested in the Colleges of Physicians of London, Edinburgh, and Dublin respectively; and as these three pharmacopœias

contained many important preparations, similar in name but totally different in strength (as, for example, dilute hydrocyanic acid, solution of hydrochlorate of morphia, &c.), dangerous complications arose from a London prescription being made up in Edinburgh or Dublin, or *vice versa*. By that act it is ordained that 'the General [Medical] Council shall cause to be published, under their direction, a book containing a list of medicines and compounds, and the manner of preparing them, together with the true weights and measures by which they are to be prepared and mixed; and containing such other matter and things relating thereto as the General Council shall think fit, to be called *British Pharmacopœia*;' and by a subsequent act it is enacted that 'the British Pharmacopœia shall for all purposes be deemed to be substituted throughout Great Britain and Ireland for the several above-mentioned pharmacopœias.' The *British Pharmacopœia*, which appeared in the beginning of the year 1864, gave rise to such a general feeling of disappointment throughout the profession that the General Council brought out an amended edition in 1867. A reprint with additions appeared in 1874, and other editions in 1885, 1898, and 1914. There are also Homœopathic and Veterinary Pharmacopœias, and Pharmacopœias for some London and other large hospitals, but these are not printed by authority, nor authorised in any way by government.

The Pharmacopœia of the United States is drawn up by a national convention consisting of delegates from the various medical societies, medical corporations, and universities throughout the United States. It was first published in 1820, and a second edition appeared in 1828; a seventh edition appeared in 1893, an eighth in 1905, and a tenth in 1926.

Pharmacy, a department of the medical art which consists in the collecting, preparing, preserving, and dispensing of medicines. In Great Britain the practice of pharmacy is regulated by a series of *Pharmacy Acts*, of which the more important are those of 1852, 1868, 1869, and 1882. See ADULTERATION, CHEMISTS AND DRUGGISTS, MEDICINE, PHARMACOPŒIA, PRESCRIPTION.

Pharos. See ALEXANDRIA, and LIGHTHOUSE.

Pharsalus, now FERSALA, a town of Thessaly, to the south of Larissa, on a branch of the Salambria, and accordingly in the part of Thessaly restored to Greece in 1881; hence the Greeks had to retreat in April 1897. The district, Pharsalia, is historically notable mainly for Cæsar's great victory over Pompey, 9th August 48 B.C. See LUCANUS.

Pharynx (Gr.) is the name of that part of the alimentary canal which lies behind the nose, mouth, and larynx. Its nature and functions are described in the article DIGESTION, where an illustration will also be found. In cases of Diphtheria (q.v.) the pharynx is usually the chief seat of the disease. It is liable to ordinary inflammation or *pharyngitis*—an affection characterised by pain, especially in swallowing, without redness in the fauces or change of voice. Sometimes it proceeds to suppuration, and abscesses are formed. See QUINCY, THROAT.

Phascologale, a genus of marsupials of the family of the Dasyures (q.v.), containing several species, all arboreal and insectivorous; they are spread through the Papuan islands and Australia. The best-known form is perhaps the 'Tapoa Tafa' (*P. penicillata*), of the size and appearance of a rat, which commits depredations in Australian larders and is of a fierce disposition. This marsupial has a strange resemblance to the rodent Hapalotis, also at home in Australia. As with a few other Muridæ, the presence of Hapalotis in Australia is probably the result of being transported on

floating brushwood from the Asiatic continent. The resemblance between the marsupial and the rodent is quite superficial, and cannot mean more than that the two types are similarly or 'convergently' adapted to similar conditions of life.

Phascolomys. See WOMBAT.

Phases (Gr. *phasis*, 'appearance'), the different luminous appearances presented by the moon and several of the planets, sometimes the whole, a part, or none of the luminous surface being seen from the earth. See MOON, PLANETS.

Phasianidæ. See PHEASANT.

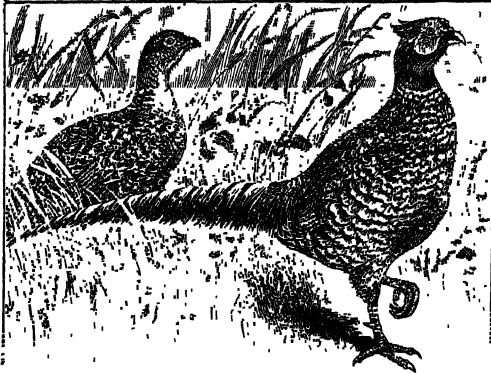
Phasis, a river in Colchis, now called Rion or Faz. It rises in the Caucasus, and flows west into the Euxine near the ancient city of Phasis.

Phas'midæ (Gr. *phasma*, 'a spectre'), a family of insects, including walking-stick insects (*Bacillus* and *Bacteria*), spectre-insects (*Phasma*), and leaf-insects (*Phyllium*). With the exception of *Bacillus*, which occurs in south Europe, they occur in the tropics—in South America, Borneo, East Indies, &c. As their names suggest, they have a striking resemblance to the twigs and leaves of the plants on which they feed and live. See LEAF-INSECT, MIMICRY.

Pheasant (*Phasianus*), a genus of gallinaceous birds of the family Phasianidæ; having a rather short strong bill, a little curved; the cheeks and skin surrounding the eyes destitute of feathers, and warty; the wings short; the tail long, its feathers so placed as to slope down, roof-like, on either side, the middle feathers longest; the tarsus of the male furnished with a spur. The males of all the species are birds of splendid plumage; the females have shorter tails and dull or sombre colours. There are numerous species, natives of the warm and temperate parts of Asia. The Common Pheasant (*P. colchicus*) is said to have been brought from the banks of the Phasis, in Colchis, to the south of Europe at a very remote period, its introduction being ascribed in classic legend to the Argonauts. From the Phasis it derived its Greek name *Phasianos*, the origin of its name in English and other modern languages. It was soon naturalised in Europe, and is now diffused over almost all the temperate parts of it. The date of its introduction into Britain is not known, but was certainly earlier than 1199, when King John granted William Brewer a license 'to hunt the hare, fox, cat, and wolf, throughout all Devonshire, and to have free warren throughout all his own lands for hares, pheasants, and partridges' (Dugdale's *Baronage*, vol. i. p. 701). Strangely, however, the pheasant seems never to be mentioned as a royal dish till 1689. It has long been plentiful in plantations and game-preserves, and has been introduced into almost every part of the country suitable to its habits. The abundance of pheasants in Britain, however, is to be ascribed chiefly to careful game-preservation, without which the race would in all probability soon be extirpated. No kind of game falls so easy a prey to the poacher, for in its present method of rearing it is semi-domesticated, though we can hardly include it amongst our domestic fowls.

A minute description of the common pheasant is unnecessary. The feathers on the upper part of the head are brownish green, with edgings of yellow; the neck has variations of green and blue, with reddish orange below; the breast and sides are brownish yellow, each feather tipped with purplish blue; the back and belly are variegated, the rump deep red with green and grayish reflections; the tail is dull greenish yellow, with yellowish gray, and bars of black, and a band of dull red on each side. The whole length of a male pheasant

is about 3 feet, of which the tail measures about 18 inches. The entire length of the female is a little more than 2 feet, principally in that the



Common Pheasant (*Phasianus colchicus*), male and female.

tail is much shorter than in the male. The general colour of the female is pale grayish brown and yellow, varied with darker brown, the sides of the neck tinged with red and green. The ordinary weight of a pheasant is about two pounds and a half; but when pheasants are abundantly supplied with food, and kept undisturbed, they are sometimes four pounds or four pounds and a half in weight. The pheasant, unlike the partridge, is polygamous.

The nest of the pheasant is on the ground, and is a rude heap of leaves and grasses, in which eleven or twelve olive-brown eggs are laid. But in the half-domesticated state in which it exists in many English preserves the pheasant does not pay that attention to its eggs and young which it does when more wild, and not unfrequently continues to lay eggs for a considerable time, like the domestic fowl; the eggs being removed by the gamekeeper, and hatched by hens, along with eggs from nests found among clover and hay in the season of mowing. In fact, where pheasants are reared in large numbers nearly all the birds are hatched by either common hens or incubators, which are being largely employed for the purpose. In the former method coops are employed, in front of which are runs formed by wire netting, and in this way a large number can be attended to at one time. Very young pheasants must be carefully supplied with ants' eggs, maggots, gentles, &c., and the whole difficulty of rearing them is in their earliest stage. The difficulty of rearing birds bred in confinement has led to the introduction of various forms of artificial food, several of which are excellent. Custard is largely employed, and when given fresh is eaten with avidity, and brings on the young birds rapidly. Canary-seed is good also at first. Pheasants feed very indiscriminately on berries, seeds, roots, young shoots of plants, worms, insects, &c. Beans, peas, corn, and buckwheat are frequently thrown for them in open places in woods; and they scrape up bulbous and tuberous roots in winter. They roost in trees at no great height from the ground, and poachers sometimes capture them by burning sulphur below them. During the moulting season they do not ascend trees to roost, but spend the night on the ground, when they fall a ready prey to foxes. They are fond of woods with a thick undergrowth, in which, when disturbed, they naturally seek shelter, running whilst it is possible, rather than taking flight. The male pheasant takes flight much more readily than the female, which, appar-

ently trusting to her brown colour to escape observation, often remains still until the sportsman is almost upon her. The males and females do not associate together except during the breeding season, but small numbers of one sex are often found in company. The 'short crow' of the males begins to be heard in March. In England and Scotland pheasant-shooting legally begins on the 1st of October, and ends on the 3d of February. The pheasants turned out from the gamekeeper's breeding-yard into a preserve are in general supplied with abundance of food during winter, and come to the accustomed call as readily as any kind of poultry, so that the sportsmanship of a *Battue* (q.v.), in which they are killed by scores or hundreds, is of the lowest kind. Maize is one of the best foods, but barley, peas, wheat, and oats, with the usual green food, are all employed. Some pheasant-rearers use chopped meat, boiled potatoes, decayed apples, raisins, and similar dainties. It is scarcely necessary to mention that the flesh of the pheasant is in very high esteem for the table.

The female pheasant, as is the case with most other birds, in old age, or when from any cause incapable of the functions of reproduction, sometimes assumes the plumage of the male. The pheasant exhibits a remarkable readiness to hybridise with other gallinaceous birds. A hybrid between it and the common fowl is not unfrequent, and is called a *Pero*. Hybrids between the pheasant and black grouse have also occurred; and hybrids are supposed to have been produced between the pheasant and guinea-fowl, and the pheasant and turkey. None of these hybrids, however, have ever been known to be fertile, except with one of the original species. On the contrary, the offspring of the common pheasant and the Chinese or Ring-necked Pheasant (*P. torquatus*) is perfectly fertile, a circumstance which is urged in argument by those who regard them as mere varieties of one species. The ring-necked pheasant is now almost as plentiful in Britain as the common pheasant; it is a native of the forests of India and China, and is said not to breed with the common pheasant in a truly wild state, but in Britain they readily intermix. It is distinguished by a white ring almost surrounding the neck, and is of smaller size than the common pheasant, somewhat different in markings, and has a shorter tail. It is the common pheasant of the Celestial Empire. There is also the Ringless Chinese Pheasant (*P. decollatus*), and others scarcely known here. The Bohemian Pheasant is another variety of a creamy colour, and it is much more homely in appearance. White pheasants are of not very unfrequent occurrence, and often appear spontaneously from the common variety. Pied pheasants may be bred from crossing the white and common varieties. Of other species of pheasant may be mentioned Diard's Pheasant (*P. versicolor*), a native of Japan, in which the prevailing colour is brilliant green; Soemmering's Pheasant (*P. soemmeringii*), also from Japan, one of the most beautiful pheasants known, but terribly pugnacious; and Reeves's Pheasant (*P. reevesii*), a native of the north of China, in which white is the prevailing colour, and the tail is of extraordinary length, so that a bird not larger than the common pheasant measures eight feet in entire length. Of somewhat different type, and more nearly approaching to the common fowl, are the Golden Pheasant (*P. pictus*, or *Thaumalia picta*) and the Silver Pheasant (*P. or Ergolocampus nycthemerus*), both natives of China, and hardy birds, the introduction of which into British preserves has been attempted with decided success. Both have long been kept in a state of domestication by the Chinese. The golden pheasant is one of the most splendid of the tribe. It has a fine

crest, and a ruff of orange and black, capable of being erected at pleasure. The tail is very long. The crest and ruff are held in great estimation by anglers for making artificial flies. Lady Amherst's Pheasant (*P.* or *Thaumalia amherstiae*) is a native of China, resembling the golden pheasant, and with an extremely long tail. The silver pheasant is one of the largest and most powerful of the tribe, and very combative, driving the common pheasant from preserves into which it is introduced. The prevailing colour of the upper parts and tail of the male is white, finely pencilled with black, the breast and belly purplish black. The Eared Pheasant (*Crossoptilon mantchuricum*) has a sombre brown body, a vaulted beak, red face, and white throat and ears, the feathers on which stand up above the head. The Argus Pheasant (*Argus giganteus*), found in Malacca and Siam, is separately discussed (see ARGUS). The latter series of pheasants are chiefly kept in aviaries as ornamental fowls, for which purpose they are well adapted. A recent introduction, the Prince of Wales Pheasant (*P. principalis*), was discovered on the Afghan frontier of India, and is distinguished from all other pheasants in that the greater part of its wings are white, though it is somewhat different in its markings and the arrangement of its colours.

See D. G. Elliot, *Phasianidae* (1870-72), Tegetmeier, *Pheasants* (1873); Price, *Pheasant-rearing* (1888); Macpherson and others, *The Pheasant* (1895); Beebe, *Monograph of the Pheasants* (4 vols. 1918-22).

Phelps, ELIZABETH STUART (1844-1911), an American authoress, was born at Andover, Massachusetts, the daughter of Professor Austin Phelps and of the authoress of *Sunny Side*. Besides lecturing and working for the advancement of women and for social reforms, she wrote a number of stories, including *The Gates Ajar* (1868), which passed through twenty editions in the year of its publication; *Beyond the Gates* (1883); *The Gates Between* (1887); *Hedged In* and *The Silent Partner* (1870); *The Story of Avis* (1877); *Doctor Zay* (1884), in which the question of professional life for women is considered; and in 1890, in conjunction with her husband, the Rev. Herbert D. Waid, *Come Forth*, a travesty of the story of Lazarus, and *The Master of the Magicians*.

Phelps, SAMUEL, the last of the old school of actors, was born 13th February 1804 in Devonport. When seventeen years old he came to London, and was engaged on the *Globe* and *Sun* newspapers as reader; among his companions being Douglas Jerrold, then, like himself, a stage-struck youth. After some experience as an amateur, Phelps joined the York circuit in the autumn of 1826, and continued in the provinces for eleven years. On 28th August 1837 he made his début in London as Shylock at the Haymarket, under the management of Benjamin Webster, making a very great success. He was afterwards engaged by Macready, but his genius did not get full scope until the beginning of his famous Sadler's Wells management, one of the most extraordinary achievements in the history of the drama. At an outlying unfashionable and unpopular theatre he for eighteen years produced a constant succession of 'legitimate' plays, attracting around him an excellent company, and educating a rough and unpolished audience to appreciation of the masterpieces of English dramatic literature. He began this apparently unpromising experiment on 27th May 1844, continued as manager till March 1862, and made his last appearance before his Islington friends on 6th November 1862. During his management he produced no fewer than thirty-one Shakespearian plays, as well as works of the other great Elizabethans, and of the dramatists of the 18th century from Congreve to Colman. After

leaving Sadler's Wells Phelps did not attach himself to any particular theatre, appearing at Drury Lane, the Queen's, and the Gaiety theatres, and playing regularly in the provinces. On 1st March 1878, when acting Wolsey at the Aquarium (Imperial) Theatre, he broke down, and never played again. He died on 6th November 1878. Although primarily a tragedian, Phelps was an excellent all-round actor, and some of his comedy parts are among his most notable—as, for instance, Malvollo, Bottom, and Shallow. In tragedy he was famous in Wolsey, Lear, Macbeth, Brutus, Luke (*City Madam*), and Sir Giles Overreach; while among his other chief successes were Richelieu, Sir Pertinax Macmoryphant, Bertuccio, Old Dornton, and Job Thornberry.

See *Memoirs*, by J. and E. Coleman (1886); and *Life and Life-work*, by W. May Phelps and John Forbes Robertson (1886).

Phenacetin, a drug prepared from carbolic acid, valuable in fevers, and, like antipyrin, of service in stilling pain and securing rest in cases of severe headaches, insomnia, and nervousness.

Phenacodus. See MAMMALS.

Phenol, a name for Carbolic Acid (q.v.). See also AROMATIC SERIES.

Phæræ, a powerful city of Thessaly, near Mount Pelion; according to legend, the ancient royal seat of Admetus and Alcestis, and afterwards of political consequence under 'tyrants' of its own, who long made their influence felt in the affairs of Greece, and repeatedly attempted to make themselves masters of Thessaly. One of these tyrants, Alexander (slain 357 B.C.), is particularly celebrated for his cruelties.

Pherecydes, an ancient Greek philosopher, born in the island of Syros, in the 6th century B.C., a contemporary of Thales. He taught the doctrine of the existence of the human soul after death; but it is uncertain if he held the doctrine of the transmigration of souls, afterwards promulgated by his disciple, Pythagoras. Of his work, a mythological system of philosophy, only fragments are extant, collected and edited by Sturz (2d ed. Leip. 1824).—Another Pherecydes, a native of Leros, who lived in the 5th century B.C., compiled mythical histories of Athens and other states, but only a few fragments remain, published in C. Müller's *Frag. Hist. Græc.* (vol. i.).

Phi Beta Kappa, by far the oldest of the American college Greek letter societies, takes its name from the initial letters of its motto, said to be *Φιλοσοφία Βίου Κυβερνήτης*—'Philosophy is the guide of life.' The society, 'founded on literary principles,' and intended to embrace the 'wise and virtuous of every degree and of whatever country,' was an outcome of the desire for national union, and sprang into being in the somewhat chaotic period when the old colonies had become states, but had not yet adopted a federal constitution. It was founded in 1776 (the same year as the Illuminati, q.v.), in the old 'Raleigh Tavern' at Williamsburgh, Virginia, by forty-four undergraduates of William and Mary College, of whom John Marshall was one. Branches were established at Yale in 1780 and at Harvard in 1781; and later in the other principal colleges and universities of the United States. The Phi Beta Kappa is now simply 'an agreeable bond of meeting among graduates;' since 1831 its innocent mysteries have been open secrets.

Phidias (Gr. *Pheidias*), the greatest sculptor of ancient Greece, was born the son of Charmides, at Athens about 500 B.C. His instructor in sculpture was Ageladas of Argos. To Phidias came an opportunity such as falls to the lot of few artists: Pericles, having risen to the head of affairs in the

Athenian state, resolved to adorn the city with temples and other public buildings fitting for the vanquisher of Persia, and he not only gave to Phidias a commission to execute the more splendid statues that were to be erected, but made him general superintendent of all the public works planned for the city. Plutarch tells us that Phidias had under him architects, statuaries, workers in copper and bronze, stonemasons, gold and ivory beaters, &c. He constructed the Propylæa and the Parthenon, the sculptured ornaments of which were executed under his direct superintendence, while the statue of the goddess Athena, of ivory and gold, was the work of Phidias himself. Fragments of the metopes, frieze, and pediments of the Parthenon were carried to England by Lord Elgin (see ELGIN MARBLES). Phidias executed a colossal statue of Zeus for the Olympieum at Olympia (q.v.), also of ivory and gold; this was reckoned his masterpiece. Accused of having appropriated to himself some portion of the gold destined for the robe of Athena, and of impiety in having introduced his own likeness and that of Pericles on the shield of the goddess, he is said to have been thrown into prison, or banished, or to have fled about 432 B.C. Other works by his hand were a statue of Aphrodite at Elis, of gold and ivory, a colossal bronze figure of Athena Promachos on the Acropolis at Athens, a gilt colossal Athena at Plataea, a monument of the victory of Marathon at Delphi, and numerous others. Their prevailing characteristic appears to have been an ideal sublimity, and the imperfect relics that we can tentatively connect with his name are the most noble specimens of sculpture in the world. In 1888 there was dug out at Tanagra a red vase bearing what was believed to be the signature of Phidias. See SCULPTURE.

See A. S. Murray, *Greek Sculpture* (1880); Gardner, *Six Greek Sculptors* (1910); Schrader, *Phidias* (Frankf. 1925); Johansen, *Phidias and the Parthenon Sculptures* (1925).

Phigalia, an ancient town of Arcadia, situated in its extreme south-west corner. From its temple of Apollo, at Bassæ, 5 to 6 miles distant, a sculptured frieze representing the contests between the Centaurs and Lapithæ, and the Amazons and Greeks, was brought to the British Museum in 1812. The temple was first described by Chandler in 1765. Next to the Theseum at Athens it is the most perfect architectural ruin in all Greece, being built of fine gray limestone and white marble. It was designed by Ictinus, one of the architects of the Parthenon at Athens, and measured originally 125½ feet long and 48 broad, and had 15 columns on each side and 6 at each end, in all 38, of which 34 still stand.

Philadelphia, the chief city of Pennsylvania and the third city in population and importance of the United States, is called the 'Quaker City' and is situated on the Delaware River, about 96 miles by ship-channel (36 feet) *via* Delaware Bay from the Atlantic Ocean, 87 miles SW. of New York City, and 136 miles NE. of Washington. Co-extensive with the county of Philadelphia, the city lies along the Delaware from the mouth of the Schuylkill River (which has likewise been deepened) at League Island, northward, for about 23 miles, and has an average breadth of some 8 miles. Its total area embraces nearly 130 sq. m., including towns and villages still known by the names they bore prior to their annexation to the city. There are 37 miles of water-front. On League Island is a navy yard. Philadelphia is notably 'a city of homes.' Its inhabitants are largely composed of the well-to-do middle class,

and it has within its limits more comfortable single residences than any other city in the world.

The dominant architecture of the older sections of the city is of the severely plain, substantial style which characterised its Quaker founders, and which until the second half of the 19th century held undisputed sway, its outstanding features being uniformity of design and a general employment of red brick as building material. A marked departure then took place in the style of both the public and the private buildings of Philadelphia, among the former of which the city hall (1871 *et seq.*), built of white marble upon a granite base, and covering an area of 486 by 470 feet, affords a striking instance. The height of the tower and dome is 537 ft. 4½ in.; or 573 ft. 4½ in. with the colossal figure of Penn (36 ft.), to surmount the whole, the structure being thus one of the highest in the world. Over 500 rooms (mostly offices for city officials) are comprised in it. Other buildings worthy of note architecturally are the Masonic Temple, of granite; a United States government building of granite—containing the Post-office, United States court-rooms, and other offices of the general government; a custom-house of marble, modelled after the Parthenon at Athens; a naval asylum; the United States Mint; the Academy of Fine Arts; the Academy of Natural Sciences, a massive Gothic structure with an extensive scientific library and a great museum; the Academy of Music; and the buildings of the University of Pennsylvania. The greatest historical edifice is Independence Hall, in which the Declaration of Independence was adopted. It contains the famous Liberty Bell.

Nearly every street of importance is traversed by tramways, and an underground and elevated system is in use. A great suspension bridge joins Philadelphia with Camden, on the New Jersey side of the Delaware River. There are numerous well-shaded commons in the older portion of the city, some of which were laid out by William Penn at the foundation of his 'great towne' in 1682-83; while the Fairmount Park, over 3000 acres in extent, and bisected through its entire length of 10 miles or more by the Schuylkill River and its affluent the Wissahickon, stands without a rival among the pleasure-grounds of the great cities of the New World. In this park in 1876 was held the Centennial Exhibition; and in its environs are the Zoological Garden, the beautiful Horticultural Hall and Memorial Hall—remains of the Centennial Exhibition—the Art Museum, the Laurel Hill Cemetery, &c. From the city hall to the park entrance extends a broad 'Parkway,' adorned with magnificent buildings. Among statues in Philadelphia there are bronze equestrian figures of Generals Meade, McClellan, and Reynolds; and there is a monument at Germantown to the Union soldiers, and another in the grounds of Girard College to those of its former pupils who fell in the civil war.

The churches include the old Swedes Church (1700), Christ Church (Episcopal, 1727-54), where Washington's pew is preserved, and a Roman Catholic archiepiscopal cathedral. Philadelphia has almost from its foundation been noted for its benevolent institutions, prominent among them the Pennsylvania Hospital (1751). There are many other hospitals, including those in connection with the university and the several medical schools.

The educational facilities of Philadelphia are very great. The public schools, which are numerous, are maintained at a high standard of excellence. Besides the Girard College (q.v.) the city contains the Drexel Industrial Institute; and in Philadelphia

or its immediate environs are the Williamson Free School of Mechanical Trades, state institutions for the blind and deaf and dumb, the Franklin Institute (1824, for the mechanic arts), Spring Garden Institute (for drawing, painting, and mechanical handiwork), the Episcopal Academy (1785), several Catholic colleges and convents, and Episcopal, Lutheran, and Roman Catholic theological seminaries, and Temple University. Crowning all these is the University of Pennsylvania, which began as an academy chartered by the sons of William Penn, became a college in 1755, and a university in 1779. It is now a great national centre of education. The Jefferson Medical College (1825) is one of the most famous medical schools of the United States; and there are several others, including the Medico-Chirurgical College (1880). The scientific institutions comprise the above-named Academy of Natural Sciences, the American Philosophical Society (1743), the Wagner Institute of Science, &c. The Commercial Museum, with a great collection of the world's products, is of high importance.

Manufactures, Commerce, &c.—Though in its early history noted for its extensive shipping interests, as compared with those of its sister cities, it is rather as a manufacturing than as a commercial city that Philadelphia holds a present prominence. Here are immense establishments covering acres of ground, from which millions of dollars' worth of products are issued annually for the home and foreign markets, besides smaller concerns innumerable. No city in the world possesses a greater variety of manufactures, many of the establishments being of immense extent and employing thousands of artisans. Among the most notable of these are the Cramp Shipyards, in which some of the largest battleships of the United States navy have been built, and the Baldwin Locomotive Works, the greatest of its kind in the world, turning out some 480 locomotives a month. Many thousands of operatives are employed in the production of carpets, a prominent speciality of the city, and other articles of very large production are cotton, woollen, worsted, and upholstery goods. General iron and steel products employ another great fraction of the population, the single article of saws amounting in annual value to several million dollars. In addition are oil refineries, great chemical works, and a large number of smaller industries. The domestic and foreign commerce of this city is also large, but is secondary in importance to its manufactures. Shipping has greatly increased since the deepening of the rivers.

Founded in 1682 (see PENN.), Philadelphia the year after was made the capital of Pennsylvania, and soon became a place of importance. It was the central point in the war of independence, and the city still preserves the Carpenters' Hall (1770), where the First Congress met (4th September 1774), and the old State House (1735), now famous as Independence Hall, where the Second Continental Congress sat, and the Declaration of Independence (see INDEPENDENCE DAY) was adopted in 1776. At Philadelphia, moreover, the federal union was signed, in 1778; and here, too, the constitution was framed, in 1787. An interest of another kind attaches to the fact that the Protestant Episcopal Church of North America was organised here in 1786. From 1790 to 1800 Philadelphia was

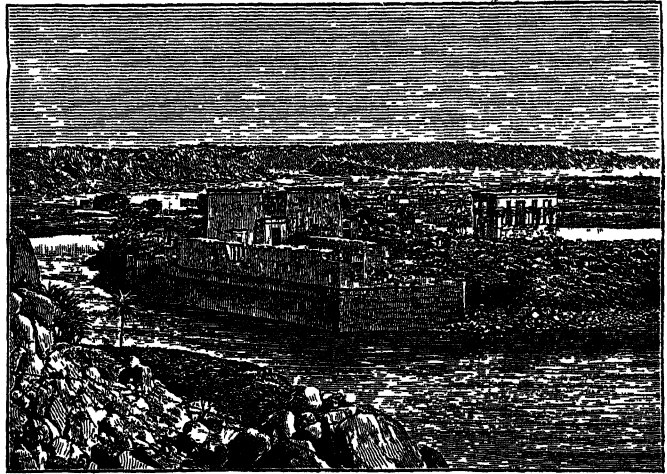
the federal capital; and the first mint was established here in 1792. Pop. (1700) 4500; (1800) 70,287; (1860) 568,034; (1880) 847,170; (1890) 1,046,964; (1900) 1,293,697; (1910) 1,549,008; (1920) 1,823,779.

Philadelphia. See ALA-SHEHR; and (for Ammon or Rabbath Amman) KERAK.

Philadelphians, a mystic sect emphasising 'brotherly love' (Gr. *philadelphia*), founded in London in 1652 under the influence of Boehme by Dr John Pordage (1608-98) and Mrs Leade and others. It had for a time a branch in Holland, but disappeared early in the 18th century.

Philadelphus. See SYRINGA.

Philæ (Gr. *Philai*, Egyptian *Pālek*), an island now submerged, in the Nile, near Assuan and south of Syene. It is a small granite rock, fringed with rich verdure, about 1200 feet long and 450 broad, almost covered with ancient buildings of great architectural beauty and interest, though not of very ancient date. That to the east, a hypæthral or roofless hall, commonly called 'Pharaoh's bed,' belongs to the Greek and Roman period, and consists of fourteen great columns with capitals of various patterns, connected at the lower part by solid walls; the length is 63 feet, the width 48. The great temple of Isis, to whom the island was sacred, was mainly built by Ptolemy Epiphanes, and continued by his successors, especially by Ptolemy III., Energetes. The processions of pilgrims approached the island from the south, were received by the priests at a flight of steps at



Island of Philæ, seen from the south-west corner.

the south-west corner, and then passed into a court with a colonnade to right and left, erected by Tiberius and later Roman emperors. To the north stood the great propylon or gateway, 60 feet high and over 120 wide. This is the oldest part of the temple, and bears the name of Nectanebes II. (about 361 B.C.). Beyond was another court with several chambers and a small chapel. Another smaller pylon gave entrance to the temple proper, at the northern end of the irregular complex of buildings (converted into a Christian church in 577). The great dam at Assuan (q.v.), as completed in 1902, did not injure the ruins; the deepening of the dam by 26 feet, carried out since 1907, has submerged them, and was said to save them from serious injury from encrusting salts. Nevertheless rapid disintegration of hieroglyphs and small details of reliefs is reported.

Philaret (1782-1867), from 1821 Archbishop of Moscow, was the greatest preacher and the most influential Russian churchman of his time.

Philately. See STAMPS.

Philemon, EPISTLE TO, is the shortest and most personal of the extant letters of Paul. It was addressed to Philemon, who is described as one of the apostle's converts, to Apphia who is probably his wife, and to Archippus 'our fellow-soldier,' who may have been his son. The epistle does not definitely state where Philemon lived, but as Colossians iv. 17 seems to assume that Archippus lived at Colossæ, and as Onesimus, who is the main theme of the Epistle to Philemon, was one of the messengers whom Paul sent to Colossæ, we are justified in drawing the conclusion that Colossæ was also the home of Philemon and Apphia. In that case it was probably at Ephesus that Philemon came under the influence of Paul, because we have no evidence that the apostle ever visited Colossæ, indeed, the Epistle to the Colossians implies that Colossæ was unknown to him. Later tradition (e.g. the Apostolical Constitutions) regards Philemon as bishop of Colossæ, and makes him out to have been a martyr. This little epistle (containing only 25 verses) which Renan has described as 'master-piece in the art of letter-writing,' is a plea for Onesimus, a slave belonging to Philemon, who had wronged his master, probably by some act of theft, and escaped to Rome. In Rome, Onesimus had been brought into contact with Paul (whether there had been any previous relationship between the two can only be a matter of surmise), and had been converted by his influence. Paul's first intention apparently was to keep Onesimus with him as his own body-servant, but it soon became clear to him that Onesimus's paramount duty was to go back to his master, and make reparation for his crime. The performance of such a duty was attended with considerable risk, for the usual penalty inflicted upon a slave for such a misdeed was crucifixion. Paul, therefore, wrote this letter to Philemon and Apphia for Onesimus to take back with him, and in it he begs his master to pardon the slave who has wronged him, offering to take upon himself the responsibility for making good the theft, 'If he hath wronged thee, or oweth thee ought, put that to mine account, I Paul will repay it' (vers. 18, 19). But Paul pleads not only for the forgiveness of the slave, but that he should be welcomed back as a fellow-Christian—'a brother beloved'—a plea which shows the new attitude which Christianity had introduced toward slavery. The Apostle Paul does not attack the institution of slavery, though as Lightfoot puts it 'the word emancipation seems to be trembling upon his lips,' but he transcends it by the Christian conception of brotherhood. There is an interesting parallel to the epistle in the letter written by Pliny to Sabianus on behalf of a runaway freedman. The genuineness of the epistle is universally recognised except in the Dutch school of radical criticism (see article by Van Manen in the *Encyclopædia Biblica*.) The best modern commentaries are those of Lightfoot, Vincent, Haupt, and Dibelius. See also New Testament Introductions of Moffatt, Jülicher, Holtzmann, &c.

Philemon and Baucis, according to a classic myth, finely poetised by Ovid in his *Metamorphoses*, were a married pair, remarkable for their mutual love. Jupiter and Mercury, wandering through Phrygia, in human form, were refused hospitality by every one, till this aged pair took them in, washed their feet, and gave them such humble fare as they could provide. On going away, the gods took them with them to a neighbouring mountain, on looking from which they saw their village covered

with a flood, but their own cottage changed into a splendid temple. Jupiter permitted them to make any request they chose, but they only asked to be servants of his temple, and that they might die at the same time. When, accordingly, they were seated at the door of the temple, being now of great age, they were changed, Philemon into an oak, and Baucis into a linden.

Philharmonic Society, a musical society established in London in 1813, for the purpose of giving concerts, now entirely orchestral. Weber, Mendelssohn, and Wagner directed performances of their own works at concerts of the society. The Philharmonic Society of New York dates from 1842, and that of Berlin, which has had von Bülow, Richter, and Nikisch among its conductors, from 1883.

Philidor, the assumed name of a French family, originally called Danigan, which has produced several distinguished musicians, and a composer, François André (born at Dreux in 1726, died in London, 1795), who was even more famous as an authority on Chess (q.v.). See Allen's *Life of Philidor* (Phila. 1864).

Philip of Macedon, the father of Alexander the Great, was born probably at Pella about 382 B.C. He was the youngest son of Amyntas II. and Eurydice, and spent part of his early life as a hostage at Thebes. The assassination of his eldest brother, Alexander II. (367 B.C.), and the death of his second brother, Perdiccas III., in battle (360 B.C.), made him guardian to his nephew Amyntas, still an infant; but in a few months Philip was made king, Amyntas being set aside. Enmities arose without and within, but they soon disappeared before the decision, the energy, and the wise policy of the young king. In the brief space of a year he had secured the safety of his kingdom, had thoroughly reorganised the army, and had gained for himself a dreaded name. Henceforward his policy was one of aggression. The Greek towns on the coast of Macedonia were the first objects of attack. In Thrace he captured the small town of Crenides, which under its new name, Philippi, soon acquired great wealth and fame. The surrounding district, rich in gold-mines, proved a source of great revenue to Philip, while the neighbouring forests gave him timber for ships. After a few years of comparative leisure he captured Methone (losing an eye at the siege), advanced into Thessaly (353 B.C.), and ultimately to the Pass of Thermopylæ, which, however, he did not attempt to force, as it was strongly guarded by the Athenians. He therefore directed his arms against the Thracians. After capturing all the towns of Chalcidice—the last of which was the important city of Olynthus—he eventually concluded the Peace of Philocrates in 346 B.C. with the Athenians, who had been at war with him in defence of their allies the Olynthians. This peace marked the end of the 'Sacred War' which had been raging between the Thebans and the Phocians. The siege of Olynthus called forth the famous Olynthiac Orations of Demosthenes (q.v.), and the subsequent relations with Philip the more famous Philippic Orations. Philip's next step was to secure a footing in the Peloponnese, by espousing the cause of the Argives, Messenians, and others against the Spartans. Thereafter he was engaged unsuccessfully in the sieges of Perinthus and Byzantium. In 339 B.C. the Amphictyonic Council declared war against the Locrians of Amphissa; and appointed Philip commander-in-chief of their forces. The Athenians, alarmed at his approach into Greece in this capacity, joined with the Thebans against him; but their united army was utterly defeated at the battle of Chæronea (338 B.C.). The same year, deputies from the different states of Greece, except Sparta,

which refused to yield, assembled in congress at Corinth, and formed an alliance, offensive and defensive, with Philip as the leader of their armies. If was, too, a significant attempt to give peace and unity to Greece. With Greece at his feet, Philip was now in a position to enter on the great dream of his later years—viz. to invade the Persian empire. Preparations were in progress for this great expedition when he was suddenly cut off by the hand of the assassin Pausanias, at a festival to celebrate the marriage of his daughter with Alexander of Epirus (336 B.C.). Philip was a man given to self-indulgence and sensuality; he was faithless in the observance of treaty obligations, and unscrupulous as to the means by which he gained his ends; but of his energy, acuteness, and eloquence it is impossible to speak too highly. He was at the same time a lover of learning and a liberal patron of learned men. See a work by D. G. Hogarth (1897), those cited at GREECE and DEMOSTHENES; Casson, *Macedonia, Thrace, Illyria* (1926).

Philip II., better known as PHILIP-AUGUSTUS, king of France, was the son of Louis VII. and Adela of Champagne, and was born in August 1165. He was crowned joint-king in 1179, during the lifetime of his father, succeeded him in 1180, and proved one of the greatest monarchs of the Capet dynasty, while he confirmed his hold of the throne by marriage with Isabella of Hainault, the last direct descendant of the Carolingians. His first war, made upon the Count of Flanders, gave him the county of Vermandois and the city of Amiens (1185). He rigorously punished heretics and despoiled the Jews, and reduced the rebellious Duke of Burgundy to submission. He supported the sons of Henry II. of England in their rebellions against their father, and gained Berri by cession in 1189. On the accession of Richard to the throne Philip and he set out together on the third crusade; but they quarrelled while wintering in Sicily. After staying but three months in Syria he returned to France, having taken a solemn oath not to molest Richard's dominions; but no sooner had he returned than he made a bargain with the faithless coward John for the partition of Richard's territories in France. The fiery Richard's sudden return occasioned an exhausting war, which was closed through the mediation of Pope Innocent early in 1199. Richard died within two months after; but war with England blazed out anew, on account of the rival claims of John and his nephew Arthur of Brittany to the French heritage of King Richard, which consisted chiefly of Anjou, Maine, and Touraine. Philip embraced the cause of Arthur, but was for a while fully occupied by his quarrel with the pope. He had put away his second wife, Ingeborg of Denmark, in order to marry the beautiful Agnes of Meran, but the terror of the thunders of the Vatican forced him to replace Ingeborg upon her throne. The murder of Arthur again gave him the excuse he sought. Richard's great fortress of Château Gaillard fell early in 1204, and Philip passed in triumph over Normandy. Before the end of that year he had added to his dominions Normandy, Maine, Anjou, and Touraine, with part of Poitou, as well as the over-lordship of Brittany, hitherto a fief of Normandy. Philip took no active part in the war against the Albigenes, but devoted himself to consolidating his dominions. The great victory of Bouvines (29th August 1214) over the Flemish, the English, and the Emperor Otho established his throne securely, and the rest of his reign he was able to devote to reforms of justice and to the building and fortifying of the city of Paris. Notre Dame remains a lasting monument of this great king's administration. By his favour towards the communes and his stern

dealings with the great feudal lords, Philip did much to strengthen the position of the monarchy. He died at Mantes, 14th July 1223.

See works by Capefigue (1842), Mazabran (1878), Davidsohn (1883), Hutton (1896), and several volumes by Achille Luchaire (1881-1912).

Philip IV., surnamed *Le Bel* or 'the Fair,' king of France, the son of Philip III., 'the Rash,' and Isabella of Aragon, was born at Fontainebleau in 1268, and succeeded his father in 1285. By his marriage with Queen Joanna of Navarre (q.v.) he obtained Navarre, Champagne, and Brie. He overran Flanders, but a Flemish revolt broke out at Bruges, and at Courtrai on the 'Day of Spurs' the flower of the French chivalry went down in thousands before the sturdy burghers. The great event of his reign was his struggle with Pope Boniface VIII., which grew out of his attempt to levy taxes from the clergy. By the bull *Clericis laicos* in 1296 Boniface forbade the clergy to pay taxes, and to this Philip replied by forbidding the export of money or valuables, thus cutting off a main supply of papal revenue. A temporary reconciliation in 1297 was ended by a fresh outbreak of the quarrel in 1300. Philip flung the papal legate into prison, and summoned the Three Estates of France, clergy, nobles, and burghers. The last two assured him of their support even in case of excommunication and interdict. Boniface replied with the celebrated bull *Unam Sanctam*. Philip caused the bull to be publicly burned, and with the consent of the States-general confiscated the property of those prelates who had sided with the pope. Boniface now excommunicated him, and threatened to lay the kingdom under interdict, but the king sent to Rome William de Nogaret, who seized and imprisoned the pope, with the aid of the Colonnas. Though released after a few days by a popular rising, Boniface soon afterwards died. In 1305 Philip obtained the elevation of one of his own creatures to the papal chair as Clement V., and placed him at Avignon, the beginning of the seventy years' 'captivity.' He compelled the unhappy and reluctant pope to condemn the Templars in 1310, and to decree their abolition in 1312. In spite of skilful defence, they were condemned and burned by scores (see **TEMPLARS**), and their wealth appropriated by Philip. Philip during his whole reign steadily strove for the suppression of feudalism and the introduction of the Roman law; but while thus increasing the power of the crown, and also that of the third estate, he converted royalty, which was formerly protecting, kind, and popular to the mass of the people, into a hard, avaricious, and pitiless taskmaster. Under him the taxes were greatly increased, the Jews persecuted, and their property confiscated; and, when these means were insufficient to satisfy his avarice, he caused the coinage to be greatly debased. He died at Fontainebleau, 29th November 1314.

Philip VI., of VALOIS, king of France, was the son of Charles of Valois, younger brother of Philip IV., and succeeded to the regency of France on the death of Charles IV. The proclamation of a king was deferred on account of the pregnancy of Charles IV.'s widow; but on her giving birth to a daughter Philip caused himself to be crowned king at Reims (May 29, 1328). His right to the throne was denied by Edward III. of England, the grandson of Philip IV., who declared that females, though excluded by the Salic law, could transmit their rights to their children, and therefore insisted upon the superiority of his own claims. Philip, however, was not only already crowned king, but he had the support of the people. His reign commenced gloriously; for, marching into

Flanders to support the count against his rebellious subjects, he wiped out the disgrace of Courtiai by vanquishing the Flemings at Cassel (August 23, 1328). He was obliged to give up Navarre (q.v.), as the Salic law of succession did not apply to it, but he retained Champagne and Brie, paying for them a considerable annual stipend. The hundred years' war with England began in 1337 both in Guienne and in Flanders, but was carried on languidly for several years, the only prominent incident being the destruction of the French fleet off Sluys (June 24, 1340). Philip was a bad and faithless man, and his grasping extortion well-nigh exhausted the wealth of the country. Yet money for his pleasures and for new wars had constantly to be provided by some new tax or fresh confiscation. In 1346 Edward III. landed in Normandy, ravaged the whole country to the environs of Paris, and totally defeated Philip at Crécy. A truce was then concluded, but the devoted kingdom had no sooner been released from war than destruction threatened in the yet more terrible form of the 'Black Death.' Philip received Dauphiné in gift in 1349, purchased Majorca from its unfortunate king, and died August 22, 1350, neither loved nor respected.

Philip II., king of Spain, the only son of the Emperor Charles V. and Isabella of Portugal, was born at Valladolid, 21st May 1527. He was brought up in Spain, and carefully educated for his destiny, but grew up distrustful and reserved; cold and austere, without being virtuous; haughty and bigoted, yet without real respect for honour or religion. In 1543 he married Mary of Portugal, who died three years later, after bearing a son, the ill-fated Don Carlos. In 1548 he went to join his father at Brussels, and made a decidedly unfavourable impression upon his future subjects. Three years later he returned to Spain, and in 1554 he made a marriage of policy with Mary Tudor, Queen of England. During his fourteen months' stay in England, he found little favour with the people, and the vexatious jealousy of a wife who was plain, spare, nearly forty, and likely to be childless, prompted him to return to Brussels (September 1555). In the next half-year he became by the abdication of his father the most powerful prince in Europe, having under his sway Spain, the Two Sicilies, the Milanese, the Low Countries, Franche Comté, Mexico, and Peru; with the best disciplined and officered army of the age. The treasury, however, was depleted by the enormous expenditure of his father's wars. Henry II. of France and the Neapolitan pope Paul IV. combined to deprive him of his Italian dominions, but Alva soon overran the pope's territories, while Philip's army under Philibert of Savoy defeated the French at St Quentin (1557) and Gravelines (1558). Henry II. agreed to terms of peace at Cateau Cambresis (2d April 1559). In January 1558 the French had captured Calais, and Mary Tudor's death followed eleven months later. Philip thereupon married Elizabeth of France (1559) and returned to Spain, where he lived the rest of his life.

The main object of his domestic policy was to concentrate all power in himself, and to this end he laboured to destroy everything resembling free institutions in any of his dominions. He ostentatiously put himself at the head of the Catholic party in Europe, but the interests of the Church in his eyes were ever identical with his own. He found the Inquisition the best engine of his tyranny in Spain, but its effect in the Low Countries was a formidable revolt, which ended in 1579 with the northern part, the Seven United Provinces, achieving independence. To replenish his exhausted treasury Philip exacted enormous contributions from his subjects, abolishing all the ancient special communal or provincial privileges of Spain, and

suppressing all insurrection and discontent by force of arms or the Inquisition. The tragic death of William the Silent (1584) and the relentless persecution of Antonio Perez show how pitiless and how persistent was his hatred of an enemy. His wife Elizabeth having died in 1568, he married in 1570 as his fourth wife his niece, Anne of Austria, whose sole surviving son afterwards became Philip III. The one great triumph of his reign was the famous naval victory of Lepanto (7th October 1571), won by his half-brother, Don John of Austria, over the Turks. In 1580, the direct male line of Portugal having become extinct, Philip claimed the throne, and despatched Alva to occupy the kingdom. But his attempt to conquer England recoiled upon himself in the hopeless disaster of the Armada. His intrigues against Henry of Navarre were foiled by his antagonist's courage, aided by the death (1592) of his own general Alexander Farnese and Henry's politic change of religion. The stubborn heroism of the Netherlanders and the exasperating ravages of the English cruisers on the Spanish Main, added to financial distress at home, embittered the last years of Philip, and he died of a lingering and peculiarly loathsome disease, in the Escorial at Madrid, on 13th September 1598, under the shadow of that failure which had followed all his greatest undertakings. Philip II. possessed great abilities, but too little political wisdom to manage successfully the vast dominions which he inherited. A fanatical and gloomy bigot in religion, sullen and jealous in temper, he persecuted all heretics through the Inquisition with relentless cruelty, and at the same time dealt a fatal blow to Spain by crushing that ancient, proud, and chivalrous spirit which had been the secret of its strength, as well as by cutting off the commerce of the country by oppressive exactions and by a bitter persecution of the industrious Moriscos. On the other hand he has not always received justice from historians. It can, at least, be said that his ultra-religiousness proceeded from the conviction that he was a divine agent. He was cruel and crafty, but his enemies also were not lacking in these respects. The persecution of Perez seems to have had some justification, while the light shed by more recent historians upon his dealings with his lunatic son, Don Carlos, must temper with pity the accusations of callousness hurled at him by earlier writers. See CARLOS.

See also the articles ALVA, ARMADA, CHARLES V., MARY, PEREZ, HOLLAND, and SPAIN; the *Histories* of Prescott, Motley, and Froude; Mignet's *Antonio Perez et Philippe II.* (5th ed. 1881); Forneron's *Histoire de Philippe II.* (3d ed. 4 vols. 1887); Gachard's two books on Don Carlos, and his editions of the correspondence of Philip (1848-89); Froude's *Spanish Story of the Armada* (1892) and Martin Hume's books on Philip (1897 and 1908).

Philip V., king of Spain, founder of the Bourbon dynasty in that country, was the second son of the Dauphin Louis (son of Louis XIV. and Maria Theresa of Spain) of France, and was born at Versailles, 19th December 1683. In 1700 Philip, then Duke of Anjou, was bequeathed the crown of Spain by Charles II. His grandfather, Louis XIV., as he left him to take possession of the throne, uttered the famous phrase, 'Mon fils, il n'y a plus de Pyrénées.' He entered Madrid in 1701, and after a long struggle against his rival, the Archduke Charles, was left in possession of his throne by the peace of Utrecht in 1713. Next year died the queen, Maria Louisa, daughter of Victor Amadens, Duke of Savoy, whom Philip had married in 1702; and soon after he married Elizabeth Farnese of Parma, 'the termagant,' in Carlyle's phrase, who embroiled the peace of Europe for thirty years. By her influence the reins of government were committed by the amiable and weak-minded king to Alberoni. Philip was

obliged by the Quadruple Alliance to dismiss his daring and ambitious minister at the close of 1719. He abdicated in favour of his son Don Louis in 1724, but resumed the crown on his death eight months later. The ambitious queen's dearest wish was to drive the Hapsburgs out of Italy in the interests of her sons by a former marriage, but all her efforts succeeded only in securing the Two Sicilies for Don Carlos. Spain joined the coalition against Maria Theresa, and her younger son Don Philip was at first successful in conquering the Milanese; but as soon as the Silesian war was closed by the treaty of Dresden the Austrian empress poured her troops into Italy and drove out the Spaniards. At the crisis Philip, who had been for years sunk in a state of mental stupor, died at Madrid, 9th July 1746. See ALBERONI, SUCCESSION WARS, and SPAIN; and Baudrillart's *Philippe V. et la Cour de France, 1700-15* (2 vols. 1890-91).

Philip, sachem of the Wampanoag Indians, and second son of Massasoit, the ally of the Pilgrim settlers of Plymouth, succeeded his brother in 1661, and continued the friendly relations for some years. In 1675, however, goaded by the encroachments of the whites, he led a confederation of tribes against them in what is known as King Philip's War. It was a war of surprises, massacres, and destruction on both sides, but the Indian confederation steadily weakened. In the early summer of 1676 Philip's squaw and little son were captured, and sold as slaves for the West Indies; and on 12th August, at midnight, he and his remaining followers were surprised by Captain Benjamin Church. Philip was slain, his head was cut off and exposed on a gibbet at Plymouth for twenty years. Church wrote an *Entertaining History of King Philip's War* (1716; new ed., 1865); see also Washington Irving's *Sketch-book*.

Philip the Bold (*Philippe le Hardi*), the founder of the second and last ducal House of Burgundy, was the fourth son of John the Good, king of France, and his wife Bonne of Luxemburg, and was born 15th January 1342. He was present at the battle of Poitiers (1356), where, by his heroic courage, venturing his own life to save his father's, he earned the epithet of *le Hardi*, or 'the Bold'. He shared his father's captivity in England, and on returning to France in 1360 received in reward of his bravery the duchy of Touraine, and on the death, without heirs, of Philippe de Rouvre, also that of Burgundy (1363), being created at the same time the premier peer of France. On the accession of his brother, Charles V., to the throne of France Philip had to resign Touraine, but, as a compensation, obtained in marriage Margaret, the heiress of Flanders, in 1369. In 1372 he commanded with success against the English, and in 1380 he helped to suppress the sedition of the Flemish towns against their count, his father-in-law. But the citizens of some of the populous places, especially Ghent, were only brought back to their allegiance after the bloody defeat of Rosbeck (27th November 1382), where 26,000 Flemings were left on the field. Flanders, the county of Burgundy, Artois, Rethel, and Nevers fell to him by the death of the count in 1384, and his firm and wise government quickly won the affection and esteem of his new subjects. He encouraged judiciously arts, manufactures, and commerce, and his territory—a kingdom in extent—was one of the best governed in Europe. During the minority and subsequent imbecility of his nephew, Charles VI. of France, he was obliged to take the helm of affairs, and preserve the state from insurrection and sedition within and the attacks of the English without. He died 27th April 1404.

Philip the Good (*Philippe le Bon*), Duke of Burgundy, the son of Jean 'Sans-peur' by Margaret

of Bavaria, and grandson of Philip the Bold, was born at Dijon, the capital of the duchy, 13th June 1396, and, on the assassination of his father at the instigation of the dauphin (afterwards Charles VII.), succeeded to the duchy of Burgundy. To avenge the murder of his father, he entered into an alliance with Henry V. of England at Arras in 1419, recognising him as regent of France, and heir to the throne after Charles VI.'s death. This agreement was sanctioned in the treaty of Troyes (1420). The dauphin took to arms but was defeated at Crevant (1423) and Verneuil (1424), and driven beyond the Loire. Some disputes with the English prompted Philip to conclude a treaty with the king of France in 1429. However, the English, by giving him the province of Champagne, and a large sum of money, gained him back to their side. Falling heir to Brabant, Holland, Zealand, and the rest of the Low Countries, Philip became much more powerful than his superior, the king of France, though he preferred to continue in nominal subjection. He made a final peace (1435) with Charles, who gladly accepted it even on the hard conditions which Philip prescribed. The English, in revenge, committed such havoc among the merchant navies of Flanders that Philip declared war against them, and, in conjunction with the king of France, gradually expelled them from their French possessions. The imposition of heavy taxes excited a rebellion, headed, as usual, by the citizens of Ghent, but the duke inflicted upon them a terrible defeat at Gavre (1453), though he wept over a victory bought with the blood of 20,000 of his subjects. The later part of his reign was filled with trouble caused by the quarrels between Charles VII. and his son, the Dauphin Louis (afterwards Louis XI.), who had fled from his father's court, and sought shelter with Philip, although, after ascending the throne, far from showing gratitude, he tried in the most dishonourable manner to injure his benefactor. Philip died at Bruges, 15th July 1467, deeply lamented by his subjects. Under him Burgundy was the most wealthy, prosperous, and tranquil state in Europe; its ruler was the most feared and admired sovereign of his time, and his court far surpassed in brilliancy those of his contemporaries. See Barante's *Histoire des Ducs de Bourgogne de la Maison de Valois*.

Philiphaugh, on Yarrow Water, 3 miles WSW. of Selkirk, the property from 1461 till 1889 of the line of the 'Outlaw Murray' of the ballad. Here, on 13th September 1645, Montrose (q.v.) was defeated by David Leslie, who butchered more than a hundred Irish prisoners.

Philip Neri, ST. See NERI.

Philippeville, a seaport of Algeria, the harbour of Constantine, from which it lies 54 miles NNE. by rail. The town, built since 1832, occupies the site of the Roman *Rusicada*, and has a magnificent harbour (1892). There are distilleries, tanneries, and a trade in wool, hides, fruit, and cattle. Pop. (1891) 15,788; (1921) 33,808.

Philippi, earlier KRENTIDES, a city of Macedonia. It was named after Philip II. (q.v.) of Macedon, who enlarged it because of the gold-mines in its neighbourhood. It is famous on account of the two battles fought in 42 B.C. between Antony and Octavianus on the one side and the republicans under Brutus and Cassius on the other, in the second of which the republic finally perished. The apostle Paul founded a Christian church here. See PHILIPPIANS. The city has been excavated by the French School.

Philippians, THE EPISTLE TO, is generally regarded as having been written by Paul during his imprisonment at Rome about the year 62 A.D. Another theory, however, with much less proba-

bility maintains that it was composed during the imprisonment at Cæsarea, and Kirsopp Lake has recently propounded a third view, that Ephesus was the place of its origin. The epistle is closely related to Colossians and Ephesians, which belong to the same group and were written under the same circumstances. There has been considerable difference of opinion as to whether Philippians was written at the commencement of the imprisonment in Rome or towards its close. Lightfoot maintained the former position, and held that Philippians was a 'transition epistle,' standing between the second group (Galatians, Romans, &c.), and the third. His main arguments were: (1) from the point of view of style the epistle has more affinities with the earlier group; (2) in Philippians iii. we have the last echoes of the old controversy with Judaism which was finished before Colossians and Ephesians were written. The majority of modern scholars, however, think that these arguments are inconclusive, and feel that there is much more ground for supposing that the epistle was the last rather than the first of the third group. The fate of the apostle was evidently nearing its crisis. The judgment of the court was about to be pronounced, and Paul is evidently anxiously awaiting the verdict. 'I am in a strait betwixt the two, having the desire to depart and be with Christ . . . yet to abide in the flesh is more needful for your sake' (i. 23-24). It is probable, therefore, if the Pastoral Epistles in their present form are not genuine (see TIMOTHY and TITUS), that this epistle was the last which came from the pen of the apostle, and constitutes his final message to the Church.

The epistle is well attested; and though its authenticity was questioned by Baur and Holsten, there is scarcely a dissentient voice among modern scholars in regarding it as a genuine work of the Apostle Paul (except, of course, in the extreme Dutch school of criticism which questions the Pauline authorship of all the epistles assigned to him).

The epistle is one of the most personal letters that Paul ever wrote. It was written to express Paul's gratitude to the Philippians for a gift which they had sent at the hands of Epaphroditus (iv. 18). Epaphroditus was taken dangerously ill in Rome, and the desire to allay the anxiety of his fellow-Christians at Philippi was an additional motive for the letter (ii. 25-30). The apostle gives an encouraging description of his work in Rome, pointing out how the 'things that had happened to him had fallen out unto the progress of the gospel' (i. 12), writes a noble plea for the spirit of humility, based upon the illustration of the incarnation (ii. 1-12), tells in a great autobiographical passage the story of his own conversion and spiritual development in order to prove that 'the righteousness which is through faith in Christ,' transcends 'the righteousness which is of the law' (iii. 1-15), and finally pours out his soul in gratitude for the liberality of the Church at Philippi (iv.).

The best modern commentaries are by Lightfoot, Jones (*Westminster Commentary*), Kennedy (*Expositor's Greek Testament*), Vincent (*International Critical*), B. Weiss, Lipsius, Haupt, P. Ewald, and Dibelius.

§ **Philippines**, originally the three orations of Demosthenes against Philip of Macedon. The name was afterwards applied to Cicero's fourteen orations against the ambitious and dangerous designs of Mark Antony. It is now commonly employed to designate any severe and violent invective, whether oral or written.

Philippine Islands, a large insular group forming a northern section of the Malay Archipelago, separated from the rest by the Sulu

(Mindoro) and Celebes Seas, 2000 to 3000 fathoms deep. These seas are enclosed by the three insular chains of Palawan, with Balabac in the north, Sulu in the centre, and Sanguir with Sias in the south, all of which lie in shallow waters, and form a geological connection between the Philippines and Borneo in the south-west and the Philippines and Celebes in the south. The archipelago is washed on the east side by the Pacific Ocean, which in the Philippine trough off Mindanao attains a depth of 5384 fathoms (the greatest depth known), and in the north-west by the China Sea (2000 fathoms). It lies in 5°-21° N. lat. and 117°-127° E. long., and comprises a vast aggregate of over 7000 islands of all sizes, ranging from mere rocks and reefs to the great lands of Luzón (41,000 sq. m.), and Mindanao (37,000 sq. m.). The other chief members of the group, collectively called Visayas, are Mindoro, 3800 sq. m.; Palawan (Paragua), 4500; Samar, 5000; Panay, 4500; Negros, 4900; Leyte, 2800; Cebú and Bohol, each 1500; Masbate, 1200. The census of 1918 gave the population as 10,350,640.

The archipelago is disposed nearly due north and south, and is essentially mountainous and volcanic, lying in the direct line of the vast igneous chain which sweeps round from Sumatra and Java through the Lesser Sunda groups and the Moluccas northwards to Formosa and Japan. In the Philippines the first link in this system going southwards is the volcanic islet of Babuyan off the north coast of Luzón; but beyond the remarkable volcano of Taal, near Manila Bay, the chain ramifies into an eastern and a western branch, which traverse the whole of the archipelago, and are continued seawards by the insular chains of Sulu and Sanguir. The eastern branch develops the lofty cones of Mayon (7943 feet) and Bulusán at the south-eastern extremity of Luzón, while the western branch gives rise to those of Canlaon and Bacón in Negros and Camiguin near the north coast of Mindanao; in this island the two chains converge at the head of the Gulf of Davao, where they culminate in Apo (9610 feet), highest point in the Philippines. These various ranges, which cover nearly the whole surface of the archipelago, leaving room for scarcely any plains except about the lower courses of the rivers, consist mainly of very old eruptive rocks, in many places covered by later Tertiary, Quaternary, and modern scoriæ and lavas. The underground forces are still active, and reveal themselves by tremendous eruptions, such as those of Mayon in 1766 and 1900, and Taal, 39 miles from Manila, in 1911, and especially by earthquake shocks. Violent earthquakes are fortunately of infrequent occurrence, although Manila itself was nearly destroyed by earthquakes in 1600 and 1863, and there have been disastrous convulsions in many parts since then. The navigation of the inland waters is endangered not only by seismic disturbances, but also by the conflicting currents caused by opposing tidal waves, and by the typhoons, which range as far south as about 10° N. lat (see Map at ASIA).

Owing to the parallel disposition of the mountain-ranges, space is afforded for the development of several large rivers, such as the Cagayán (Rio Grande), which drains more than one-third of Luzón, flowing for 220 miles northwards between the Sierra Madre and the North Cordillera east and west; the Agno and Pampanga on the west side of the same island; and in Mindanao the Agusán and the Rio Grande de Mindanao, which flows from the centre of the island first south-west then north-west to Illana Bay in the Celebes Sea. This river is joined by the emissaries of several other lakes, and a characteristic feature of the landscape in most of the islands is the large number

of lacustrine basins, which send their overflow through short coast-streams to all the surrounding waters. The most important and best known of these in Luzón are the Pansipit, which drains Lake Bombón, and the Pásig, which flows from the Laguna de Bay to Manila. Several of the basins appear to be flooded craters, while others are of marine origin, bays and inlets cut off from the sea by the eruptive matter ejected from the neighbouring volcanoes in former geological epochs.

Thanks to the general elevation of the land, and the prevailing sea-breezes, the climate, although moist and hot, is less insalubrious than that of most tropical lands. As elsewhere in the Malay Archipelago, there are two seasons, a wet and a dry, which are determined by the trade-winds, but which, owing to the peculiar configuration of the land, may be said to go on simultaneously. Thus, for all the southern and western slopes, the south-west monsoon is the wet, the north-east the dry season, the recurrence of these periods being reversed on the opposite slopes of the same ranges. At Manila, which is exposed to the south-west winds, the rains last from June to November, dry weather for the rest of the year; but this succession is elsewhere constantly modified, especially by the trend and altitude of the mountain-chains. On the other hand, the temperature varies little throughout the year, ranging from about 77° F. in December (the coldest month) to 84° F. in May (the hottest month), while the greatest extremes recorded at Manila Observatory are seldom more than 25 degrees (66°—91°). But the rainfall varies enormously, from $\frac{1}{2}$ inch in March to 20 inches in August, with a yearly average of 68 to 70 inches. Typhoons occur during the rainy season, and sometimes cause great damage. The Weather Bureau at Manila which issues timely forecasts is important.

The indigenous flora, which is nowhere surpassed in variety and exuberance, indicates a long connection of the Philippines with Indo-Malaysia, and more transitory relations with Austro-Malaysia, through Celebes. Though most of the local genera are represented in the Great Sunda Islands and Malay Peninsula, there are endemic genera too—*Ahernia* (Flacourtiaceæ), *Adelmeria*, and *Monophrynium* (Scitamineæ), *Cleistolanthus* (Loranthaceæ), *Everettiodendron* (Euphorbiaceæ), *Greenlopsis* (Rubiaceæ). Vast spaces are still covered with magnificent primeval forests containing a great number of useful plants, such as coconut, and many other palms, ebony, banyan, pandanus, bamboo, tree-ferns. The nipa palm grows in brackish estuaries. Specially numerous are the fibrous plants, such as the gigantic bejuco (a *Calamus*), the buri, and abacá (Manila hemp). On the plantations are grown many varieties of rice, also maize, sugar-cane, cotton, coffee, cacao, tobacco, and camote (sweet potato). Bananas, oranges, mangoes, and papayas are the most important fruits. Rubber plantations have been established in the south and give promise of a successful industry.

The fauna is much less varied. The carabao or water-buffalo, which in a domesticated state is the principal beast of burden, is found wild in some of the more remote districts. Other wild mammals are the tamarao (a buffalo), wild hog, deer, and monkeys. Bats and squirrels abound, and there are several species of civet. Crocodiles and lizards are plentiful, as are snakes, of which the python is the largest, though not the most deadly. Bird life is varied and presents some species of great beauty. The jungle-fowl is very abundant. An endless variety of forms is also offered by the insect world. Locusts breed freely in the *cogonales*, or grass wastes, and inflict much damage on crops. The fresh and marine waters abound in fishes,

turtles, molluscs, (including pearl and mother-of-pearl oysters), sponges (*Euplectella* and other exquisite kinds).

Of minerals the most widely diffused are gold and coal. There also await exploitation deposits of copper, petroleum, manganese, lead, zinc, asbestos, lime, limestone, alum, besides jasper, marble, and fine building stones. Thermal waters, chiefly sulphurous and ferruginous, occur in many places, especially in Luzón. But the mineral resources of the archipelago are little developed.

Agriculture is the principal occupation, but numerous industries have developed especially during and since the Great War. The most important are sugar-refining, cigar and cigarette manufacture, oil and timber milling, hat-making, while the live-stock industry and fishing are already important. The exports are chiefly abacá, maguey and other fibres, sugar, cigars, cigarettes, tobacco, coconut oil, copra, and hats; and imports, rice, flour, cotton-goods, iron, steel, and machinery. The bulk of trade is with the United States. There are some 800 miles of rail-road, mostly in Luzón, and over 6000 miles of public roads. Besides nearly 8000 public schools there are many technical institutions, a normal school, a state-supported university, and some smaller universities. The chief towns with their populations (1918) are as follows: Manila (the capital, Luzón), 285,306; Cebú (Cebú) 56,502; Albay (Luzón), 52,756; Iloilo (Panay), 49,114; and Laoag (Luzón), 38,469. About 160 miles from Manila is Baguio, the summer capital.

The original inhabitants of the Philippines were undoubtedly the Negritos (*Aetas*, *Atas*, *Itas*), who at one time occupied the whole of the archipelago, but are now reduced to a few isolated groups scattered over the remoter parts of Luzón, Negros, Mindanao, and several other islands. The Indonesians and Malays at present constitute the great bulk of the population. The Indonesians (see MALAYS) are mostly pagans, whereas nearly all the Malays are either Roman Catholics or 'Moros' (i.e. Mohammedans). Like the allied races of Sumatra and Borneo, the Indonesians are distinguished by their tall stature, muscular frames, light-brown complexion, and regular features. Their chief tribes are the Tinguianes, Kalingas, Igorrotes, Ifugaos, and Ilongotes of Luzón; the Cimarrones, Samars, and others of the Visayas; the Subanuns, Manobos, Mandayars, Bilans, Bukidnons, and Bagobos of Mindanao. They probably number about 300,000. The Moros or Mohammedan Malays, chiefly confined to Palawan and the west of Mindanao, were estimated in 1919 at 400,000 in number. All the rest of the Malays are at least nominal Catholics, and comprise two main divisions, the northern Tagálogs of Luzón and the central Visayas (Bisayas) of the Visayas Islands and parts of Palawan and Mindanao. There are about six smaller divisions, mostly in Luzón. All the different tribes and divisions have separate languages and dialects. English is superseding Spanish as the common tongue. Of foreigners, the Chinese, Japanese, Americans, and Spaniards are the most important.

The Philippines (named after Philip II. of Spain) were discovered in 1521 by Magellan (q.v.) during his circumnavigation of the globe. Legaspi, who came from Mexico in 1565 established a Spanish colony in the islands and with him came the first friars. In the succeeding centuries the colonists had to defend themselves against the Portuguese, Chinese, Dutch, English, and Moros. The English sacked Manila in 1762. Spanish rule was oppressive and taxation heavy, civil and ecclesiastical authorities strove with each other, and the tyranny of the friars was resented by the natives. The 19th century brought education and liberal ideas,

and several revolts took place, the first of importance being in 1872. In 1896 Dr José Rizal, a native patriot, suffered martyrdom. Meanwhile the country was again in revolt, when, the Spanish-American War having broken out, an American squadron under Admiral Dewey destroyed the Spanish fleet in Manila Bay (1898). The Philippines was thereupon ceded to the United States (1899), although a guerilla warfare was carried on by Aguinaldo, a native insurgent, till 1901. Under American rule the islands have undergone great administrative and economic advancement. At present the governor-general, appointed by the President of the United States, is the head of the executive, while legislation is in the hands of the Senate (24 members) and the House of Representatives (93), the Philippine Commission being abolished by the Jones Act of 1916. Very many of the governmental posts are held by natives.

See J. E. Stevens, *Yesterdays in the Philippines* (1898); D. C. Worcester, *The Philippine Islands and their People* (1898); G. J. Younghusband, *The Philippines and Round About* (1899); A. B. Meyer, *Die Einwohnerzahl der Ph., Ueber die Negritos, and Album of Philippine Types* (1878-85); Semper, *Reisen* (1879-91); Montero y Vidal, *El Archipiélago Filipin.* (1886), and *Historia General de Filipinas* (1887); Foreman, *The Philippine Islands* (1892); L. R. Sullivan in *Anthropological Papers* (Amer. Mus. Nat. Hist. xxiii. 1918); the bibliography in *The Bulletin of Bibliography*, vol. ii. (Boston, 1899); E. H. Blair and others, *The Philippine Islands, 1493-1898*, 55 vols. (Cleveland, O. 1903-9); J. Blount, *The American Occupation of the Philippines, 1898-1912* (1913); *The Philippines, The Land of Palm and Pine* (Manila, 1912); D. C. Worcester, *The Philippines, Past and Present*, 2 vols. (1914); D. F. Barrows, *History of the Philippines* (rev. ed. 1924); Katherine Mayo, *The Isles of Fear* (1925).

Philippo'polis (Bulg. *Ploudiv*), city of southern Bulgaria, on the navigable Maritza, 110 miles by rail W. by N. of Adrianople. It manufactures silk, cotton, tobacco, leather, &c., and prepares and exports otto of roses. It has a Greek and a Bulgarian archbishop. Pop. 63,400. An outpost of the Macedonian kingdom, it was ruined by the Goths, captured by the Turks (1363), destroyed by an earthquake (1818), burned (1846), and occupied by the Russians (1878).

Phillippsburg, a town of Baden on the Rhine's right bank, 16 miles N. of Carlsruhe. Fortified till 1800, it was often besieged.

Philips, AMBROSE, minor poet, was descended from a Leicestershire family, and born about 1675. He was educated at St John's College, Cambridge, and contributed to the university memorial verses on the death of Queen Mary. Coming up to London he became intimate with Addison and Steele, did hack work for Tonson, and first gained a reputation by the 'Winter-piece' in the *Tatler* (No. 12) and the six Pastorals which opened the sixth volume of Tonson's *Miscellany* (1709), of which the first four volumes had been edited by Dryden. Strangely enough the same volume closed with the Pastorals of the young Pope, whose jealousy was aroused by Tickell's praising Philips and passing over himself, in his paper in the *Guardian* on Pastoral Poetry from Theocritus downwards. Pope took a characteristic revenge by a paper in the *Guardian* (No. 40), in which the worst of the verses of Philips were ironically exalted above the best of his own. His design he disguised with such dexterity that, though Addison discovered it, as Dr Johnson tells us, Steele was deceived, and was afraid of displeasing Pope by publishing his paper. Philips is said to have hung up a rod in Button's Coffee-house with which he threatened to chastise Pope on the first occasion. Pope nourished his anger against him, and all the more after his own

quarrel with Addison to whose circle Philips belonged, and did not forget him in the *Dunciad*. Philips supported the government in the columns of the *Free-thinker*, and was rewarded by being made secretary to Archbishop Boulter in Ireland. Later he sat for Armagh, acted as secretary to the Lord Chancellor and judge of the Prerogative Court, and after his patron Boulter's death returned to London, and died in 1749. Of his plays, *The Distress'd Mother* (1712)—an adaptation from Racine's *Andromaque*—was warmly praised in the *Spectator*; *The Briton* and *Humphrey, Duke of Gloucester* lived only long enough to be damned. His *Pastorals* are vigorous and easy yet graceful verse, but lack the charm that belongs to Gay, whose *Shepherd's Week* was really written at Pope's instigation to take Philips off. Some of his odes, addressed to children, and written with simplicity of diction, earned him from Henry Carey the nickname of 'Nabby-Pamby,' and thus brought a new word into the English language.

See Johnson's *Lives* and Pope's *Correspondence* in Elwin and Courthope's edition.

Philips, or PHILLIPS, EDWARD, the elder of the two nephews brought up and educated by Milton, the sons of his sister Anne, whose husband Edward Phillips held a government office in Chancery and died in 1631, leaving two sons to Milton's care. Edward Philips was born in 1630, and became a student of Magdalen College, Oxford, but left in 1651 without taking a degree. In 1663 he was tutor to the son of John Evelyn at Say Court in Essex. He is mentioned in Evelyn's Diary as 'not at all infected by Milton's principles,' yet certainly he entertained a great respect and admiration for his uncle, and not only extolled Milton in his *Theatrum Poetarum* as 'the exactest of heroic poets,' 'who hath revived the majesty and true decorum of Heroic Poesy and Tragedy,' but has left us a valuable though short and fragmentary *Life* of the poet. This was originally prefixed (1694) to a translation of Milton's *Letters of State*, but is now most accessible in Godwin's *Lives of E. and J. Philips* (1815, pp. 350-383), and is, as Johnson says, 'the only authentic account of Milton's domestic manners.' Of his numerous works may be mentioned a complete edition (the first) of the *Poems of Drummond* of Hawthornden (1636); *New World of English Words* (1638), a kind of dictionary, which went through several editions; the *Continuation of Baker's Chronicle of the Kings of England* (1665); *Theatrum Poetarum*, or a *Complete Collection of the Poets* (1675); the *Tractatulus de Carmine Dramatico Poetarum* in the 18th edition of Buchler's *Thesaurus* (1679); and *Tractatulus de Lingua Latina* (1682). Milton, says Aubrey, made his nephews songsters, and sing from the time they were with him; verses by both are found in *Ayres and Dialogues for One, Two, and Three Voices*, by Henry Lawes (1653). Edward is thought to have died not long after the publication of the *Letters of State*, perhaps in 1696.

Philips, JOHN, Milton's younger nephew and more peculiar charge, born in 1631, was, like his brother Edward, educated by his uncle, and frequently acted as his amanuensis. It may be supposed that Milton had formed a high opinion of his literary capability, since he entrusted to John rather than Edward the writing of the *Responsio ad Apologiam pro Rege et Populo Anglicano* (1652), himself correcting it with the utmost care. But if John was Edward's superior in ability, he was greatly his inferior in character, and persistently displayed an unnatural animosity to his uncle and benefactor. His next work was *A Satyr against Hypocrites* (1655), a bitter anti-Puritan poem and attack on Cromwell, written with considerable

talent, but in a strain of coarse buffoonery. Somewhat in the style of Chaucer, he describes a Sunday in Cromwell's time, a christening, and a Wednesday fast with the extravagant supper at night. This production was frequently reprinted, and must have caused Milton no small disappointment and annoyance. In 1660 John amused himself and the world with his *Montelion* or the *Prophetic Almanac*, a low, scurrilous work, which was, however, extremely successful; he was also a most industrious translator, and in little more than a year (1677) published three large folio translations, *Almahide*, from the French of Madame de Scudéry, on which was founded Dryden's tragedy, *The Conquest of Granada*; Calprenède's *Pharamond*; and Tavernier's *Voyages*. Philips wrote many scurrilous pamphlets, and died in 1706. See Godwin, *Lives of Edward and John Phillips* (1815).

Philips, JOHN, described on the monument in Westminster Abbey erected by Sir Simon Harcourt to his memory as a second Milton. He was the author of three very popular poems, *The Splendid Shilling*, a burlesque of Milton's manner; *Cider*, an imitation of Virgil; and *Blenheim*, a Tory celebration of Marlborough's great victory. He was born in 1676, but, curiously enough, was registered at Winchester as five years, and at Christ Church, Oxford, as six years younger than he really was. He died in 1709, and was buried in the cathedral at Hereford.

Philips, KATHERINE, 'the matchless Orinda,' was born the daughter of a respectable Presbyterian London merchant, on New-year's Day 1631. A precocious child, she early became strongly royalist in feeling, and in her seventeenth year she married a worthy Welsh gentleman, James Philips of Cardigan Priory. Her earliest poem was an address to Henry Vaughan the Silurist, on the appearance of his *Olor Iscanus* (1651). About the same time she seems to have assumed her melodious *nom-de-plume* of Orinda, having formed among her neighbours of either sex a Society of Friendship, the members of which must needs be re-baptised—the ladies as Lucasia, Rosania, Regina, Valeria, Polycrite; the gentlemen as Palæmon (Jeremy Taylor), Silvander, Antenor (her own husband), and Poliarchus (Sir Charles Cotterel, her greatest friend, her forty-eight *Letters* to whom were published in 1705). Our earliest sentimental writer, Orinda, has tears at will even for the marriages of the lady-members, which she resents as outrages on the sufficiency of friendship. Yet she was a worthy woman and a good wife, and deserved the honour of a dedication from Jeremy Taylor (*Discourse on the Nature, Offices, and Measures of Friendship*, 1659). She went to Dublin in 1662, and here Roger, Earl of Orrery, and the rest gave her a flattering reception. On a visit to London she caught smallpox, and died at thirty-three, 22d June 1664. At Dublin she translated Corneille's *Pompée*, and in her last year the greater part of his *Horace*. Her poems were surreptitiously printed at London in 1663, but an authoritative edition was issued in 1667. Her poetry has long since been forgotten despite the chorus of contemporary praise from Cowley and others. Keats found her poems in 1817 while writing *Endymion*, and in a letter to Reynolds speaks of them as showing 'a most delicate fancy of the Fletcher kind.'

See Gosse, *Seventeenth Century Studies*, and text in Sainsbury, *Caroline Minor Poets* (vol. i. 1905).

Philipstown, a market-town of King's County, Ireland, 8 miles E. of Tullamore and 38 miles W. of Dublin, takes its name from Queen Mary's consort, Philip of Spain. Pop. 660.

Philistines (Heb. *Pelishtim*; Gr. *allophuloi*, 'strangers'), a people mentioned in the Bible as

being in frequent contact with the Jews, who gave their name to the country called Palestine, and who belonged to a group of maritime tribes inhabiting the Mediterranean coast-lands, including the islands of Cyprus and Crete, possibly also Sardinia and Sicily, the fringes of Asia Minor and the Aegean countries. Until quite recent times very little was known of the Philistines, and although much indeed still remains to be learnt about them, nevertheless the reader is cautioned against books written on this subject prior to the archaeological discoveries of the present century. It is particularly by the latest results of Egyptian and Hittite research that the problem of the Philistines must be approached. It would appear probable that the first Philistine settlement in Palestine is to be dated about 1190 B.C., during the reign of Rameses III., about the time of the Trojan War, just after the accession of Agamemnon at Mycenæ and the conclusion of the second war of Argos against Thebes. The exodus of the Israelites from Egypt is generally placed at 1240, or about half a century before the Philistine settlement, and in consequence of the martial reputation which the Philistines bore, the circuitous route through the wilderness was taken by Moses (Exodus, xiii. 17). Yet the circumstance presents certain difficulties which yet await solution.

It is a noteworthy fact that the Old Testament narrative invariably represents the Philistines as totally distinct from the Semitic inhabitants of Palestine, not only because they were uncircumcised, but generally because of their social, religious, and political organisation. The famous genealogical table in Genesis (x. 14) counts them among the Egyptian colonies (the 'Casluhim, out of whom came the Philistines'); according to Amos, ix. 7, Jeremiah, xlvii. 4, and Deuteronomy, ii. 23, they came from Caphtor—formerly, from mere resemblance of the word, identified with Cappadocia. Others have, no less groundlessly, derived them from the Pelasgians. The tendency is to believe that the Philistines, who were undoubtedly immigrants, came from Crete, the collocation of Cherethites (Cretans) and Pelethites (2 Sam. viii. and xv.) favouring this view. Moreover, if the equation of Caphtor with Keftiu is somewhat doubtful on account of the final 'r', it is strengthened collaterally by the mention, in a hieratic school exercise-tablet (Brit. Mus. 5647) dating from the end of the 18th dynasty, of Akasou as a Keftian name; this at once recalls the Philistine name Achish. All that is known of the Philistines points to a Cretan origin. In their civilisation there were Carian elements, and thus Minoan influence may have made its appearance in Palestine.

It is doubtful if Abimelech, king of Gerar (Gen. xxi., xxvi.), was king of this people or merely of the country afterwards Philistine; more probably the expulsion of the Danites (Judges, v., xviii.), presumably before the new invaders, marks their first appearance as aggressive enemies. They were subject to five princes, who ruled over the provinces of Gaza, Ashdod, Ascalon, Gath, and Ekron. They were so powerful at the time of Eli that they carried away the ark itself. Under Samuel their rule was terminated by the battle of Mizpah. Saul was constantly engaged in warding off their new encroachments, and at Gilboa he and his sons fell in a disastrous battle against them. David succeeded in routing them repeatedly; and under Solomon their whole country seems to have been all but incorporated in the Jewish empire. The internal troubles of Judæa emboldened the Philistines once more to open resistance; but Hezekiah subdued their country with the aid of the Egyptians. The Assyrians afterwards took Ashdod; and in the time of the Maccabees the Philistines

were Syrian subjects; by the time of Herod the name of the country had long been lost in that of Palestine. A civilised, agricultural, commercial, and warlike nation, they traded largely, and their wares seem to have been much sought after.

The power of the Philistines at the beginning of their history in Palestine is well illustrated by the Golénischef papyrus, which gives the account of an Egyptian envoy, Wen Amon, in the reign of Iameses XII., his adventures at the court of Zakar Baal, Prince of Byblos, and his treatment by Philistine sailors. The narrative brings out clearly not only the decay which had overtaken Egyptian authority but the strength of the Philistines and other 'sea tribes.'

The Philistine language is non-Semitic. Until the Phœstos disk is deciphered, little can be stated with certainty, save that the word *seren*, or 'lord' (1 Kings, vii. 30; Jud. iii. 3), is definitely Philistine, and may be connected with the Greek *tyrannos*: Renan's list of Philistine words in the Hebrew Bible (*parbar*, suburb, cf. *peribolus*; *mekhonot*, machine; *mekherah*, sword (?), *παχαρα*; *capltor*, crown, capital; and *pilegesh*, concubine, *pellex*) is doubtful. The problems connected with the Philistine head-dress and the god Dagon are brilliantly discussed by R. A. S. Macalister (*vide infra*).

Finally, it should be observed that R. N. Salaman (*vide infra*) maintains a partial racial fusion between Philistines and Jews, resulting in the 'Pseudo-Gentile' type which is so common to-day among Jews.

The latest information and bibliographies may be found in R. A. S. Macalister, *The Philistines, their History and Civilisation*, Schweich Lectures for 1911 (Oxford, 1913); see also articles in *Ency. Brit.* and *Jew. Ency.*; *Camb. Anc. Hist.*, vol. ii. (Camb. 1924); the Golénischef papyrus appeared in *Recueil de Travaux relatifs à la phil. et à l'arch. égypt. et assyr.*, xxi. 74; R. N. Salaman, 'Racial Origins of Jewish Types,' *Trans. Jew. Hist. Soc.* (London, 1922), and 'The Philistines,' *Pal. Expl. Fund. Quart. Statement* (Jan. and Ap. 1925).—German students call those who have ceased to be students, as well as non-students, tradesmen, &c., *Philister* or Philistines; hence the further sense of 'uncultured,' 'narrow-minded,' in which application the term has come to be used in Britain, especially through Matthew Arnold's influence.

Phillimore, SIR ROBERT JOSEPH, born 5th November 1810, studied at Oxford, and, after serving in the Board of Control, had a brilliant career at the bar. He sat in Parliament as a Whig from 1853 to 1857; and held in succession the offices of Advocate-general (1862, when he was knighted), Judge Advocate-general (1871), judge of the Arches Court (1867-75) and of the High Court of Admiralty (1867-83). Made a baronet in 1881, he died 4th February 1885. His most important works are his *Commentaries upon International Law* (4 vols. 1854-61; 3d ed. 1879), and his *Ecclesiastical Law of the Church of England* (2 vols. 1873; supp. 1876). His eldest son WALTER GEORGE FRANK PHILLIMORE, 1st Baron Phillimore (born 1845) issued a second ed. of *Ecclesiastical Law* (1895), a third ed. of vol. iv. of *International Law*, and wrote *Three Centuries of Treaties of Peace and their Teaching* (1917). He was raised to the peerage in 1918.

Phillip, JOHN, R.A., was born, an old soldier's son, at Aberdeen on 19th April 1817. He was apprenticed to a painter and glazier, but in 1836 was sent by Lord Panmure to London, where he was ere long admitted to the schools of the Royal Academy. In 1838 he began to exhibit in the Academy Exhibition. Most of his early subjects were of Scottish character, such as a 'Scotch Fair' and 'Baptism in Scotland.' In 1851 he went to Spain in search of health. On his return he

became noted as a painter of the habits and customs of the Spanish people, and was known as 'Spanish Phillip.' In 1857 he became A.R.A., in 1859 R.A. His main triumphs were in Spanish subjects, such as 'La Gloria' (1864), and 'El Cigarillo' (1864). He twice again visited Spain, was in Italy in 1866, and died in London, 27th February 1867. He was a great colourist, and his light effects were broad and strong.

Phillipps, JAMES ORCHARD. See HALLIWELL-PHILLIPPS.

Phillipps, SIR THOMAS, antiquary and manuscript-collector, was born in 1792 at Manchester of an old Worcestershire family, and succeeded to the Middle Hill estates on his father's death in 1818. He was made baronet in 1821 and high-sheriff of Worcestershire in 1825. His famous collection of some sixty thousand manuscripts, largely mediæval, embraced specimens from all over Europe. He died at Cheltenham in 1872.

Phillips, STEPHEN, poet and dramatist, son of the Precentor of Peterborough Cathedral, was born in 1864 at Somerton, near Oxford. After studying at Cambridge, he did some acting and army tutoring, but then turned to literature, drawing critical notice by his striking *Christ in Hades* (1896) and collection of *Poems* (1897). His best plays, in classical style, were *Paolo and Francesca* (1899), *Herod, Ulysses, The Sin of David, Nero* (1906). His *New Inferno*, a blank verse allegory, appeared in 1910; *Harold* (a chronicle play) in book form in 1927. He died at Deal in 1915.

Phillips, WENDELL, abolitionist, was born 29th November 1811, at Boston, Massachusetts, the son of the first mayor of the city (1822). He graduated at Harvard with Motley in 1831, studied law there, and was called to the bar in 1834. But before clients came he had been drawn away from his profession to the real work of his life. A timely and important speech in Faneuil Hall in 1837 made him at once the principal orator of the anti-slavery party; and henceforth, until the president's proclamation of 1st January 1863, he was Garrison's loyal and valued ally, his lectures and addresses doing more for the cause than can well be estimated. He also championed the cause of temperance, and that of women, and advocated the rights of the Indians. In 1870 he was nominated for governor by the Prohibitionists and the labour party. He died 2d February 1884. His speeches and letters were collected in 1863 (new ed. 1884). See Lives by Austin (1888), Sears (1900).

Phillipsburg, a city of New Jersey, on the Delaware River (crossed by two railroad bridges), opposite Easton, at the western terminus of the Morris Canal, and 73 miles W. of New York by rail. It contains foundries, &c. Pop. 17,000.

Phillpotts, EDEN, born in India in 1862, was educated in Plymouth, and was for ten years a clerk. Turning to literature, he made his name by *Children of the Mist* (1898), and other realistic novels, the favourite scene of his books being Dartmoor. His more important publications are *The Human Boy* (a study of adolescence, 1899), *Sons of the Morning* (1900), *Widcombe Fair* (1913), *The Secret Woman* (dramatised 1912), *The Farmer's Wife* (a play, 1917), *Evander* (1919), *Children of Men* (1923), *Up Hill Down Dale* (1925), and some collections of verse.

Phillpotts, or PHILPOTTS, HENRY, was born at Bridgwater, 6th May 1778, studied at Corpus Christi College, Oxford, and was elected Fellow of Magdalen in 1795. He became prebendary of Durham in 1809, Dean of Chester in 1823, and Bishop of Exeter in 1831. A zealous Tory, an extreme High Churchman, and combative by disposition, he

was ever the foremost in opposition to measures of reform, and his name would survive if only for his prolonged but unsuccessful refusal to institute George Gorham (q.v.) for not believing in baptismal regeneration. Yet if he was narrow he was devoted and sincere, his standard of a bishop's duties was an unusually high one, and he was much beloved throughout his diocese. He died near Torquay, 18th September 1869.

Philo Byblius. See PHÆNICIA.

Philoctetes, a famous archer, the friend and armour-bearer of Heracles, who bequeathed him his bow and poisoned arrows. As one of the suitors of Helen, he led seven ships against Troy; but being bitten in the foot by a snake (or, according to one story, wounded by his own arrows), he fell ill. As his wound gave forth an unendurable stench, the Greeks left him on the island of Lemnos, where for ten years he spent a miserable life. But an oracle declared that Troy could not be taken without the arrows of Heracles, so Odysseus and Neoptolemus were despatched to bring Philoctetes to the Greek camp; where, healed by Asclepius or his sons, the restored hero slew Paris, and helped powerfully in the taking of Troy. After the war he settled in Italy. A play of Sophocles is named from him.

Philodendron, a genus of Araceæ, comprising over 200 species mostly of climbing plants (hence the name) in tropical and subtropical America. Many of them play a great part in the local pharmacopœia. *P. bipinnatifidum*, in Brazil called *banana de macaco* (monkey banana), has berries which are liked by man too. *P. Sonderianum*, var. *Missionum*, an epiphyte of Misiones province, Argentina, has aerial roots several yards long, from whose bark are made ropes that will not rot in water. Fibre from the petioles is also made into ropes.

Philo Judæus, the Philosopher, was born at Alexandria, most probably about 20–10 B.C. Belonging to a wealthy family—his brother, according to Josephus, was the alabarch or arabarch Alexander—he received the most liberal education; and such was his zeal for learning that at a very early age he had passed through the ordinary course of Greek studies. Although every one of the different free sciences and arts included in the *Encyclika*, he says, attracted him like so many beautiful slaves, he yet aimed higher, to embrace the mistress of them all—Philosophy. Metaphysical investigation was the only thing which, he tells us, could give him anything like satisfaction or pleasure. He was intimately acquainted with Plato, the Greek tragedians, and Homer, and he speaks with the warmest praises of the Stoics and the Pythagoreans. With these and especially with Plato his affinities are closest—an old proverb runs: *ἡ Πλάτων φιλονίζει ἢ Φίλων πλατωνίζει*. Yet with all his Greek culture he remained a Jew, holding Jewish philosophy as the highest wisdom, the divine revelation given to Moses as the source of all true knowledge in religion. He had completely mastered the literature of his nation, but, strange to say, was by no means a profound Hebrew scholar. When over fifty years of age he went to Rome as the advocate of his Alexandrian brethren, who had refused to worship Caligula in obedience to the imperial edict. His *De Legatione ad Caium* gives a vivid account of this embassy. Of his life we know little except what is recorded above, and that he once went to Jerusalem. His second mission to Rome, to the Emperor Claudius, on which occasion Eusebius reports that he made the acquaintance of the apostle Peter, is doubtful.

The religious and philosophical system of Philo, however, is most minutely known, and deserves the

most careful study on account of the vast influence which it has exercised both on the Jewish and Christian world. To understand his system aright it will be necessary to recall to memory the strange mental atmosphere of his day. The Alexandrines had endeavoured to make Judaism palatable to the refined Greeks, by proving it to be identical with the grandest conceptions of their philosophers and poets, and had quite allegorised away its distinctive characteristics. Philo was the first man who, although himself to a great extent imbued with allegorising tendencies, made a bold and successful stand against a like evaporation of the revealed religion of his fathers; which, indeed, in many cases had led people to throw off its yoke also outwardly. Himself a most zealous champion of Judaism, his bitterness knows no bounds in rebuke of those co-religionists who tried to defend their secret or overt apostasy by scoffing at the Law itself, who were 'impatient of their religious institutions, ever on the lookout for matter of censure and complaint against the laws of religion, who, in excuse of their ungodliness, thoughtlessly argue all manner of objections.' He cannot understand how Jews, 'destined by divine authority to be the priests and prophets for all mankind,' could be found so utterly blind to the fact that that which is the position only of a few disciples of a truly genuine philosophy—viz. the knowledge of the Highest—had by law and custom become the inheritance of every individual of their own people; whose real calling, in fact, it was to invoke the blessing of God on mankind, and who, when they offered up sacrifices 'for the people,' offered them up in reality for all men.

To Philo the divinity of the Jewish law is the basis and test of all true philosophy. Although, like his contemporaries, he holds that the greater part of the Pentateuch, both in its historical and legal portions, may be explained allegorically—nay, goes so far even as to call only the Ten Commandments, the fundamental rules of the Jewish theocracy, direct and immediate revelations, while the other parts of the Book are owing to Moses—he yet holds the latter to be the interpreter specially selected by God, to whose dicta in so far also divine veneration and strict obedience are due; and again, while admitting that many explanations of a metaphysical nature may be given to single passages, yet demands in general that their literal meaning shall not be tampered with. This literal meaning, according to him, is the essential part, the other explanations are mere speculation—exactly as the Midrash and some Church Fathers hold. At the same time it is true that, without denying the literal meaning, again and again he puts forward the allegorical meaning as the one really divine, and indeed sometimes he treats the literal meaning as absurd. Only the allegorical method in his hands differed in so far from that of his contemporaries that to him these interpretations—for which he did not disdain sometimes even to use the numbers symbolically, or to derive Hebrew words from Greek roots, and the like—were not a mere play of fancy, in which he could exercise his powers of imagination, but, to a certain extent, a reality, an inner necessity. He clung to philosophy, as combined with the Law. If the former could be shown, somehow or other, to be hinted at in the latter, then only he could be that which all his soul yearned to be—viz. the disciple of both: a Greek, with all the refinement of Greek culture, and a Jew—a faithful, pious, religious Jew. Nay, he even urged the necessity of allegory from the twofold reason of the anthropomorphisms current in Scripture and from certain apparent superfluities, repetitions, and the like, which, in a record that emanated from the Deity, must needs have a special meaning of their own which

required investigation and a peculiar interpretation. Yet this fanciful method never for one moment interfered with his real object of pointing out how Judaism most plainly and unmistakably was based upon the highest ethical principles.

His writings develop his ideas and his system in the two directions indicated. In that division of his writings principally which treats of the Creation (*κοσμοποιία*) he allows allegory to take the reins out of his hands; in that on the Laws (*νόμοι*), on the other hand, he remains remarkably sober and clear, extolling the Mosaic legislation throughout at the expense of every other known to him. In a very few instances only is he induced to find fault, or to alter slightly, by way of allegory, the existing ordinances.

His idea of God is intended to be in the highest degree philosophical, though its religious significance is never lost sight of. God alone is the real Good, the Perfect, the final cause of all things, which ceaselessly flow outwards from Himself. God is only to be imagined as the primeval light, which cannot be seen by itself, but which may be known from its rays that fill the whole world. Being infinite and uncreated, He is not to be compared with any created thing. He has, therefore, no name, and reveals Himself only in designations expressive of this 'inexpressibility,' such as 'the Place' (the Talmudical *Makom*), because He comprises all space, and there is nothing anywhere besides Him. He is better than Virtue and Knowledge, better than the Beautiful and the Good (*καλοκάγαθία*), simpler than the One, more blissful than Bliss. Thus He has properly speaking no quality, or only negative ones. He is the existing Unity or Existence itself (*ὁ ὢν*), comprised in the unpronounceable Tetragrammaton. As Creator, God manifests Himself to man, and in this phase of active revelation of God, which is as natural to Him as burning is to the heat, and cold to the snow, may be distinguished two distinct sides or essential properties, the Power and the Grace, to which correspond the two Scripture names of Elohim and Adonai. The Power also gives the laws and punishes the offender; while the Grace is the beneficent, forgiving, merciful quality. Yet, since there is not to be assumed an immediate influence of God upon the world, their respective natures being so different that a point of contact cannot be found, an intermediate class of beings had to be created to stand between both, through whom He could act in and upon creation—viz. the spiritual world of ideas, which are not only 'Ideals,' or types, in the Platonic sense, but real, active powers (*δυνάμεις*), surrounding God like a number of attendant Beings. They are His messengers, who work His will, and by the Greeks are called good *dæmons*, by Moses *angels*. There are very many different degrees of perfection among them. Some are immediate 'serving angels;' others are the souls of the pious, of the prophets, and the people of Israel, who rise higher up to the Deity; others, again, are the heads and chief representatives of the different nations, such as Israel does not need, since they conceive and acknowledge the Everlasting Head of all Beings Himself. Collectively the Powers are used as equivalent to the nature or essence of God—his ideas or thoughts dominating and informing the universe; yet they are far from being substitutes for God. Zeller maintains that in Philo's doctrine of the Powers two representations cross each other—the religious notion of personal, and the philosophical of impersonal, mediators. Edersheim also asserts that here Philo's philosophy and theology are hopelessly at issue, the *δυνάμεις* being undoubtedly represented as *hypostases*, while yet they have no true personal subsistence. Dr Drummond refuses to admit that

Philo imputed personality to the Powers, or that he identified them with the angels. Schürer maintains that we cannot deny definitely the personification of the *λόγοι* or *δυνάμεις*, since Philo conceived of them both as independent hypostases and as immanent determinations of the Divine existence.

The *Logos*, or Divine Reason, comprises all these intermediate spiritual powers in His own essence. It is the universal idea, the one supreme and all-embracing thought which unifies everything into a real cosmos—a property of God, and the representative of God in His relation to the created world. As such the *Logos* is the highest of the angels, the Beginning, the Name, the Word, the Primeval Angel, the first-born son of God, the second God (*δεύτερος θεός*, in opposition to *ὁ θεός*). As the expressed Thought of God it has a twofold aspect regarded as the *uttered* and the *inward* *Logos*, although this is not formally expressed by Philo. It becomes objective in the harmonies of the created world, and stands distinct from the same Thought when hidden in the silent depths of God, and known only to His omniscience. The *Logos* formed the world out of chaotic matter, regarded as a mass occupying space, and now considered as the *μὴ ὂν* of Plato, again as the *οὐσία* of the Stoics. Man is a microcosm, a little world in himself, a creation of the archetypal *Logos*, through whom he participates in the Deity, or, as Scripture has it, 'he is created in the image of God.' He stands between the higher and lower beings—in the middle of creation. The ethical principles of Stoicism Philo identified with the Mosaic ethics, in which the ideal is most exalted moral perfectibility or sanctity, and man's duties consist in veneration of God, and love and righteousness towards fellow-men. Philo holds firmly the belief in immortality. Eternity is the motionless duration of unalterable being; time but the moving succession of ever-shifting phenomena. Man is immortal by his heavenly nature; but as there are degrees in his divine nature, so there are degrees in his immortality, which only then deserves this name when it has been acquired by an eminence of virtue. There is a vast difference between the mere living after death, which is common to all mankind, and the future existence of the perfect ones. Future recompense and punishment are not taken by him in the ordinary sense of the word. Virtue and sin both have all their rewards within themselves; but the soul, which is 'pre-existing,' having finished its course in the sublimar world, carries this consciousness with it in a more intense and exalted manner. Paradise is Oneness with God; there is no hell with bodily punishments for souls without a body, and no Devil in the Philonic system. Dr Drummond has succeeded in proving against Dähne and others that matter, though eternal, is purely passive, and not itself necessarily evil in Philo's teaching. The source of the imperfection is not in the material as opposed to the spiritual, but in the phenomenal as opposed to the eternal. The human *πνεῦμα* is itself an emanation from Deity, subject meantime to the bondage of sense, and the loftiest principle of ethics is the utmost possible renunciation of sensuousness. The direct vision of God is possible only for those souls which have been lifted out of themselves and illumined by renunciation and severe purity. And transcending this ecstasy is the complete deliverance from the body beyond the gates of death, when the soul that has freed itself in life from the bondage of sense returns again to its original condition as pure spirit.

Philo's Messianic notions are vague in the extreme, and he partly even interprets certain scriptural passages alluding to some future Re-

deemer as referring to the soul. Yet he indicates his belief in a distant time when some hero will arise out of the midst of the nation who will gather all the dispersed together; and these, purified by long punishments, will henceforth form a happy, sinless, most prosperous community, to which all the other nations will be eager to belong. Still the Messianic hope is very obscure, and Dähne's identification of the Logos with the Messiah is indefensible.

We have only been able to indicate, in the slightest of outlines, the principal features of Philo's theology and philosophy, without endeavouring to follow any one of the manifold systematic schemes into which his scattered half-obscure dicta have been pressed. His method of exegesis and the main elements of his religious philosophy passed into the Christian church, and exercised a powerful influence over its thinkers. Nor can Philo ever lose his importance in the history of thought as the earliest eclectic religious philosopher, the first to construct a real philosophy of religion, in which were harmonised the rational and the irrational—the results of speculative thought with the suppositions of a supernatural revelation.

Philo's writings are numerous, and their arrangement presents no small difficulty to the student. Many of his writings in the list given by Eusebius (*H. E.* ii. 18) are lost, but the bulk even of these have been preserved in the Fathers and early Christian writers, like Eusebius, who quote Philo to an enormous extent. Many detached portions have also been preserved in the *Florilegia* and similar compilations of the earlier Christian Parallelists. The first and very imperfect edition of the Greek text was that published by Turnebus (Paris, 1552), containing only thirty-nine treatises. This was followed by those of Thomas Mangey (2 vols. folio, Lond. 1742) and Holtze (Leipzig, 1801). The *Libellus de Opificio Mundi* was edited by Leop. Cohn in 1889 as a specimen of a projected edition; Cohn and P. Wendland's critical edition of Philo (Berl. 1896-1902) is now the standard one. Some writings of Philo preserved only in Armenian have been published in Latin translations by Jo. Bapt. Aucher (Venice, 1822, 1826); and Greek portions of greater or less extent have been given by Mai, Grossmann, Tischendorf, Cardinal Pitra, and Professor J. Rendel Harris (Cambridge Press, 1886). The more recently collected materials are contained in the hand edition of C. E. Richter (8 vols. Leip. 1828-30) and the Tauchnitz stereotype edition (8 vols. Leip. 1851-53). See the brief account of each book in Schürer's *Hist. of the Jewish People* (di. 2, vol. iii. 1886) in Clark's translation. An important contribution to Philo bibliography is that by L. Massebiau (Paris, 1889). There is an Eng. trans. by C. D. Yonge in Bohn's 'Eccles. Library' (4 vols. 1854-55).

More than three-fourths of what has come down to us from Philo consists of three chief works on the Pentateuch: (1) *Ζητήματα καὶ λύσεις* (*Questiones et Solutiones*)—in Armenian—a short explanation of Genesis and Exodus in question and answer; (2) *Νόμων ἑρμηνείαι*, a large allegorical commentary on Genesis, in which the history is interpreted as a system of psychology and ethics, itself filling almost the whole of Mangey's first volume, and consisting of a series of sixteen special treatises; (3) a group of compositions intended as an *Exposition of the Mosaic legislation for non-Jews*, and falling naturally into three divisions—an Account of the Creation (*κοσμοποιία*, *De Opificio Mundi*), the Biographies of Virtuous Men, and the Legislation proper. Besides these have been preserved, either entire or in fragments, the following works: *Περὶ βίου Μωυσέως* (*Vita Moysi*), *Περὶ τοῦ πάντα σπουδαῖον εἶναι εὐθερόν* (*Quod omnis probus liber*), *Εἰς Φλάκκον* (*Adversus Flaccum*) and *Περὶ ἀρετῶν καὶ πρεσβείας πρὸς Γάϊον* (*De legatione ad Caium*), *Περὶ προνοίας* (*De Providentia*), *Ἀλέξανδρος ἢ περὶ τοῦ λόγον ἔχειν τὰ ἄλογα ζῶα* (only in Armenian), *Ἵποθετικά* (known only from Eusebius), and *Περὶ Ἰουδαίων*.

Other works now generally regarded as spurious are *De incorruptibilitate mundi*, *De Mundo*, and *Interpre-*

tatio Hebraicorum nominum. The Philonic authorship of the *De Vita contemplativa* was attacked by Lucius (*Die Therapeuten*, 1879), but defended by Edersheim in Smith's *Dict. of Christ. Biography*, and with great ingenuity by F. C. Conybeare in his admirable edition of the text (1895).

See H. C. Ryle, *Philo and Holy Scripture* (1895); Herriot, *Philon le Juif* (Paris, 1898); Gfröer, *Philo und die Alexandrinische Theosophie* (Stuttgart, 1831); Dähne, *Die Jüdisch-Alexandrinische Religions-Philosophie* (Hall, 1834); Keferstein, *Philo's Lehre von den göttlichen Mittelwesen* (Leip. 1846); Siegfried, *Philo von Alexandria als Ausleger des Alten Testaments an sich selbst und nach seinem geschichtlichen Einfluss betrachtet* (Jena, 1875); Zeller, in part iii. div. 2 of *Die Philosophie der Griechen* (3d ed. 1881); Edersheim's *Life and Times of Jesus the Messiah* (2 vols. 1883); Principal Drummond's admirable *Philo-Judæus, or the Jewish-Alexandrian Philosophy in its Development and Completion* (2 vols. 1888); L. Cohn in *Hermes*, xxxviii. (1903) and xliii. (1908); C. G. Montefiore, 'Florilegium Philonis,' *Jew. Quart. Rev.*, vii.; the following articles in *Jew. Quart. Rev.*, F. C. Conybeare ('Philo concerning the Contemplative Life'), vii.; 'The Philon. Text of the LXX,' v, viii.; L. Cohn, v, x.; S. Krauss, x.; J. H. A. Hart, xvii., xx.; an admirable study (and bibliography) is that of N. Bentwich, *Philo-Judæus of Alexandria* (Philad. 1910). See also H. I. Bell, *Jews and Christians in Egypt* (Brit. Mus. 1924). I. Abrahams on the permanent value of Philo in *Permanent Values* (Oxford, 1924). On Philo and the Jewish *Halakha* see B. Ritter, *Philo* (Leipzig, 1879). The admirable essay on *Hellenistic Contributions* by C. G. Montefiore, in his *Old Testament and After* (Lond. 1923), should be carefully studied. The Oxford Lectures (1925) on Philo by E. R. Bevan are summarised in his essay on 'Hellenistic Judaism,' in the *Legacy of Judæa* (Oxford, 1926), and should be consulted as the most recent contribution to the subject and the best treatment of existing information. See also articles in *Jew. Ency.*, Hastings's *E. R. E.*, and *Ency. Brit.*

Philology. The meaning of this term has varied curiously. As we find it first employed by Plato, it meant the love of discussion, limited practically to the moral and social questions in which Plato delighted; and the method of such discussion was the Socratic one. At Alexandria the 'philologer' was busied with all the knowledge of his day brought together for the first time in the great library of the Ptolemies. Thus, Eratosthenes, who applied this term to himself, was specially famous as a writer on astronomy. But the great scholars of Alexandria devoted themselves with especial eagerness to the study of the older Greek literature. Men like Zenodotus and Aristarchus compared the numerous MSS. of Homer, selected the best texts, made lists of difficult words, called *glossæ*—the earliest dictionaries—and were the founders of the science of criticism by establishing canons on which they rejected what they deemed spurious in the copies before them. Two centuries later at Rome Cicero, who uses the word not unfrequently in his letters, applies it to study in general. But ever after the Alexandrian time 'philology' was essentially the intelligent critical study of the traditional learning of the past. It widened again at the revival of learning to include the study of grammar, rhetoric, poetry, archaeology—in a word, all the 'humane' studies. And this wider sense clung to the word. Johnson in the 18th century defines a philologer as 'one whose chief study is language, a grammarian, a critic.' Yet Watts, whom he quotes as one of his authorities for the use of the word, says that 'studies called philological are history, language, grammar, rhetoric, poesy, and criticism.' In fact philology was the study which interpreted the best writings; and these writings were Greek and Latin; and in these languages were to be found the most noteworthy speculations on all matters of human interest. So philology had its special and its wider sense.

The work of the critical scholar of the present day has been widened to a degree which could not have been realised before the 19th century. First, the art of interpretation has been developed; the old storehouses of MSS. have been more fully searched; the principles of palæography are more widely known, so that we have many more scholars capable of dealing at first hand with MSS., of deciding upon their age, origin, and relative value. The sister-art of epigraphy, which deals with inscriptions, has ever-increasing material to work upon. Secondly, the science of archæology has been almost re-created. Explorations in all parts of the Hellenic world—Attica (especially the Acropolis at Athens), Delphi, the Peloponnese, Cyprus, Crète, and Asia Minor—have profoundly affected our ideas of Greek art, both plastic and constructive. The long-continued excavations at Pompeii have shown us the domestic life of the 1st century in the most minute detail. There can be no doubt that we have yet much to learn, and that the zeal of modern students will be equal to the task. Again, historical inscriptions and coins have corrected and supplemented the statements of ancient writers, and have often given us unexpected and perfectly trustworthy information as to periods unrepresented in any literature. These and other auxiliary sciences have given new life and meaning to the scholar's work. They make it at once more satisfying and more difficult: there is so much more to be known. Formerly a really great scholar could master the whole domain of knowledge; now every man must depend for something on the labours of others.

The study of philology, especially the study of grammar, after it was transplanted from Alexandria, flourished at Rome in the imperial time. It lingered on at Constantinople till the line of great grammarians ended in Priscian; while lexicography culminated later in the work of Photius and of Suidas. But it was in Italy that the study of antiquity became again a living thing: Italians in the 14th and 15th centuries discovered in Italy, Germany, and France works of the greatest Roman writers, such as Cicero and Lucretius, which had remained for generations buried in convents; it was to Italy that learned Greeks, especially after the sack of Constantinople, came to teach the Greek language at Florence and at Venice, and brought with them the MSS. of Thucydides and of Plato, to be translated by Valla and by Ficinus; and it was in Italy that the results of their labours were first published to the world at large by the great houses of the Manucci and the Giunta. But with the exception of Faerno Italy had no great scholar. Yet by its connection with France it produced scholars in northern Europe. Budé was secretary to Louis XII., whose main interests were in Italy; Lambin visited Rome and Venice before he became the editor of Horace, of Lucretius, and of Cicero; while Muret, though born near Limoges, lived and worked at Rome from 1559 to his death in 1585, and at Rome he lodged for two years the young Joseph Scaliger, destined to become the foremost of European scholars. Italian by descent, but born in France, where he edited his Manilius and wrote his *De Emendatione Temporum*, the first great work in historical criticism, he was led by his conversion to Protestantism eventually to retire from France to Leyden, where he ended his days, the dictator of the world of letters. Isaac Casaubon, a leader in exegesis, as Scaliger was in criticism, though born at Geneva, was the son of a French Huguenot refugee, and in France he lived during the greater part of his life, till like Scaliger he found a securer home elsewhere—in Protestant England. Justus Lipsius, the third great scholar of the day, was a Belgian, professor successively at

Jena, at Leyden, and at Louvain; he also had travelled in Italy.

Of the members of the older German school the most famous was Erasmus, by birth a Hollander, but the centre of a band of able scholars at Basel, where he spent the last sixteen years of his life, well known in England, and for a short time a professor at Cambridge, a man of vast learning, but not a master in criticism, 'the man of letters, the first who had appeared in Europe since the fall of the Roman empire' (Mark Pattison). He lived some three years in Italy, but gained, as he thought, nothing from it. Able scholars were Camerarius, professor at Leipzig, and Gruter of Antwerp, the first great collector of Greek and Latin inscriptions.

For different reasons France and Germany ceased to be the nurse of scholarship in the 17th century. The reign of Louis XIV. fostered modern rather than ancient literature; and Germany was the scene of furious war. But Scaliger's influence lived on in Holland. At Leyden, where he died, lived Daniel Heinsius and his son Nicolas, Gronov (Gronovius), conspicuous for his skill in appreciating MSS., and Clüver (Cluverius), the first great writer on geography. At the same time Graefe (Graevius) was editing Cicero at Utrecht. Somewhat later in England lived the first of English scholars, Richard Bentley, in frequent correspondence with Dutch scholars, but owing nothing to them, a man whose astounding critical power could not always save him from errors due to his self-confidence. The only other Englishman whose fame, like Bentley's, has steadily grown with time was Richard Porson, professor of Greek at Cambridge at the end of the 18th century. Distinguished names in the school of Holland in the 18th century are Hemsterhuis and his pupils Ruhnken and Valckenauer. In Germany we find Ernesti at Leipzig, the editor of Cicero; his scholar, Heyne, the founder of the school of Göttingen; Reiske of Leipzig, skilled not only in Greek and Latin, but also in Arabic, whose edition of the Greek orators is still in use; Winckelmann, the first great writer on ancient art; Wolf, professor at Halle, who is best known as the great Homeric critic, but whose general power and method almost entitle him to a place by the side of Scaliger and Bentley. Scholars of a later date are Immanuel Bekker, professor at Berlin, editor of Plato, Thucydides, the orators, and Aristophanes; Godfrey Hermann, a scholar of unusual breadth, whose fame rests securely upon his work on Æschylus; Boeckh, the editor of Pindar and of the *Corpus* of Greek inscriptions; Welcker, professor at Bonn, the first who combined the study of Greek art, literature, and mythology; K. O. Müller, whose services to the study of ancient history were cut short by his premature death; F. Ritschl, professor at Bonn, the restorer of the text of Plautus, as Lachmann at Berlin was the restorer of Lucretius; H. A. J. Munro of Cambridge, the inheritor of Lachmann's labour on Lucretius; Madvig the Dane, a Latin scholar of eminent acuteness; and Cobet, in whom the critical power of Holland seemed to be renewed again. To the end of the century belong Bücheler of Bonn, editor of Petronius; R. C. Jebb of Glasgow and Cambridge, editor of Sophocles and Bacchylides; Ingram Bywater of Oxford, the Aristotelian scholar. (The fullest and best account of the history of classical philology is to be found in Sir J. Sandys' *History of Classical Scholarship*, 3 vols. 1903-8.)

In the 19th century, however, the term 'philology' came to be more frequently applied to *Comparative Philology*, which is a subdivision of the more general term, and grew out of the older sense of the word 'philology.'

Comparative philology has taken the place of such terms as 'linguistics' or the 'science of lan-

guage.' Either of these terms would have been more precise, but 'linguistics' has never been popular, and 'the science of language' has for some reason been regarded as cumbersome, although it was employed in Max Müller's famous lectures at the Royal Institution in 1861 and 1864. The origin of the term was the observation that groups of languages can be compared together in detail. In this way their structure and history could, to a large extent, be illustrated, and the discovery of the value of comparison laid the foundation of the whole modern structure of the science of language. In earlier centuries, when scholars went further in the investigation of their own language, or of Latin and its relation to Greek, which was a favourite theme of research, they did not think of comparing a number of languages together and ascertaining what relations existed between them.

In the Middle Ages it was generally assumed that the dispersion of peoples at the Tower of Babel was the origin of the difference between the known languages of the world, and consequently it was taken for granted that Hebrew was the original language from which all others had, in different degrees, become corrupted. There are several stories handed down, for example in ancient times by Herodotus of Psammetichus, King of Egypt, and in later times of Akbar in India, and of James IV. in Scotland, who are reported to have made experiments in order to ascertain what the original language was. According to Herodotus (ii. 2) King Psammetichus entrusted two newly-born infants to a shepherd, with instructions that nobody was to be allowed to talk to them. They were to be kept entirely isolated, with no living creatures in the neighbourhood but the goat that supplied them with milk. After a time the children were reported to have uttered the word *bekos*, which, after much research by Egyptian scholars, was pronounced to be the Phrygian word for 'bread.' It is curious that it did not occur to Herodotus that if the Greek ending *-os* were left off, the word *bekos* was simply the cry of the goats, *bek*. King James IV. of Scotland in the same way isolated children with a dumb nurse upon the island of Inchkeith in the Firth of Forth. Lindsay of Pit-scottie, who relates the story, says that after a time the children pronounced sounds which were declared by the learned to be good Hebrew, but the historian himself pointedly remarks that he has no personal knowledge of the facts, and relates them only by 'the author's rehearse.'

Jesuit missionaries in India had observed similarities between Sanskrit, the sacred language of the Hindus, and Greek and Latin; but the first statement on the subject which attracted public attention was that made by Sir William Jones, the Chief Justice of Bengal, in addressing the recently founded Asiatic Society of Bengal in the year 1786. In that discussion he pointed out that future investigations would no doubt show that Sanskrit, Greek, Latin, Celtic, and the Teutonic languages were all of one origin, thereby defining, with tolerable exactness, the bounds of the family of languages now known as Indo-European or Indo-Germanic. It was, however, difficult for Europeans to obtain knowledge of Sanskrit. The natives were jealous of Europeans mastering their sacred language, and even when the pundits taught them the classical Sanskrit of the epics, they carefully kept from them knowledge of the earlier forms of language found in the Vedic hymns. Till this earlier language was known, the similarities between Sanskrit and the languages mentioned of Europe were less conspicuous both in forms and in syntax. The knowledge of Sanskrit was obtained in Europe first from Alexander Hamilton, who had lived for a

long time in India, and who on his return home was captured by Napoleon and kept a prisoner in Paris in the year 1803. There he taught some distinguished scholars, amongst others Friedrich Schlegel and C. Fauriel, who at once realised the importance of the language. Schlegel carried with him the knowledge of Sanskrit to his native Germany, where the study of it soon became popular. He did, however, one serious injury to the study. Schlegel insisted that Sanskrit was the mother tongue from which the other languages mentioned by Sir William Jones were descended, whereas he ought to have regarded it as only the elder sister of these other languages. This mistake proved a serious detriment to the scientific development of the study for at least two generations.

The effect of the discovery of Sanskrit is well elucidated by the writings of Alexander Murray (1775-1813), for a short period in 1812-13 Professor of Oriental Languages in the University of Edinburgh. He had prepared a work comparing the languages of Europe, which, ten years after his untimely death, was published without correction in 1823. But his correspondence with Constable, the publisher, shows that he realised how imperfect his work was, when once he had the opportunity of learning something of Sanskrit. If he had lived his book would no doubt have been the first attempt at a scientific study of the languages which are known as Indo-European or Indo-Germanic. This task ultimately fell to Franz Bopp (1791-1867), who studied in London in 1816 and familiarised himself with the newly discovered language. It was necessary to find a term for the family of languages whose relations had thus been established, and in 1818 Thomas Young, who was both philologist and physicist as well as doctor of medicine by profession, first published, it appears, the word 'Indo-European' in an article in the *Quarterly Review*. It is obvious that he extended the bounds of the family much beyond what is accurate, including amongst other peoples who spoke an Indo-European language, Arabs and Finns.

In 1823 a well-known German philologist, Klaproth, made use of the term 'Indo-Germanic,' but did not claim that it was a new invention, and it is not certainly known whether this was the first use of it. This term has in Britain been used as well as Indo-European. Indo-European has always been used in France but avoided in Germany, where, owing to the pronunciation of the diphthong *eu* as *oi* the word is much more difficult to pronounce than Indo-Germanic. It has been objected that some of the languages, e.g. Armenian and Persian, are neither Indian nor European, and that all European languages do not belong to the family, e.g. Finnish, Hungarian, Turkish, Basque. Indo-Germanic was rather an attempt to define the group by expressing the two ends of the chain, India being the most easterly point and Germany, or rather the lands inhabited by the peoples of Germanic origin, the furthest west. At the time the origin of Celtic was not certainly known. The influence of accent upon this group of languages has changed the form of the words so much that it required very elaborate investigation to discover if they were really of the same stock. But the term Indo-Germanic, even when Celtic was identified as belonging to the same family, was not wrong, because Iceland has been inhabited since 874 A.D. by people speaking a Germanic or Teutonic language, and a language of the same stock has in recent centuries spread over the continent of North America.

In the first stages of the investigation, philologists were content with a general resemblance between words in order to establish, as they thought, a connection between them. But as

investigation continued, it soon became clear that stricter rules were required in order to establish identity of origin between words. Various sound laws were formulated for this purpose. The use of the word 'law' is incorrect because, strictly speaking, a law is issued by some authority, and has attached to it some penalty for its violation. Neither of these features characterises the laws of language. They are, in fact, only observed changes from an earlier state of the language to a later, and clearly if they are to have any scientific value they must be shown to follow definite principles. If in the same circumstances, at the same period and in the same dialect, a sound changed in half-a-dozen different ways, clearly any scientific knowledge would be impossible. On the other hand, the laws of language cannot be compared with the natural laws established for physics or chemistry, because in physics and chemistry, given certain antecedents, the results follow without fail. From two atoms of hydrogen and one of oxygen nothing else can be produced but water, and no such invariable sequence can be postulated for the laws of language. The main reason for the difference is that the action of natural law in the case of sciences such as physics or chemistry cannot in any way be influenced by the human mind; given the antecedents, the result is inevitable. In language, however, the human mind plays a great part in the changes that take place. Through its action, sounds and forms, syntax and meaning all take new and erroneous directions, because the human mind has jumped to the conclusion that things which have some apparent connection are really related when they are not. In English the forms of the noun and the verb have been altered to a very great extent owing to this influence, which at one time was called false analogy and is now generally known by the name analogy without qualification. It is owing to this fallacious play of reason upon the facts of language that the vast majority of substantives in English make their plurals in *-s*, this suffix being originally only one of several which formed the plural in English. In the same way in the verb the past tense is now in the great majority of verbs made by the suffix *-ed*. We still preserve in some verbs the old strong conjugation represented by *sing, sang, sung; tear, tore, torn*, and various others; but we have lost all trace of this conjugation in a great number of verbs which once possessed it, though in various dialects traces of the old state of things still survive. Thus the verb *bake* makes its past tense and its past-participle *baked*; but in Scotland the past tense *bauk* still survives to this verb, and there are scores of other examples of the same phenomenon.

The first investigators of the Indo-European or Indo-Germanic family of languages contented themselves with discovering the general resemblances between the languages. Bopp, the greatest of them, carried the bounds of the family a good deal beyond what was justified, bringing into it, for example, the languages of the South Sea Islanders, which in some respects have a superficial resemblance, though investigation has shown that they are not really related to the Indo-European family. The first of the etymologists who established relations between the words of the different languages was August F. Pott (1802-87). One of the most striking generalisations made in the early days of the study was that known in Britain as Grimm's Law, but in Germany as the 'sound-shifting.' The main part of this generalisation was discovered by the Dane, Rasmus Kristian Rask (1787-1832), and was elaborated further by the famous German scholar, Jacob Grimm (1785-1863), who published the elaborated form in the

second edition of his German Grammar (*Deutsche Grammatik*) in 1822.

It was observed that many Latin and Greek words had forms akin to them in the Germanic or Teutonic languages, but with a difference in the stopped consonants—*p* being represented by *f*, *b* by *p*, and the original *bh* (surviving as such only in Sanskrit, and represented by *ph* in Greek and by *f* and other sounds in Latin) by *b*. In the same way *t* was represented by the Germanic *th*, *d* by *t*, and *dh* (surviving like *bh* only in Sanskrit while represented in Greek by *th* and in Latin by *f* and other sounds in certain combinations) by *d*. In the same way *k* was represented by *h*, *g* by *k* (*c*), and the original *gh* (surviving only in Sanskrit as before and represented in Greek by *kh* and in Latin by *h* and sometimes other sounds) by *g*. Grimm unfortunately combined with this series another series which in point of time was separated from it by many hundreds of years in its development. This was the 'sound-shifting,' which differentiates modern High German from German of the Platt-Deutsch type, to which English belongs.

There were a number of exceptions to this law which remained for half a century inexplicable. In 1875 the clue to their explanation was discovered in the influence of accent by Karl Verner (1846-96). At this time an attempt was made to formulate the influence of phonetic laws more carefully. This movement began with the works of Professor W. D. Whitney (1827-94), and was propagated by his translator August Leskien (1840-1916), and after him by his friends and former pupils, Karl Brugmann (1849-1919) and Hermann Osthoff (1846-1909). Their views were definitely formulated in the work of Hermann Paul (1846-1921), in his book, published in 1880, *Prinzipien der Sprachgeschichte*, which has gone through five editions. The investigation of dead languages, on which most of the observations (though not Paul's) were founded, led these scholars to regard the working of phonetic laws as a more regular and precise thing than the careful study of living languages has shown it to be; not that the principles are wrong, but that the interchange between dialects is much more extensive than had been supposed.

In 1900 E. Wechssler argued that the changes of sounds were effected in one or other of two ways: (1) there was a gradual and sometimes almost imperceptible change in sounds without external influence in languages remaining on the same area for a long period undisturbed, and (2) the immediate sound change where two languages came in contact as by conquest. In such a case the pronunciation of both parties was likely to change because each would attempt to pronounce the language of the other. It is observed that when grown persons attempt to pronounce foreign languages, as the cartilages of the larynx which have the main work of sound production to carry out are much less movable than in children, they always attempt to produce the effect of the foreign sounds by the nearest sounds in their own language. Thus if they are compelled to adopt a new language, they will have the words of the new language but the sounds will be the nearest sounds they can produce out of their native language. This change is instantaneous and it may be permanent. Thus in most parts of Spanish America the Spaniards were a very small minority in the early days of the Spanish conquest, and as a result kept themselves to themselves, and in this way perpetuated a comparatively pure but ultimately archaic form of Spanish. In Chile, however, they were numerous enough not to be afraid of the natives, and the consequence of greater intermixture is shown by the fact that the native dialect consists of Spanish words, but

with the sounds not of the 16th century Spanish but of the language of the Araucanian Indians who held the country before the Spanish conquest.

Between 1840 and 1875 the work that was done in Comparative Philology was mainly in the organising of the material already accumulated. The foremost scholar in this direction was August Schleicher (1821-68), whose compendium of comparative grammar was the standard text-book from 1861; the 4th edition appeared after his death in 1876. Another important work of this period was the *Principles of Greek Etymology* of Georg Curtius (1820-85), which appeared first in 1858 (5th ed. 1879). This book, treating of Greek, comprehended a comparison of Greek with Sanskrit, Zend, Latin, Germanic, Letto-Slavonic, and Celtic. It is noticeable in this book what a large number of forms are given which are regarded as being irregular. Another independent thinker of that period was Theodor Benfey (1809-81), and Max Muller's lectures on *The Science of Language* in 1861 and 1864 added very much to the popular interest in the study. The philosophical treatment of language generally was helped greatly by Wilhelm von Humboldt (1767-1835) and his editor, Heymann Steinthal (1823-99). The words that were common to the whole Indo-European family or to its different members were systematically collected by August Fick (1833-1916) in his comparative dictionary of the Indo-Germanic languages (1st ed. 1868, 4th ed., left incomplete, 1890-94). In 1870 the Italian scholar, G. I. Ascoli (1829-1907), showed that the investigation of the sounds of the Indo-European original language was not yet complete, and established that besides *k*, *g*, and *gh*, which are pronounced against the hard palate, there must have been another series produced against the soft palate (velum), and therefore called velar sounds. This last series often had along with them a *w* sound, the combination being represented by the Latin *qu* and the English *wh* which stands for an older *hw*.

In 1876 Karl Brugmann showed that Sanskrit and Greek represented by a vowel alone a sound that in other languages was represented by a vowel and a nasal. Thus Sanskrit *tatās*, Greek *tatōs*, Latin *tenus* were the same word made from the same root, and Brugmann was able to show that the explanation of this was that, owing to the stress accent having fallen upon the last syllable, the first syllable was reduced, so that *n* alone made the syllable, all nasals being continuous sounds like vowels, which could be prolonged as long as the breath would hold out. The discoveries of Ascoli, of Verner, and of Brugmann explained a very large number of the forms which had been regarded as irregular, and others were explained by the distinguished mathematician G. Grassmann (1809-77), who in middle life had taken up with great enthusiasm the study of Sanskrit and of Comparative Philology. A law which is generally known by his name as 'Grassmann's Law' showed that in Greek and in Sanskrit aspirated sounds like *dh* or *bh* in Sanskrit, or *th* and *ph* in Greek were avoided in successive syllables, thus removing one of the remaining difficulties about Grimm's Law.

The investigation of all these points was greatly helped by the more accurate representation of the sounds in Sanskrit by its alphabet, the study of Sanskrit having been pursued, from very early times, in India by pundits who were themselves expert phoneticians. The revision of the vowel sounds of these languages began with these discoveries and was systematised first by Ferdinand de Saussure (1857-1913) in his *Mémoire sur le Système Primitif des Voyelles dans les langues indo-européennes* (1879), and the whole of the

sounds of the Indo-European languages were treated with much detail by Brugmann in his *Grundriss*, the first volume of the first edition of which appeared in 1886, the second edition of volume I. in 1897. The second edition is a work of great size and was not entirely complete when the author died in 1919. Besides the sounds, this work treats also of the forms and the syntax of the Indo-European languages.

The investigation of these languages was the first, but it has been succeeded by investigation of the Semitic languages, for which also there is now a comparative grammar by Carl Brockelmann in two volumes, 1908 and 1913. The languages of Africa have also produced grammars of various groups, and the same principles have been found to work equally effectively in all. This is clearly shown by the following remarks of an expert writer upon African languages:

'As we carried our investigations deeper and deeper we were surprised to note how far-reaching and absolute are all the principles and rules. We are able to state and explain them definitely and find them working without exception. Indeed, when an irregularity is found, at once the suspicion is raised that the real principle has not been discovered, and our grammar stands without the usual lists of exceptions. In this respect it figures as an ideal, impossible to our European languages, which have been subject to such interaction and reaction until Keltic, Saxon, and Latin rules have brought about results and changes, so arbitrary and strange as to be almost inexplicable, and we have to state facts as facts and leave them so.'—Bentley, *Dictionary and Grammar of the Kongo Language*, Preface, p. xxi. (1887).

The most effective cause in the complications which this writer notes is analogy, which has already been mentioned. The working of this principle has been carefully examined by B. I. Wheeler in a little treatise entitled *Analogy and the scope of its application in Language* (Ithaca, New York, 1887). Its influence extends throughout the whole field of language to sounds, to forms, to syntax, and to meaning. It is impossible in a short article to enumerate all the forms in which analogy makes its appearance. Its working may be classified under three headings: (1) logical analogy; (2) formal analogy; (3) a combination of 1 and 2. When particular forms of a word influence other forms of the same word we have an example of logical analogy. In the original language from which the various Indo-European languages have descended the paradigm of many nouns showed different forms in the different cases. Thus the word for 'father' was in the nominative *patēr*, but its locative case was *patēri*, and its genitive was *patrēs* or *patrōs*. The effect of analogy is to reduce this variety so that in Latin we get the shortest form throughout, thus the genitive *patris* and the accusative (which would have been originally *patērm*) *patrem*. It is, however, difficult to say how analogy will work in any particular instance, because in Latin the nouns like *dator*, 'giver,' had originally a long *o* in the last syllable, while there was a short vowel in the accusative, and in the middle syllable the vowel altogether disappeared, as in the genitive originally *datres*. These short forms, however, have disappeared and the long *o* has been carried throughout *datōrem*, *datōris*, &c. And curiously enough through another law of the Latin language whereby a long vowel is shortened after a short vowel, the long vowel of *dator* has become short in the classical period, and remains the only short vowel in the paradigm which elsewhere has a long vowel throughout. (In both *pater* and *dator* the *a* of the root syllable in the original paradigm is a reduced

vowel owing to the influence of the strong stress accent falling on the final syllable.)

In formal analogy forms of one word influence forms of another word which does not belong to the same series. Thus the word 'hoe' makes its plural 'hoes,' and as a result of this the word 'hose' has been treated in dialect as a plural making its singular 'ho.' Thus in Allan Ramsay's *Christ's Kirk on the Green* the form *ho*, 'stocking,' occurs as the singular of 'hose.' In a similar way in American dialect *shay* is regarded as the singular of 'chaise.' It is by analogy that the great majority of new words are made, sometimes with curious results. In English we have a form 'worm-eaten,' a properly made compound meaning 'eaten by worms,' but there is a class of workmen who are known as 'worm-eaters.' Their business is not to eat worms but to make holes in furniture to represent the ravages of worms, in order to give the impression of antiquity. In the east end of London some years ago a popular name for a policeman was 'swede-eater,' which was intended to imply that he was a rustic and fed on Swedish turnips. It is through analogy that in Elizabethan English a confusion arose between the verb 'leren' (to teach) and 'learn,' which has led in various dialects to the use of 'learn' in both senses, a use which also can be found in the Prayer-book version of the Psalms and in the Elizabethan writers not infrequently (cf. Ps. xxv. 4, Lead me forth in Thy truth, and *learn* me (Prayer-book); *teach* me (Authorised Version)).

A further appearance of irregularity arises from the mixture of dialects. Within a language dialects arise mainly from isolation or bilingualism. Strictly speaking, dialect differences may be seen between members of the same family, but they are much more conspicuous in groups of persons isolated from their nearest neighbours by living, for example, on an island or in a mountain valley. Such isolation tends to greater homogeneity within the small area in constant communication, and greater differentiation from the large area outside, this differentiation arising from new developments within the separate areas. Districts where such dialect differences arise plentifully are in the islands of the Ægean or in the Orkney and Shetland Islands. Bilingualism arises where the speakers of two different languages come to be mixed. The result is a mongrel dialect which is neither language but contains features of both in vocabulary, sounds, morphology, and syntax. A good example of the kind is the Pennsylvania-Dutch spoken in America. Less conspicuous but not less common is the mixture in Britain between local dialect and book English. The effect of a language may survive long after the language has ceased to be spoken in the district or even to be understood. Thus in Aberdeenshire, except in the mountainous parts, Gaelic has not been spoken since 1308, when the greater part of the county was ravaged by Robert the Bruce and the Gaelic speakers suppressed and in part at least exterminated. Their places were taken by English speakers who had been established long before in the city of Aberdeen, but to this day Gaelic words survive in the dialect like 'oy' for grandchild, 'caird,' tinker, 'pluke,' pimple, &c. In the sounds, the use of *f* in this dialect where English would use *wh* is characteristic of areas where Celtic and Saxon border upon one another. The same change is observed in parts of Ireland, and is given by Elizabethan writers as an Irish characteristic.

It is supposed that the origin of sound-shifting known as 'Grimm's Law' was of the same character. When the two languages are not spoken in the same area, dialect infection may arise from several causes. Geographical proximity is not very

effective because rivers and mountain ranges are both sufficient to reduce the influence very much. Trade is more effective and facility of communication. Political unity attracting the inhabitants to a centre, and conscription, have both much influence in introducing new dialect words. Still more, perhaps, have literature and systematic education. Uniformity over a large area, unless it is free from geographical difficulties, is rarely attainable. The commonest form of infection is by the borrowing of words for implements, wares, and the like. Of these we can see many examples in English. For example, the word 'damsons' includes the name of the city of *Damascus*; 'shalot,' the name of *Askalon*, a city of the Philistines; 'coach,' the name of the town of *Kocs* in Hungary; 'cravat' is a form of tie borrowed from the *Croats*. When [Shakespeare] says: 'You freeze capacities, ye jane judgments' (*Two Noble Kinsmen*, iii. 5, 9), he is thinking of two fabrics of a rough and inferior character, one named from *Friesland* in the north of Holland, and the other from the city of *Genoa* in Italy, through *Gênes*, the French form of the name.

In all languages there are to a greater or less extent two accents: (1) pitch, which consists in raising or lowering the voice from one note to another, and (2) stress, which consists in emphasising and pronouncing one syllable at the expense of the syllable preceding or succeeding it. Pitch accent has little influence upon modifying the forms of words, but stress accent is very powerful in this respect. If we take a word like the Latin *latrocinium*, there were in this word two stress accents, a subordinate stress accent upon the first syllable and a main stress accent upon the third syllable from the end, it being a rule in Latin that if the second syllable from the end is short the stress is upon the third syllable from the end, and if the second syllable is long, the stress is upon that syllable. The effect of stress accent upon this long word is to cut out the syllable containing *o* and the final syllable, and to reduce the word to the form which we know as *larceny*. The effect of stress accent is to reduce the number of syllables in a word by destroying unaccented short syllables altogether, and this is the main reason for the great difference in appearance of words in ancient Greek and ancient Latin. The main accent of ancient Greek was pitch, and thus its short syllables remain unimpaired, with the result that it is very easy in Greek to write in dactylic measures (—υ, —υ, . . .) owing to the preservation of the short syllables. In Latin and in English, as the short syllables have been very largely destroyed, such metre is very difficult, and in English has never been successful. A great artist like Virgil was able to accomplish it in Latin with success, and his influence was sufficient to perpetuate it till changes came in Roman civilisation, when language reverted to the old trochaic measures (—, υ, . . .) which were more suitable to it just as they are to English.

Of the formation of words, very little, as a rule, is known for the older period of the languages, like the Indo-European, which have long records, the bulk of the vocabulary being in existence long before the production of any existing documents. At one time Western philologists, following the example of the Indian grammarians of an earlier age, regarded words as consisting of monosyllabic roots to which formative suffixes were added, and the noun, pronoun, and verb were completed by the addition of endings which, in the noun, were supposed to be of the nature (in the majority of cases) of postpositions, expressing local relations, while in the verb there were formative elements for different tense and mood formations, and endings

which represented 1st, 2d, and 3d persons in the singular and plural, with a corresponding set of forms if the language recognised a dual. A dual number was really a luxury, and most of the languages discarded it at an early period. Its use is strictly limited to pairs of things—the two eyes, the two hands, the two horses in the chariot, &c.—but it could not be used for any casual combination of two, like ‘a man and a dog.’ The explanations offered of these formative suffixes and terminations are plausible, but can be no more, because the word is complete before history begins. We can, however, see the same processes going on in later times. In English there was a masculine form *singer*, and a feminine form *songster*. A number of the words ending in *ster* ceased to have a feminine sense, mainly because the work concerned passed from women to men. Thus the word *tapster*, which in Chaucer is feminine, has long ceased to be so, and many of the other words have ceased to live except as proper names—e.g. *Baxter*, which is the feminine of *baker*, and *Webster*, which is the feminine of *weaver*. The result of the feminine value disappearing is that in the case of *songster* a further suffix is added to it belonging to another section of the Indo-European family. The newly-coined word *songstress* contains a second suffix indicating the feminine, which has had a very long history. One of the earliest words to contain it which we know is the Greek *basilissa*, ‘queen.’ Here the ending might arise by analogy from *anassa*, the feminine to *anax*, ‘king.’ In all probability, however, the ending was not Greek, but came into Greek from the population that inhabited Greek lands before the Greeks. But it maintained itself in Greek, and spread from Greek to Latin, particularly after the incoming of Christianity. Thus the feminine of *abbas*, ‘abbot,’ is *abbatissa*, whence *abbess*, and from words of this type the ending has been added by analogy to *songster*.

In many Germanic words there was the ending ‘-inga,’ implying membership of a family or stock, and a large number of place-names in England are derived from such formations. Thus Nottingham (O.E. *Snotingā-hām*) is the home of the Snottingas, the family of Snot (‘the wise’). The ending was added to one or two words which ended in *l*: thus *cæthel*, ‘noble,’ had appended to it the ending *ing*, whence the name of Edgar Ætheling. As not infrequently in language the ending was misunderstood as being *-ling* and not merely *-ing*, and a large number of new words have been made in English with this mistaken ending—nestling, darling, youngling, &c.

Though we cannot trace in the Indo-European languages the development of the verb, it is in all probability a later formation than the substantive. In other languages where the history of the formation is clearer, it seems to be generally true that the verb is of the nature of a participle followed by a personal pronoun, and, as the endings in the Indo-European languages also have a pronominal value, it is very possible, though we cannot trace the process of development, that such is also the origin of the Indo-European verb.

The subject of Comparative Syntax is too long and involved to be treated here, but it may be said in brief that throughout their whole history the Indo-European languages are tending away from synthesis—the making of compound forms such as have been just discussed—towards analysis, the use of separate prepositions with the substantive and auxiliary verbs instead of tense and mood suffixes, and substantives or pronouns as subjects instead of personal endings.

The most recently investigated subject in connection with the development of language is Mean-

ing. How do the meanings of words develop? The subject is complicated, and not yet by any means fully worked out. It is clear that words change their meaning by confusion with some related idea. The relation may be purely accidental, as in the confusion of meaning in English between *pert* and *impertinent*. *Impertinent* is properly a legal word meaning ‘irrelevant’—not bearing on the subject in hand—and it has been established in English since the 14th century at least, its positive form, *pertinent*, being found a century earlier, descended from Norman French and legal Latin. The word *pert* is of the same age, and also of Norman French origin; it represents two Old French and Latin words in its early usages: Latin *apertus*, meaning open, frank, handsome, smart; the other usage representing Latin *expertus*, Old French *asperte* or *esperte*, meaning skilled, ready, clever, and hence ‘saucy—bordering upon cheeky’ (*Oxford English Dictionary*). This meaning does not properly belong to *impertinent* at all, but it is at this point that the two words get confused, *impertinent* being apparently looked upon as a more dignified and impressive form of *pert*. This confusion was no doubt helped by the existence of *malapert*, which, in spite of its spelling, is not derived from Latin *male* and *apertus*, but from *male* and *expertus*.

In Latin there was an early derivative *captivus* from the root of Latin *capio*, ‘catch.’ The common meaning of the word was ‘prisoner of war,’ or, more generally, a ‘captive.’ The miserable position of such persons in the wars of the Middle Ages led to the further development shown by the form *cattif*, in Old French *chattif*, meaning ‘miserable wretch,’ where *miserable* also shows the development from the unhappy condition of a prisoner of war to the mean-spirited character which no doubt was very often connected with it. The word *wretch*, ‘outcast’ or ‘exile,’ has had a similar development of meaning.

When metaphor comes into the meaning it may be difficult to identify the relationship between the words. Thus *cabbage* to the ordinary reader does not suggest the idea of ‘head,’ but the word is really connected with the Latin *caput*. From the same Latin word we get the English word *cattle*, which meant originally ‘property,’ Latin *capitale*, because property in early times consisted mainly of live stock. The same word is disguised in the form *chatel*, now confined in ordinary usage to the plural. The word has been borrowed again by economists in the form of *capital*, which in this sense, according to the *O.E.D.*, is later than 1600. The original notion of ‘head’ survives better in *capital*, ‘the top of a pillar.’ The difference of pronunciation between ‘cattle’ and ‘chatel’ depends upon the French dialects from which the two were drawn. The word *case*, ‘an event,’ and the similarly spelt *case*, ‘receptacle,’ come from two distinct Latin words, the first from the Latin *casus*, the second from the Latin *capsa*, ‘box.’ From the second word also comes *cash*, arising naturally from the connected ideas of the container and the thing contained; but much further removed is the word *sash*, the meaning and pronunciation of which are affected by the Old French *chasse*.

It is curious to observe how the metaphor attached to particular kinds of seats has established itself for many different offices and professions. Thus we find the throne, the bishop’s see, the judge’s bench, the professor’s chair, the prebend’s stall, and the orator’s stump. In Ashanti, the golden stool was an extremely important symbol. So the Persian divan was first a sofa, and then a tribunal, and in barons’ halls and English colleges, the dais, where the distinguished members of the household or the visitors sat, was first the table itself, Latin *discus* (borrowed from Greek), and

afterwards 'canopy' over a seat of state or the seat itself. Some words which have come by metonymy have ousted the words which they represented: thus the 'bar' has come to be the generic word for 'advocates in court' in English, Barristers, because historically they were called to the bar, the division between the benchers and the students of law when they were invited to take a prominent part in legal discussions (*O.E.D.*). Similar developments are the bench for the body of judges, the Front Bench for Cabinet Members of Parliament, the word *Cabinet* itself, in its political signification, the Treasury, the War Office, the Board of Green Cloth. Sometimes the meaning of the word or part of the word might be entirely obscured, and we can use a combination which is a contradiction in terms. Thus in English we can talk of *brass fire-irons* and in French of a *bonnet de coton de soie* 'cotton bonnet of silk,' the first part of the combination having come to represent a particular shape without regard to the material. A more remarkable application of a word is in *tick* as the cover of bedding, which came to us from the Latin *theca*, 'receptacle' or 'case,' which itself was borrowed from the Greek *thēkē*.

With a change of meaning a word may long survive when its original value is forgotten and a new word for that value has had to be coined or borrowed. Thus the Latin *culina* has been specialised in English in the sense of 'kitchen,' and the Latin word *coquina* of the same origin but not found in classical authors at all, but frequently in other sources, has taken its place in the English word 'kitchen' (Anglo-Saxon *cycegn*, from the late Latin form *cucina*). Sometimes words arose by mistake. Hence all ghost words, of which examples may be found in English in *gravy*, which ought to be *grany*, as a soup with grains in it; or *celt*, a stone axe, or *termagant*, which ought to be *tervagan*. It is suggested that *taper*, a wax candle, has developed out of the Latin *papyrus*, the meaning having passed from the wick to the candle made round it. The word *jackanapes*, applied to a monkey, meant originally 'Jack of Naples,' and occurs first as a 'nickname of William de la Pole, Duke of Suffolk, murdered in 1450, whose badge was a clog and chain such as was usually attached to a tame ape' (Skeat). But it is possible that this usage first started by a transference of the name from the master of the monkey to the monkey.

In all this investigation it has carefully to be borne in mind that the speaking of a particular language is not necessarily connected with race in any way. There are at the present day, besides people of English birth and breeding who talk English, many other races, negroes, Chinamen, Maoris, and others who speak English as acquired by themselves or their forefathers from English speakers. Throughout the whole history of the study there have been continual mistakes made through confusion between language and race, a confusion increased by the use of the same word for the language and for the people who speak it. The language, for example, may be Indo-European, but in the earlier stages of those languages it is safer not to commit ourselves as to the racial character of the speakers, and if we use the word *Viros* for the speakers (Latin *vīr*, Sanskrit *vīras*, Lithuanian *wyras*, 'man'), we are able to distinguish between the speakers, whatever they may be, and the origin of the language. It is often very difficult or impossible to tell where a language was first spoken: the peoples of the earth are continually in movement; sometimes it has happened that a whole people has left its original habitat and moved elsewhere, and at all times there have been accretions to the population by commerce, by conquest, or by the incorporation into the com-

munity of slaves thus acquired. Changes of method in farming, coupled with other economic changes, may lead to entire change in the population of a district. Thus we know that in Italy at the end of the second Punic war the country was left entirely ruined by Hannibal. The great bulk of the able-bodied male population had been embodied in Roman armies, and those who were not killed in the course of the war found themselves without capital to restore their farms, and no doubt in many cases without inclination to resume an agricultural life. The result was that the wealthy citizens of Rome acquired large areas of land in Italy which were no longer worked by free men with very few slaves, but tilled mainly by slaves working in great gangs, herded together in workhouses (*ergastula*), and when employed in the fields loaded with chains to prevent their escape. There can be no doubt that in Southern Italy there is a large amount of alien blood imported into the country during this period, when farming on a great scale (*latifundia*) prevailed.

Small communities have frequently migrated, but it is not very often that we can trace migration of tribes of great size from one place to another far distant. One of the most famous migrations of this kind is that of the Kalmucks from the Volga into China in 1771 A.D., a migration which caused them a great deal of loss in lives, but which was ultimately effective. Most migrations begin with pioneers who, driven by need of greater supplies of food for themselves and for their flocks and herds, sally forth in hope that they may find a better country. Other causes may be disease (plague and the like) or great floods. It has been suggested that floods were the origin of the great movement of the Cimbric and Teutonic peoples in the 1st century B.C. from Northern Europe into Gaul. If the country is thinly peopled, it is possible for the newcomers to settle in small numbers without disturbance, or if there is hostility at the outset it presently passes over. Thus in Asia Minor, till after 1920, villages existed within a few miles of one another inhabited by different populations, Turk, Armenian, Greek, with here and there also a little colony of Circassians. The contact of peoples like these, speaking very different languages, leads in time to alteration in speech. In some parts of Asia Minor before the war of 1914-18 the Greek population was gradually losing its language under the pressure of Turkish. The population was poor, and the women had to go out as servants to Turkish mistresses. They had thus to become bilingual, and, as Turkish was the language of the ruling authority, Greek was steadily giving way more and more to Turkish. When the women learn a foreign language, as in this case, the children also naturally learn it more easily than if the men alone learn a foreign language. The same thing has been observed nearer home. About 1890, in some villages on the east coast of Ross-shire, the establishment of School Board education, with the teaching at that time entirely in English, had led to a break of communication even within families, the grandparents speaking Gaelic only, the parents speaking both English and Gaelic, and the children English only, so that grandparents and grandchildren had no means of language communication in the absence of the parents.

It is impossible to say how many languages have perished from Europe altogether. Basque is reputed to be the remains, surviving in a small area in the Pyrenees, of a language which at one time extended over a great part of Western Europe, including the British Isles. Etruscan, which was the language of a powerful people who disputed for centuries the dominion of Italy with the Romans

prior to the 5th century B.C., as a living tongue entirely disappeared many centuries ago. Messapian, the language spoken in the heel of Italy, is represented only by a few inscriptions from times preceding the Christian era. The original speakers of Welsh and Irish and Gaelic (which is only a dialect of Irish) were invaders of the British Isles. Other invaders of the same area, whose language has entirely disappeared, were the Norsemen and Norman French. But though these languages have disappeared there are traces of them still remaining. Norman French exercised a very great influence upon the history of the language, ingrafting into it many new words and helping to modify its inflections which were already decadent before Norman French came in. Some elements in the vocabulary like *egg* for the Middle English *ei*, the pronoun *them*, and the verb form *are* show survivals from the language of the invading Norsemen.

It remains to classify briefly the languages of the world.

I. *Indo-European Languages*.—These, because of the energy of their speakers, have become the most important in the world, as being the languages of the most important ruling and commercial nations. The languages extend from India to Iceland.

(1) The *Aryan* group.—This name, which has been sometimes wrongly applied to the whole Indo-European family of languages, properly belongs only to the languages spoken in ancient times in Persia and in Northern India. The oldest language of India belonging to this type is Sanskrit, which, without doubt, was brought into India by invaders at some period before 1000 B.C. Closely related to it are the ancient languages of Persia, which are known to us from the Avesta (East Persian), the inscriptions of Darius the Great and his successors from 520 to 323 B.C. (Western Persian), the remains of Sogdian (North-eastern Persian), which have been recently discovered, and records found in recent years in Khotan, the language of which is considered to represent that of the ancient Sace. There are many sound changes which disguise the relationship between the Avesta and the old Persian inscriptions on the one side, and Sanskrit on the other, but the vocabulary is to a large extent the same, and it is sometimes possible to transliterate whole sentences from Sanskrit to Persian, or *vice versa*. The date of the Avesta is uncertain, the great prophet of Iran, its reputed author, being dated variously between 1000 B.C. and 600 B.C. From Sanskrit, with greater or less admixture of other elements, come the modern languages of this stock in Northern India, like Hindi and Bengali and many others; to an intermediate stage belongs Pāli, the sacred language of Buddhism, with sound changes from Sanskrit, which are curiously parallel to those between Vulgar Latin and Italian.

(2) Further to the west comes *Armenian*, which is known to us only from Christian times. The language has undergone a serious change, so that the sounds *b*, *d*, and *g* have changed like those sounds in the Germanic languages to *p*, *t*, and *k*, although the Armenians continued to write them with the old symbols much as if we were still to write in English *pater* and pronounce it *father*.

(3) Next to Armenian come the *Slavonic* languages, which occupy a vast area in Eastern Europe and in Northern Asia. The oldest Slavonic literature is in a lost dialect known as Old Ecclesiastical Slavonic, which was probably the language of Bulgaria before the invasion of the Mongols seriously altered the language, reducing its seven cases to two, and making many other changes. In Russian there are three dialects or sub-languages: (a) Great Russian, the centre of

which is Moscow, has become the literary language; (b) the language of the Ukraine is Little Russian; and (c) the language of Western Russia is White Russian. Closely related are the languages of Serbia and Croatia, the dialectic differences between which have been produced largely through religious separation, the Serbs belonging to the Greek Church and the Croats to the Roman Church. To the north of these are spoken the languages of Czechoslovakia. Bohemian, with a great literature, and the language of the Slovaks to the south-east in the Moravian area and part of what was Hungary. West of Russia comes Polish, also with a great literature. The Baltic languages, Lithuanian, Lettish and Old Prussian (extinct since the 17th century), probably separated early from the Slavonic stock, and preserve some very archaic features. For centuries subject to Germans and Russians the Lithuanians and Letts, as one of the results of the war of 1914-1919, have become independent, so that their languages have now a better chance of survival.

(4) With these languages spoken over great areas, may come one of very limited territory—*Albanian*, spoken in the mountains on the east side of the Adriatic and overflowing into Greece.

All the languages mentioned have one characteristic which separates them from those to follow, in that they convert original guttural sounds, *k*, *g*, *gh* into some sort of a sibilant, represented in Sanskrit by *ç*, *j*, and *jh* (*h*), and in Russian by *s* and *z*, the aspirated guttural *gh* being confused with *g*, and both being represented by the same sound *z*.

(5) West of all of these, except Albanian, comes ancient *Greek*, which was spoken over roughly the same area as modern Greek till modern Greek was, in 1922, ousted from Asia Minor. Owing to the mountainous character of the country it was divided into a great number of dialects, which are generally classified under three heads: (i.) *Æolic*, spoken in the North of Greece and in North-West Asia Minor; (ii.) *Attic-Ionic*, spoken in Attica (but in prehistoric times also in parts of the Peloponnese), in some of the islands of the *Ægean* and on the central part of the coast of Asia Minor, Ephesus and Miletus being two of its greatest cities; (iii.) *Doric*, which came into Greece later than the other dialects and with great differences in detail, extended from Epirus to the south of the Peloponnese, to the islands of Thera and Melos, to Crete, to Rhodes, to the adjacent islands and coasts of Asia Minor, and west and south in Sicily and Cyrene. The oldest form of Greek is found in the central Peloponnese, in Arcadia, which the Dorians were never able to conquer owing to its mountainous character. Closely akin to this dialect is the far-distant dialect of the island of Cyprus, which must have been colonised at a time when the speakers of Arcadian still lived upon the seacoast.

(6) *The Languages of Italy*.—In ancient times Latin occupied only a very small part of Italy on the south side of the river Tiber, although by conquest at later times it gradually extended its power first over Italy and then over the countries bordering on the Mediterranean, and still later to northern countries like Gaul and Britain, and to the far east till it reached Mesopotamia. The languages of Italy which are akin to Latin, and of which considerable remains survive, are Umbrian, Oscan, and Pæligian. These languages differ in many respects from Latin, but the most characteristic feature is the use of *p* and *b* where Latin has *qu* and *v*. Thus, corresponding to the Latin *quis*, 'who,' they have *pis*, and equivalent in meaning to the Latin *venerit*, 'he shall have come,' is the Oscan *benust*. There were many other dialects, whose speakers figure in history like Sabine and Volscian, but of them we know very little. In Italy, besides these lan-

guages which are of the same stock, there was Messapian, already mentioned, in the heel of Italy, and Venetic, which was spoken by a tribe extending from the Po to Venice. On the western side, north of the Tiber, were the Etruscans, whose language was entirely different, the speakers of which were most probably migrants from the coast of Asia Minor. On the Gulf of Genoa there were the Ligurians, whose language has disappeared. When the Romans had conquered most of western Europe, Latin was adopted as the language of government and trade. The sounds of this adopted Latin varied according to the languages previously spoken in the different areas. It also varied to some extent according to the time when Latin was introduced, Latin itself having changed greatly in the period between 238 B.C., when it was introduced into Sardinia, and the early 2d century A.D., when Trajan established soldier-colonies, from which it is believed Rumanian is descended. Spanish began before 200 B.C., Provençal about 100 B.C., French with the conquests of Julius Cæsar, 58-49 B.C., Rumansch with the conquests of Tiberius in the Alps, 15 B.C. Italian is the continuation of the old Vulgar Latin. Naturally, all the languages springing from Latin have modifications, produced by borrowing and by mixture with other peoples.

(7) The ancient area corresponding roughly to modern France was named Gallia, and was occupied by people speaking a Celtic tongue. From Gaul and what is now Belgium no doubt migrated the Celts, who occupied under the name of Britons the greater part of Britain before the invasion of the Romans and the later conquest by the Saxons. The dialect which is still represented by Welsh, and which has left some remains also in Cornwall, and in a slightly different form in Brittany, is differentiated from the kindred language spoken in Ireland and in the Scottish Highlands and the Isle of Man by the same differences that we saw in Italy between Latin and the other dialects. In Welsh and its cognates *p* appears where the other dialects have a representation of *qu*: thus the word corresponding to the Latin *quattuor*, 'four,' appeared in Gaulish as *petora*, in Welsh as *pedwar*, in Irish as *cethair*.

(8) To the north-east of Gaul lay the country of the German-speaking peoples, whose languages fall into three groups: (a) Gothic, spoken in the 4th century A.D. on the Danube; (b) Norse, one language to about 1000 A.D., and then splitting up into Danish, Swedish, Norwegian, and Icelandic; (c) Western Germanic, including the language of Germany proper, the literary language representing High German, while the language of Northern Germany, Low German, is represented only by Platt-Deutsch. Closely related to it are the languages of Holland and Belgium (Flemish) and English, though modern English has had a large influx of words from Norman French, and at an earlier period a smaller influx of words from Norse.

Besides these eight groups, in recent times Indo-European speakers have appeared in very early records (about 1300 B.C.), discovered in 1906 by the Germans at Boghaz-Keui in eastern Asia Minor, on the site of the ancient Peria. One of eight languages found in those tablets curiously enough bears a very close resemblance to Latin, making its passive as Latin does by an *r* suffix, a peculiarity known before only in Italic and Celtic languages. The further relations of this language have still to be investigated.

In recent years also a new Indo-European language has appeared in Chinese Turkestan, in two dialects, one of which was apparently literary and the other used for colloquial and business purposes. This also makes its passive in the same way as

Italian and Celtic. It has, too, some curious points of resemblance to the newly-discovered language in Asia Minor, which has been called provisionally 'Kanisian' instead of Hittite, as it was at first wrongly designated, while that in Chinese Turkestan has been named 'Tocharish,' from an ancient tribe which is supposed to have lived in those parts.

II. Next in intellectual importance to the human race is the group of languages known since the 18th century as the Semitic. (1) The earliest known of its branches is that which was settled in lower Mesopotamia at least 3000 years B.C. First from Babylon, and at a later time from Nineveh the capital of Assyria, this branch of the stock exercised great political and intellectual influence. Its cuneiform script, adopted from the older Sumerian settlers in the same area, of whom little as yet is known, was learnt and used by other races in Asia Minor. (2) From a very early time the civilisation of Babylon was in touch with that of Egypt. The ancient Egyptian language was apparently a branch of the same stock, which had been early separated from the other branches and had a large foreign element incorporated in it. (3) (a) As early as the 14th century B.C. records exist of another branch which had established itself in Palestine and was in communication with Ikhnaton, the heretic king of Egypt, at Tell el-Amarna. (b) In a dialect of this branch was written in the early part of the 9th century B.C. the famous inscription of Mesha, king of Moab, the fragments of which are now preserved in the Louvre. (c) But far the most important of its dialects is the Hebrew in which the Old Testament is written, some part of it reaching back to at least 1000 B.C. (d) Closely akin was Phœnician, the language of the great commercial cities Tyre and Sidon. These towns had trading centres established round all the shores of the Mediterranean; the most famous was Carthage. More of the early inscriptions of this dialect, reaching back to the 9th or 10th century B.C., are found in Cyprus than in Phœnicia itself. (4) From 1400 B.C. we hear of the Aramaeans as a nomad robber stock of the desert in the west of Mesopotamia. They ultimately settled eastward of Palestine in Syria, and became the great commercial people of Western Asia. In Turkestan many documents have been found written in a dialect of northern India, but docketed by a Syrian clerk in his own language, Aramaic. This language was finally crushed by (5) Arabic, which from the time of Mohammed spread far and wide. Though less early known, this language has preserved better than others many of the most primitive features of Semitic. In modern times there are wide differences between Arabic as spoken in Arabia and in Egypt, Mesopotamia, Syria, and North-west Africa. (6) In the south of Arabia a dialect was developed, the inscriptions of which are written in a fine bold alphabet of the same origin as the Phœnician. (7) An offshoot from this dialect is the language strongly mixed with other elements which was established by emigrants to Abyssinia, and of which Gêez and Amharic represent the languages which in old and modern days were spoken at the king's court. More distantly related are the Berber dialects and the extinct Guanche, the language of the Canary Islands. Still more remote are the 'languages of Cush,' the Somali, Galla, and other tongues spoken between the Nile south of Egypt and the Red Sea and Indian Ocean.

III. A large group in close touch with the Indo-European languages from the beginning of our records is the Finno-Ugrian. Its home was probably in the central Urals. It divided into two sections, the Ugrian consisting of Hungarian, which established itself in the ancient Pannonia, Vogul about

Perm and Tobolsk, and Ostyak on the river Obi and its tributaries. The Syrian is spoken by a large population in the districts of Perm, Viatka, Archangel, and Vologda, who are active agriculturists and traders. Still more numerous are the Votiaks in Viatka and Ufa, next to whom are the Cheremissians. On the middle Volga the Mordwinian language is widely spoken. The other section consists of Finnish spoken in Finland by the bulk of the population, and by some settlers in Sweden and Norway. Finnish has a literature from the middle of the 16th century. Estonian is spoken in Estonia and Livonia, and there are other dialects of less importance. The Lapps are not of the same racial stock, but speak a language akin to Finnish. The language of the Samoyedes is akin, and all the languages mentioned are included by some scholars in an Ural-Altai group, which would also comprise the Turko-Tataric languages, the Mongolian, Manchu, Tungus, and possibly the Japanese and the Korean. With this group the Dravidian languages of India, Tamil, Telugu, Canarese, and in Baluchistan Brahui, are said to have many similarities.

IV. The languages of the Caucasus are numerous, many of them confined to small mountain valleys and but little known. They fall into two groups with an elaborate consonant system. Some show many combinations of consonants difficult for a European to pronounce. The most important on the south side are the Georgian and the Mingrelian, on the north side the Circassian and the Lesghian, the former now much reduced by the migration of most of its Mohammedan speakers from Russian territory into Turkish Asia Minor. Possibly connected with the Caucasian group was the language of the ancient Hittites resident in Asia Minor eastwards of the river Halys; Lydian and Etruscan were probably also related. Some see in Basque, spoken on both sides of the western Pyrenees, a language isolated from this group, but this is still very uncertain.

V. In Eastern Asia very different from all the foregoing languages is Chinese spoken by some four hundred million persons. It has no grammar in the European sense, and no inflection of any kind, so that the sense has to depend on the order of the words in the sentence. Its writing is developed out of picture-writing, and is intelligible all over China, though speakers in distant parts may not understand each other. Once Chinese was regarded as the type of the most primitive language with no noun cases and no parts of the verb. Now, however, Chinese is considered to have gone through something of the same changes as English, which has nearly discarded its inflections also. Other languages like Chinese but with some attempt at compound forms, as when a lantern is called a 'light-cage,' are Burmese and Siamese. Another branch of this family is represented by Tibetan, where the forms are not so broken down as in the other languages.

VI. For the group called Munda, or Mon-Khmer, extending sporadically from the plateau of Chota Nagpur to Annam, see vol. iii. part i. and vol. iv. of *The Linguistic Survey of India*, edited by Sir G. A. Grierson, a work in which much valuable material regarding all Indian languages is collected.

VII. The Malayo-Polynesian languages are found from Madagascar to Easter Island, and include a vast variety of tongues which are classified as Indonesian (spoken in the Philippines, Celebes, Madagascar, Sumatra, Java), Melanesian (in Fiji and a great number of other islands), Micronesian (spoken in the Gilbert, Marshall, Caroline and Marianne groups, and Yap island), and Polynesian (including the languages of Samoa, the Society Islands, Tonga, Easter Island, and the Maori of New Zealand).

VIII. The Papuan of New Guinea and adjacent small islands.

IX. The native tongues of Australia, in which some see relations of the Mon-Khmer languages of India.

X. The languages of the Sudan and of Guinea. Of these the most important is Hausa, the language of the negroes of northern tropical Africa.

XI. The Bantu family of languages extending from Southern Nigeria to the Cape of Good Hope. Sir Harry Johnston finds that there are 366 Bantu languages and other 87 closely akin. Of many of these only lists of words are known.

XII. The languages of the Bushmen and Hottentots. The Bushmen appear to be the last remains of a Palæolithic age. They have gradually been driven southwards by the Bantu-speaking peoples, and will soon be extinct.

XIII. The native languages of America. Of many of these little is yet known. They are often described as 'incorporating' languages, because subject, object, predication, and qualifying circumstances may be all joined together in one huge word. It is now, however, certain that there are considerable variations in the type. None of the languages were the vehicle of a high civilisation but the Nahuatl of Mexico, the Maya of Central America, and the Quichua of Peru. These languages are classified geographically as Arctic (languages of Greenland, &c.), North American, Central American, and South American.

BIBLIOGRAPHY.—GENERAL PRINCIPLES: O. Jespersen, *Language*; J. Vendryes, *Le Langage* (Eng. trans. published by Kegan Paul); H. Paul, *Prinzipien der Sprachgeschichte* (5th ed.). CLASSIFICATION OF LANGUAGES: A. Meillet et Marcel Cohen, *Les langues du monde* (1924); A. H. Sayce, *Introduction to the Science of Language*, vol. ii. (4th ed.). INDO-EUROPEAN LANGUAGES: K. Brugmann, *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen* (2d ed. 1897-1916)—an abbreviated form, *Kurze vergleichende Grammatik der indogermanischen Sprachen*, appeared in three parts (1902-3-4), and has been reprinted without alteration; A. Meillet, *Introduction à l'étude comparative des langues Indo-Européennes* (5th ed.). CLASSICAL LANGUAGES: A. Meillet et J. Vendryes, *Traité de grammaire comparée des langues classiques* (1924); P. Giles, *A Short Manual of Comparative Philology for Classical Students* (new edition in preparation); J. Wright, *Comparative Grammar of the Greek Language*; J. and E. M. Wright, *Old English Grammar*. SEMITIC LANGUAGES: C. Brockelmann, *Vergleichende Grammatik der semitischen Sprachen*.

Philomela, according to the Greek legend, was changed into either a swallow or a nightingale. Poets are (or rather were) fond of calling the nightingale by its classic name.

Philopomen, a patriot of Greece, was born at Megalopolis about 252 B.C. In 222 he was one of the defenders of Megalopolis against Cleomenes, king of Sparta, and next year he fought with the Macedonians against the Spartans. He then served in Crete with such distinction that in 210 he was appointed general of the Achæan horse. In 208 he was raised to the highest military dignity in Greece, being elected *stratêgos* or commander-in-chief of the Achæan League. The battle of Mantinea (208), in which the Spartans were again utterly routed, raised him to the pinnacle of fame, and at the Nemean festival which followed he was proclaimed liberator of Greece. So great was his influence that the Macedonian monarch, Philip V., began to fear that Greece would regain its independence, and tried, vainly, to have him secretly assassinated. During the next few years he was absent in Crete, and returned to the Peloponnesus in 194 to find the Romans in Greece. On the departure of the consul Flaminius, Nabis of Sparta recommenced hostilities against the

Achæans; Philopœmen was once more appointed stratêgos (192), and in a pitched battle nearly annihilated the troops of Nabis. He now exerted all his power to heal the divisions among the Achæans, and to prevent them from affording the Romans a pretext for taking away their independence. In 188 he took a fierce revenge on Sparta for having put a number of his friends to death, and was in consequence strongly censured by the Roman senate, and by Q. Cæcilius Metellus, who was sent out as a commissioner to Greece in 185. Two years later Philopœmen (now an old man of seventy) was elected stratêgos for the eighth time. When lying ill of a fever at Argos he rose from his sick-bed to quell the revolt of the Messenians, but was overpowered by numbers, and fell into the hands of Deinocrates, the leader of the Messenians, who two nights after sent him a cup of poison. Philopœmen drank it and died.

Philosopher's Stone. See ALCHEMY.

Philosophy. In a subject where opinion has been and is still so much divided, as is the case in philosophy, the historical method is our only safe guide in arriving at a definition. The objects of the inquiry, its methods, nay, its very possibility, are still matter of debate between divergent schools. But by a review of the history of the term and the more important changes in usage, it is possible to reach a fairly accurate idea of what philosophy has meant in the past.

Tradition assigns the first employment of the word to Pythagoras, and makes him use it to signify merely the disinterested pursuit of knowledge. Socrates plays upon the etymology of the word when he contrasts the modesty of the truth-seeker with the more arrogant pretensions of the Sophists. But, so far, the nature of the truth or knowledge which the philosopher seeks is not specified; the term is still vague and general. Aristotle still uses the term to cover the whole field of scientific activity as well as those more strictly philosophical investigations to which he gives the name of 'First Philosophy,' or, as a modern might say, first principles of knowing and being. In fact, no kind of knowledge was at first alien to the philosopher. Philosophy has been truly called 'the mother of the sciences,' and it was only by slow degrees that the separate sciences attained an independent life. As specialisation proceeded, however, philosophy could no longer in a literal sense 'take all knowledge to be her province'; the details of one department after another of existence were surrendered to the scientific specialist. But the claim of philosophy to be the necessary complement of the special sciences—the only science of existence or of the universe as a whole—was not thereby surrendered. The specialist, so far as he is a mere specialist, is like the man who cannot see the wood for the trees; he loses sight of the proportions of the whole in the details of his own province. The co-ordination of the sciences, the unification of knowledge, is a task which remains to be undertaken by the philosopher. Unity or harmony in our conception of the universe is the aim which philosophy always has in view. Whether this aim is attainable by man or not is a further question; but the idea of a system of things satisfactory to the reason and the moral sense remains the inexhaustible spring of philosophic effort. The philosopher, therefore, has always his eye upon the Whole; his true function is to correct the abstractions of the special sciences. Each science makes, and must make, its own working postulates or presuppositions, and the specialist is ever prone to make the working postulates of his own department the measuring-line of existence as such. But philosophy has to review

all these scientific postulates, and if possible to harmonise their conflicting claims by showing the relative and limited validity which belongs to each. Philosophy is in this connection the critic of the sciences—of the postulates which they make and the conceptions which they use; and she exercises this critical office in the interest of the Whole. Something like this was present to Plato's mind when he described the philosopher as *synoptikos*, a man who insists on seeing things together, who refuses to consider the parts out of their relation to the whole whose parts they are, and who is therefore the inexorable foe of crude and premature generalisations from this or the other department of investigation which happens for the time to be most in evidence.

The insistent demand of reason for unity or harmony is possibly better expressed as the demand for a system in which room may be found for all the elements or aspects of human experience, aspects sometimes at first sight contradictory. In modern times, and especially during the 19th century, the advance of physical science seemed to many to disclose such a contradiction between the strict mechanical determinism of the universe as physically conceived and the postulates of the ethical and religious consciousness; and the problem of philosophy assumed the special form of an attempt to mediate between these claims. So it is formulated by Lotze in his *Microcosmus* (1856), and Spencer's doctrine of the Unknowable was put in the forefront of his *First Principles* (1862) expressly as the reconciliation of religion and science. Similarly Sidgwick, at the close of the century, lays down as 'the final and most important task of philosophy the problem of connecting fact and ideal in some rational and satisfactory manner' (*Philosophy, its Scope and Relations*, 1902). The conception of 'worth' or 'value' has been very prominent in recent discussion, which has centred in the question of the relation of human values or ideals to the ultimate ground of the universe. Philosophy thus becomes, as it has been phrased, the struggle for a *Weltanschauung*, the effort, that is to say, to reach a coherent and ultimately satisfactory view of the world, satisfactory not in the sense of gratifying all our wishes, but as not doing despite to that which we recognise as best and greatest in ourselves. In the course of this conflict there emerges the sharp opposition of idealism and materialism or naturalism.

From the time of Socrates at least, but more especially in modern times, philosophy has also been occupied by the question of the nature and limits of knowledge and the criteria of certainty. Such critical reflections are the natural sequel of a difficult and dubious inquiry such as philosophy undertakes into the ultimate nature of things. Attempts at a theory of being (ontology or metaphysics) lead naturally to a review of the competence of the human mind for such an undertaking, and to a theory of knowledge generally (epistemology, *Erkenntnistheorie*). In the hands of the Sophists, who were the first to deal with this side of the philosophical problem, the inquiry led to a sceptical or purely subjectivist doctrine of the relativity of truth. In their doctrine of concepts or general notions, ascertainable by definition, Socrates and Plato sought to vindicate the possibility of a common or objective knowledge which would put us in touch with the reality of things. In this connection Plato defines the philosopher as the man who apprehends and follows after the essence or reality of things as opposed to the man who dwells in appearances and the shows of sense. Such a distinction between the phenomenon, the world as it first appears to sense and unreflective thought, and the noumenon, the world, as reason

ultimately recognises it to *be*, may be said to be implied in the demand for any explanation at all, and had, indeed, been explicitly formulated before Plato in the systems (otherwise diametrically opposed) of Heraclitus and Parmenides. But the formulation of it by Plato in his doctrine of Ideas led (probably through a misunderstanding of his real meaning) to a separation of the world of noumenal reality from the world of actual experience, which converts the former into a metempirical or transcendent entity completely inaccessible to human reason. Such may be said to be the sense attached to the distinction between phenomena and noumena in popular thought, and to it we owe the Positivism of Comte and the Kantian and other forms of Phenomenalism, which limit our knowledge to phenomena and their laws, and deny the possibility of the metaphysical inquiry. To Comte, metaphysics, or philosophy in the older sense of the term, appears as a disease of the human mind, from which, under the influence of science, it is happily recovering. For Kant, intellectual philosophy becomes a 'criticism' of the forms and categories of human thought, in order to fix the bounds of possible knowledge and of necessary ignorance. The same result is reached in the empirical scepticism of Hume, to whom philosophy appears as a preventive against itself, or at least against what has ordinarily been understood by the name. In his own words, 'we must submit to this fatigue, in order to live at ease ever after; and must cultivate true metaphysics with some care in order to destroy the false and adulterate.'

Positivism or phenomenalism, however, is chiefly the result of an unwarrantable separation of essence and appearance, of noumena and phenomena. If the noumenal reality is something transcendent, something apart from the world we know, and as it were hidden behind it, then it must inevitably drift into the position of an otiose and unknown thing-in-itself, which has no function to discharge in the universe of knowledge. Whether we then continue to assert its existence, as an Unknown and Unknowable, or take up a purely sceptical position in regard to it, is really of little moment. In both cases the limitation of knowledge to phenomena is justified only by the false definition of the essence or noumenon from which the theories in question start. But the noumenon is not truly conceived as a transcendent entity apart from the phenomenon: it is simply the phenomenon itself fully understood. To know only phenomena would be to rest content with the immediate appearances of sense. All science is an attempt to go beyond the immediate appearance, and to understand it by connecting it with something else. Ultimately no one thing can be fully understood except in the light of the whole; so to understand things is to see them as they really are, and to know the ultimate truth about the universe. The object of the philosopher is not to reach a second and more recondit *kind* of reality, but to give an ultimately coherent account of the reality we know. Following out this line of thought, the modern philosopher oftener gives his question a teleological than an ontological form. Instead of asking what is the ultimate essence, he asks what is the ultimate meaning, significance, or end of the universe. Has it a rational and satisfying end? Does it exist to express a meaning at all, or simply as a brute fact? But end, meaning, and ultimate reality are only different ways of formulating the same problem.

Apart from this general question just discussed, the theory of knowledge has been much concerned in modern philosophy with the issue between realism and subjective idealism, that is to say, with the question how the individual knower comes to know anything beyond his own mental

states. But this supposed difficulty may likewise be traced to an initial error in the statement of the problem. The question at issue between transcendentalism and empiricism, as to the presence of *a priori* necessities or categories and forms of reason in the constitution of experience, may be said to form a part of the theory of knowledge, as well as such general questions as the nature of certainty, the distinction between knowledge and belief, and the grounds of belief and disbelief. Theory of knowledge here passes into logic, and the two names are sometimes used interchangeably.

The term Philosophy, although generally identified with the two central inquiries described in the foregoing paragraphs—Metaphysics and Theory of Knowledge—has in common usage a wider application. Besides these central disciplines it embraces what may be called the philosophical sciences, such as Logic, Ethics, Aesthetics, Psychology, Sociology, the Philosophy of Law, the Philosophy of Religion, and the Philosophy of History. Some of these, however, have two sides, and may be treated either as positive sciences or as parts of philosophy. Psychology, by which is understood what was formerly called Empirical Psychology, may be said to have established its claim to be an independent science of observation and experiment. But although its standpoint, so conceived, is different, its connection with philosophy must remain, seeing that the knowing mind is the object which the psychologist investigates. Similarly, Ethics is often treated as the natural history of moral ideas and institutions or of the moral sense, but so conceived it really forms a part of scientific psychology and sociology. The strictly philosophical part of Ethics is the theory of obligation, and this is sometimes spoken of as the Metaphysic of Ethics. The meaning assigned to duty and the explanation given of it must of necessity profoundly influence the general conception we may form of the universe. So, again, Aesthetics may be treated as a department of physiological psychology, as has mostly been the case in England; but by many continental writers the Philosophy of Art or the Philosophy of the Beautiful has been intimately connected with metaphysics. Jurisprudence on its philosophical side is closely connected with Ethics, and is sometimes spoken of as the Philosophy of Law. The Philosophy of History and the Philosophy of Religion exist only so far as there can be traced in the facts of history and in the different religions of man the evolution of an idea or purpose. Logic, as an analysis of the nature of inference or the general theory of proof, occupies a propædæutic or introductory position in relation to philosophy, and indeed in relation to scientific thought generally.

The History of Philosophy forms not the least important philosophical discipline. Philosophy cannot, indeed, be profitably studied apart from the history of its own development. Speculative thought has flourished in India and elsewhere, but the history of European philosophy begins with Thales in Greece about 600 B.C. It is usual to distinguish three great periods of philosophic thought—Ancient or Greek Philosophy, from 600 B.C. to about 500 A.D.; Mediæval Philosophy, lasting till 1600; and Modern Philosophy, since that date. Greek Philosophy is in turn divided into three periods—that of the pre-Socratic philosophers (say 600 to 425 B.C.), who devoted their attention mainly to the phenomena of external nature. Pythagoras, Parmenides, Heraclitus, Empedocles, Democritus, and Anaxagoras were the most eminent heads of mutually conflicting schools. The Sophists and Socrates raised the question of knowledge, turning man's attention upon himself; and in the idealistic systems of Plato and Aristotle

(say 400–322 B.C.) we have the great age of Greek philosophy. In Aristotle the theoretic impulse of the Greek mind seems to have exhausted itself, and the post-Aristotelian or third period of Greek philosophy was mainly inspired by ethical and religious needs, and is occupied in developing a theory of life and conduct. The Stoics, Epicureans, and Sceptics, and later the Neoplatonists with their religious mysticism, carry on the tradition of philosophy till the downfall of the Roman empire and the death of Boethius. After the so-called dark ages Mediæval Philosophy may be said to begin in the 9th century with John Scotus Erigena, who is really a Christian Neoplatonist. Mediæval philosophy is mainly the application of the Aristotelian logic to the doctrines of the church, and latterly (when the other treatises of Aristotle became known in western Europe) exhausted itself in an elaborate attempt to harmonise the philosophy of Aristotle with Christian theology. Anselm and Abelard in the earlier period, Albertus Magnus, Thomas Aquinas, Duns Scotus, and William of Ockham in the later, are probably the greatest and most representative names of the Scholastic philosophy. The Renaissance put an end to Scholasticism, and led, in the 15th and 16th centuries, to various attempts to revive the systems of the older philosophers and to strike out new paths; but the age was one of transition, and no effective beginning was made in Modern Philosophy till the commencement of the 17th century. Bacon's *Novum Organum* was published in 1620 and Descartes' *Discourse on Method* in 1637. Bacon's investigations were mainly logical and methodological, and Descartes was the real founder of modern philosophy. Cartesianism was developed on the Continent into the great monistic system of Spinoza, from which the monadistic or individualistic theory of Leibniz was a reaction. In England philosophy took an epistemological and even psychological direction with Locke, and this was continued by Berkeley and Hume, who developed Locke's dualism into subjective idealism and scepticism respectively. Hume's sceptical analysis of knowledge gave rise by revulsion to the Critical philosophy of Kant, which combines elements both from the Continental to the English line of thought. From it sprang the idealistic developments of German thought in Fichte, Schelling, and Hegel, and also the realistic systems of Schopenhauer and Hartmann. Herbert and Lotze represent a realism of a more individualistic cast, which represents the continued influence of Leibniz. Scottish philosophy has maintained the reality of knowledge and the dualism of experience in answer to the scepticism of Hume, but like English philosophy generally has been mainly psychological in character. It offers in this way no parallel to the great metaphysical systems which have succeeded one another in Germany. But Sir William Hamilton's doctrine of the relativity of knowledge, based on elements of Kantian thought, became in the hands of Herbert Spencer the foundation of modern Agnosticism. Spencer also continues the empiricist tradition of English philosophy, to which he gives a wider scope by grafting upon it a theory of cosmic evolution. Recent developments of philosophy have been strongly influenced by biological conceptions. They lay stress on action as the fundamental fact in human experience, and tend to treat the intellect as the practical instrument of the will in the service of life. This tendency is exemplified in the widely-branching movement known as Pragmatism, and in Bergson's *Creative Evolution*. The most prominent movements within the last few years have been the New Idealism of the Italian philosophers, Croce and Gentile, largely based on Kant and Hegel but with important

differences of emphasis, and the New Realism, represented in England by Professor Alexander and in America by Holt, Montague, Perry, and others.

The best general histories of philosophy are by Eidmann, Ueberweg, Schwegler, and Windelband, all accessible in English translations. The works of Zeller, Gomperz, Burnet, and Adamson are authoritative in ancient, and those of Hoffding, Falckenberg, and Adamson in modern philosophy. Rogers's *Students' History of Philosophy* is a well-executed survey. See also the articles on the various philosophers and systems, &c.

Philostratus, the name of several Greek sophists and rhetoricians, of whom the most famous was born probably about 181 A.D., studied under Proclus at Athens, and became a member of the learned circle that gathered round the Empress Julia Domna at Rome. He was alive, according to Suidas, in the time of the Emperor Philip (244–249). He wrote an idealised life of Apollonius of Tyana; the *Lives of the Sophists*, a series of bright and interesting sketches; and amatory and somewhat strained *Epistles*, interesting as the source of Ben Jonson's 'Drink to me only.' To another Philostratus, his nephew, is ascribed *Imagines*, a description of real or imaginary pictures; and to a third further *Imagines*. For the *Apollonius* (q.v.) see Conybeare's text and translation (1912) and Phillimore's (1912), who holds that the author was not a Lemnian.

Philpotts, HENRY. See PHILLPOTTS.

Philtre (Gr. *philttron*, 'love-charm'). A superstitious belief in the efficacy of certain artificial means of inspiring and securing love seems to have prevailed from very early times; love-charms and potions were in continual use among the Greeks and Romans. Their composition is uncertain, but there is no doubt that certain deleterious herbs and drugs were among their chief ingredients, magic rites being employed. Thessaly produced the most potent herbs, and her people were said to be the most skilful practisers of magic arts, whence the well-known 'Thessala philtre' of Juvenal (vi. 610). These potions were violent and dangerous in operation, and often caused weakening of the mental powers, madness, and death. Lucretius is said to have been driven mad by a love-potion, and to have died by his own hand in consequence. In the corrupt days of the Roman empire a regular trade in love-charms of all kinds seems to have been carried on chiefly by women. Philtres seem to have been used during the middle ages; and in the East belief in their power lingers down to the present day.

Phips, or PHIPPS, SIR WILLIAM, governor of Massachusetts, was born at Woolwich, Maine, on 2d February 1651, one of the twenty-one boys in a family of twenty-six children. He was successively a shepherd, a carpenter, and a trader, and in 1687 recovered from a wrecked Spanish ship off the Bahamas bullion, plate, and treasure valued at £300,000; this gained him a knighthood and the appointment of sheriff of New England. In 1690 he captured Port Royal (now Annapolis) in Nova Scotia, but failed in the following year in a naval attack upon Quebec. In 1692, through the influence of Increase Mather (q.v.), he was appointed governor of Massachusetts. He changed the manner of the witchcraft persecutions by appointing a commission of seven magistrates to try all such cases. He died on 18th February 1695 in London, whither he had been summoned to answer certain charges of arbitrary conduct. See Life by F. Bowen in Sparks's *American Biography* (1856).

Phiz. See BROWNE (HABLOT K.).

Phlebitis (Gr. *phleps*, *phlebos*, 'a vein'), inflammation of the veins, although seldom an original disease, is a frequent sequence of wounds, and is not uncommon after delivery, or in varicose veins. The disease is indicated by great tenderness and pain along the course of the affected vessel, which feels like a hard knotted cord, and rolls under the fingers. See VEINS, WOUNDS.

Phlebolites, or PHLEBOLITHS (Gr. *phleps*, 'a vein,' and *lithos*, 'a stone'), are calcareous concretions formed by the degeneration of coagulations in veins, or occasionally originating in the coats of the vessel.

Phlebotomy, or VENESECTION, is, as applied to human beings, treated at BLEEDING. The abstraction of blood was at one time considered the best and only remedy for the various diseases of horses and cattle, but at the present time it is comparatively rarely performed, except by veterinarians of the older school; but it is useful in subduing acute congestions, such as of the brain, in parturient apoplexy, congestion of the lungs, acute inflammation of the udder, &c. The vessel selected for the operation is usually the superficial jugular vein, which in cattle is large and loosely situated under the skin of the neck.

In consequence of the mobility of the tissues surrounding the vein it cannot in cattle, as in horses, be raised and made sufficiently tense without the use of a cord tied round the animal's neck below the seat of the intended operation. This cord should be from $\frac{1}{4}$ to $\frac{1}{2}$ inch thick, pulled tight enough to arrest the flow of blood and cause the vein to become distended and tense. It should then be opened with the fleam and 'blood stick,' so as to pierce the skin and vein at one blow.

When a sufficient quantity of blood has been abstracted, say from 3 to 6 or even 8 quarts, the cord is slowly slackened so as to prevent a vacuum and the ingress of air into the vein, the lips of the wound brought into opposition and maintained there by a pin passed through them, and around it twine or tow is twisted in the form of a figure of 8. The pin should not be removed for at least thirty hours.

Phlegethon (i.e. 'the Flaming'), a river of the infernal regions, whose waves rolled torrents of fire. Nothing would grow on its scorched and desolate shores. After a course contrary to the Cocytus (q.v.), it discharged itself, like the latter stream, into the Lake of Acheron.

Phlegraean Fields. See AGNANO, AVERNUS, POZZUOLI.

Phleum. See TIMOTHY GRASS.

Phloem. See BAST.

Phlogiston (Gr. 'combustible') was the term employed by Stahl, professor at Halle, in his *Zymotechnia Fundamentalibus* (1697), to designate a hypothetical element which, by combining with a body, rendered it combustible, and which occasioned combustion by its disengagement, there being left, after its evolution, either an acid or an earth. The phlogistic theory held undivided sway in chemistry until the time of Lavoisier, who substituted for it the theory of oxygenation (1775-81), and was maintained by a few chemists, especially Priestley, till the beginning of the 19th century. According to it, sulphur was composed of sulphuric acid and phlogiston; lead, of the calx or earth of lead and phlogiston; &c. In consequence of the general adoption of the phlogistic theory, when Priestley, in 1774, discovered oxygen, and when Scheele, a little later, discovered chlorine, the names these chemists gave to their discoveries were *dephlogisticated air* and *dephlogisticated marine acid*. See CHEMISTRY.

Phlox, a genus of plants of the family Polemoniaceæ distinguished by a prismatic calyx, salver-shaped corolla, and unequal filaments. The species (30 or so) are mostly perennial plants with simple leaves, and mostly natives of Siberia, eastern United States, and North America. A number of species are common in British flower gardens. It is a favourite genus with florists, and many very fine varieties have been produced.



Phlox paniculata (var.).

Phocæa, the most northerly of the Ionian cities in Asia Minor, originally a colony from Phocis, headed by two Athenians, stood on a peninsula between the gulfs of Elais and Smyrna, and had an excellent harbour. The Phocæans were distinguished among the Greeks for their nautical enterprise. When the city was besieged by the Persians in the time of Cyrus, many of its inhabitants emigrated to Corsica; Massilia (Marseille) was a Phocæan colony. The old city survived into the later empire; the Genoese had a colony there in the middle ages to exploit the alum mines. The modern town is Eski Focha.

Phocæna. See PORPOISE.

Phocas, a tyrannical emperor of Constantinople (602-610). He was deposed and executed. See BYZANTINE EMPIRE.

Phocidæ. See SEAL.

Phocidia. See PHOCIS.

Phocion (Gr. *Phokiôn*), an Athenian general, was born about the end of the 5th century B.C. He was of humble origin, but studied under Plato, Xenocrates, and perhaps Diogenes also. Phocion first attracted notice in the great sea-fight at Naxos (376), where he commanded a division of the Athenian fleet. In 351, along with Evagoras, he undertook the conquest of Cyprus for the Persian monarch, Artaxerxes III., and was completely successful. In 341 he was successful in crushing the Macedonian party in Eubœa and in restoring the ascendancy of Athens. Two years before this he had achieved a similar result at Megara; and in 340, sent to the aid of the Byzantines against Philip, he forced Philip to abandon the siege, and even to evacuate the Chersonesus. Nevertheless, he advocated, even in the midst of his triumphs, the establishment of better relations with the enemy, for he had come under the influence of the philosophical reaction in favour of monarchy instead of a democracy of petty aims and degraded character. He had come to see that a voluntary acquiescence in the supremacy of an enlightened ruler was better for Athens and for Greece than a hopeless struggle in defence of a political system that had lost its virtue. His advice was not taken; but the fatal battle of Chæronea, only two years afterwards, in which the independence of the Greek republics was lost for ever, proved its soundness. After the murder of Philip in 336 we see him struggling at Athens to repress what appeared to him the reckless desire for war on the part of the fanatical patriots, on account of which he was regarded as a traitor; but his personal honour is above

suspicion. On the death of Alexander in 323 the aged Phocion endeavoured, but in vain, to hinder the Athenians from going to war with Antipater. After Antipater's death he was involved in the intrigues of Cassander, the rival of Polyperchon, and was forced to flee to Phocis, where Polyperchon delivered him up to the Athenians. He was condemned by 'a mixed mob of disfranchised citizens, foreigners, and slaves' to drink hemlock. His body, flung unburied over the borders of the state, was carried by some of his friends to Eleusis, and burned there. The Athenians soon began to raise monuments to his memory. His life was written by Plutarch and Cornelius Nepos. See Jacob Bernays, *Phocion und seine neueren Beurteiler* (1881) and G. Coleridge in *Nineteenth Century* (March 1923).

Phocis, PHOCIDIA, a province of ancient Greece, west of Bœotia, and bounded S. by the Gulf of Corinth. The greater part of the country is occupied by the mountain-range of Parnassus (q.v.). The state derives its chief historical importance from possessing the famous oracle of Delphi (q.v.). During the Peloponnesian war the Phocians were close allies of the Athenians. In the time of Philip of Macedon they were involved in a ten years' war, on account of their opposition to a decree of the Amphictyonic Council, concerning the use of a piece of land belonging to the temple of Delphi. This war, commonly known as the Sacred or Phocian War, ended disastrously for the Phocians, the whole of whose cities (twenty-two in number) were destroyed, with one exception, and the inhabitants parcelled out among the hamlets. Phocis and Phthiotis form a province of modern Greece.

Phœbus (i.e. 'the Bright'), an epithet, and subsequently a name, of Apollo. It had reference both to the youthful beauty of the god and to the radiance of the sun, when, latterly, Apollo became identified with Helios, the sun-god. See APOLLO, HELIOS. Artemis (q.v.) was called *Phœbe*.

Phœnicia, the *Φωνίκη* of the Greeks, the *Phœnice*, or (in rare cases) *Phœnicia*, of the Romans, was a tract of country lying to the north of Palestine, along the coast of the Mediterranean Sea, bounded by that sea westwards, and eastwards extending to the mountain-crests of Bargylus and Lebanon. The limits of the tract northward and southward are variously stated by ancient authorities, and no doubt varied at different periods; but modern researches seem to indicate that the actual Phœnician occupation did not extend beyond Laodicea (Latakia) on the north and Acre, or at the furthest Carmel, on the south. This would give the coast-line a length of about 200, or, counting main indentations, of 230 miles—a fair mean between the 120–300 miles of different writers. The width between the coast and the mountain-ridges of Bargylus and Lebanon varies from 8 or 10 to 25 or 30 miles, perhaps averaging 15 miles. The area of Phœnicia proper may thus be reckoned at about 3000 sq. m. The tract included within these limits is one of a remarkably diversified character. Lofty mountain, steep wooded hill, chalky slope, rich alluvial plain, and sandy shore succeed each other, each having its own charm, which is enhanced by contrast. The sand is confined to a comparatively narrow strip along the seacoast, and to the sites of ancient harbours now filled up. It is exceedingly fine and of excellent siliceous quality, especially in the vicinity of Sidon and at the foot of Mount Carmel. The most remarkable plains are those of Acre, Tyre, Sidon, Beirut, and Marathus—none of them very extensive, but richly fertile, and capable of producing, under any tolerable system of cultivation, luxuriant crops. The hilly region forms generally an intermediate tract

between the high mountains and the plains; but not unfrequently it commences at the water's edge, and fills with its undulations the entire space, leaving not even a strip of lowland. This is especially the case in the central region between Beirut and Arka, opposite the highest portion of the Lebanon; and again in the north, between Cape Posidium and Jebel, opposite the more northern part of Bargylus. The hilly region in these places is a broad tract of alternate wooded heights and deep romantic valleys, with streams murmuring amid their shades. Sometimes the hills are cultivated in terraces, on which grow vines and olives, but more often they remain in their pristine condition, clothed with masses of tangled underwood.

From the hilly tract, which increases in elevation as it recedes from the shore, rise the two great mountain-regions, separated by a clearly-marked depression in 34° 35' lat. nearly, down which runs the river Eleutherus. The more northern of the two was known to the ancients as Bargylus (Jebel Nuṣairiyeh). But the glory of Phœnicia is Lebanon. Extended in a continuous line for a distance of 130 miles, with an average elevation of from 6000 to 8000 feet, and steepest on its eastern side, it formed a wall against which the waves of eastern invasion naturally broke. The flood of conquest swept along its eastern flank, down the broad vale of the Buka over Galilee, and the western lands were, in the early times at any rate, but rarely traversed by a hostile army. This western region it was which held those inexhaustible stores of forest trees that supplied Phœnicia with her warships and her immense commercial navy; here were the most productive valleys, the vineyards and the olive-grounds; and here, too, were the streams and rills, the dashing cascades, the lovely dells, the deep gorges, and the magnificent cedar-trees which gave her the palm over all the surrounding countries for variety of picturesque scenery. The seacoast is but slightly indented, and possesses but few prominent headlands. The most important are Carmel, if that may be reckoned to Phœnicia, and Ras el-Abiad, 10 miles south of Tyre, where a very ancient caravan route runs along a passage cut through the rock. Natural harbours were wanting, except where littoral islands offered a protection from the prevalent winds, as at Tyre and Aradus; elsewhere nature provided nothing better than open roadsteads; and the famous harbours of the Phœnicians were all of them the work of art.

The geology of Phœnicia is tolerably simple. Both Bargylus and Lebanon are longitudinal ranges of the early Cretaceous limestone, a limestone that is soft and pliable, very easily worked, but wanting the qualities needed for the imitative arts. This simple formation is, however, intruded upon by disturbances of igneous origin, especially in the lower ridges. On the whole, the predominant formation is a greasy or powdery limestone, and this is the sole material of the higher ranges. The softness of the general material facilitates the formation of a rapid vegetation and the accumulation of vegetable soil, which, washed down by the rivers, covers the more open valleys and the plains which fringe the coast with an alluvium of the most productive character. Its mountain-regions must always have furnished Phœnicia with an inexhaustible supply of excellent timber—fir, pine, and cedar; the lower slopes of its hills were admirably adapted for the cultivation of the olive and the vine, while its maritime plains were equally fitted for the growth of corn and of almost every kind of fruit and vegetable. In mineral products it may have been deficient; but the sandstone of the Lebanon is often largely impregnated with

iron, and some strata towards the southern end of the mountain are said to produce as much as 90 per cent. of pure iron ore. An ochreous earth is also found in the hills above Beirut, which gives from 50 to 60 per cent. of metal. Coal, too, has been found in the same locality. Finally, the geologist Fraas succeeded in finding innumerable traces of amber-digging on the Phœnician coast; whence it may be gathered that rare substances were also in the early times among Phœnician products.

It is now recognised that the Phœnicians are to be included among the Semites (q.v.). In Genesis x., however, they are not assigned to Shem, and Sidon is called the first-born of Canaan and a descendant of Ham (verses 6, 15). But the chapter is not framed on strict ethnographical lines, and it gives effect to the hostility to Canaan which reappears in the curse upon Canaan (chap. ix. 25 f.) and in the contemptuous references elsewhere to the Canaanites. Moreover, not only was there a very close relationship between Phœnicians and Canaanites, intercourse between Canaan, Phœnicia, and Egypt both by land and by sea goes back to a remote date. The genealogy of the 'sons' of Noah (Gen. x.) certainly expresses the feeling that the Phœnicians and Canaanites were no true kinsmen of the sons of Shem, and therefore of the Israelites, but from time to time the bond between Phœnicia, Samaria, and Jerusalem was particularly close, and the cruelty of the Tyrians could be regarded as a rupture of the 'brotherly' covenant between Phœnicia and Israel (Amos, i. 9).

In point of fact two different traditions of the origin of the Phœnicians, though recorded by late writers, unmistakably associate them with the other Semites. According to Herodotus, Strabo, Pliny, and others, they dwelt anciently on the shores of the Persian Gulf (Erythrean Sea), whence they crossed by land to Syria, and settled on the coast of the Mediterranean. Herodotus (vii. 89) declares this to be their own account of themselves, and Strabo says that there was a similar tradition among the inhabitants of the gulf, who showed, in proof of it, Phœnician temples on some of the islands. Justin, on the contrary, in his epitome of Trogus Pompeius, declares that they were driven out of their country by an earthquake, and passed to the Mediterranean from the 'Syrian lake,' or Dead Sea. This latter version of the story has been connected by some with the destruction of the Cities of the Plain recorded in Genesis. Whichever account be preferred, it would seem that the Phœnicians regarded themselves as immigrants into their country, and not (like most ancient nations) as aboriginals.

The language of the Phœnicians belongs to the North Semitic branch, which includes Hebrew, Moabite, and an ancient dialect found in the extreme north of Syria. The same common language can be traced on cuneiform tablets from Phœnicia and Palestine of the 14th century B.C., in inscriptions at Byblus (dated to the 13th century); then, forming a distinct dialect, Phœnician is found on inscriptions of the 8th and later centuries, it undergoes various changes in the Punic and Neo-Punic inscriptions of Carthage, &c., and fragments survive in the *Pœnulus* of Plautus. It was still in popular use in St Augustine's day (5th century A.D.). Corresponding to this old common language, which in Palestine was gradually replaced by Aramaic, there was a common type of alphabet which, in time, broke up into Phœnician (Old Hebrew, &c.) and Aramaic branches. This is the alphabet which through the Phœnicians was spread among the Greeks, Etruscans, Romans, &c., and they have often been regarded as its inventors. However, the problem of the Alphabet (q.v.) is still under discussion. If an inscription found by

the French at Byblus is rightly ascribed to the 13th century B.C., the characters are far removed from any Egyptian or other suggested source, and a curious script found by Sir Flinders Petrie in Sinai (c. 1500 B.C., or perhaps c. 1800), which seems to be a link between the Egyptian hieroglyphs and the Phœnician linear alphabet, is no less removed from the oldest North Semitic characters. The main facts are that c. 1400 B.C. the cumbersome cuneiform (Babylonian) was the language of intercourse over Egypt and south west Asia (including the Hittites), while the Cretans, the dominant people of the eastern Mediterranean, had pictographic and linear writing of their own. But in some way a simple alphabet of twenty-two characters arose, and in due course spread among Semites and Greeks, and the Phœnician traders in this, as in other respects, seem to have been the disseminators rather than the inventors.

Long before Phœnician history begins, the coastlands of Syria and Palestine had been in close touch with the rest of the Levant. But whatever part Phœnicians played as sailors or traders, it is very unlikely that the Phœnician ports were of any political significance prior to the fall of Crete and the decline of Egypt. From the 'Amarna Letters' (found at el-Amarna, see vol. iv. p. 241, col. 2) it is seen how they were at the mercy, not only of seapirates, but also of the great powers with whose fortunes they were closely bound up. The period (c. 1400-1350 B.C.) was one of widespread unrest, and a powerful Amorite state (centring about the Lebanons) was actively intriguing against Egypt. Then, as repeatedly happened later, all the petty peoples were divided among themselves, and already Tyre and Sidon were rivals. Subsequent events show how the Hittites gradually extended their influence to the south; and then, as the greater powers weakened, sea-peoples broke over the coastlands, and the Philistines (q.v.) were not the only strangers to settle down along the coast. It is about the 12th century B.C. that conditions were favourable for the establishment of new states, and tradition (in Justin, xviii. 3) not unjustly recognises a landmark when Tyre is said to have been founded a year before the Fall of Troy (the tradition date of which is c. 1183). Undoubtedly there had been Semites (Semitic-speaking people) in the land called 'Phœnicia'—and even the foreign Philistines, farther south, themselves became Semitised—and it is difficult to distinguish between Semitic Phœnicians and the people of Phœnicia, many of whom were invariably of foreign origin, but in any case the 12th century seems to mark a new stage in the history of Phœnicia, Syria, and Palestine.

About this time (c. 1115-1100 B.C.) an Egyptian account of the visit of an envoy to Byblus to procure cedar vividly depicts the haughty independence of the city-state, although the indebtedness to Egypt and Egypt's god Amon is clearly admitted. Mention is made also of a great Phœnician fleet; and since, in return for cedar, Egypt sends gold, silver, linen, hides, rope, and rolls of papyrus, there is little doubt that Phœnician trading-activity was in full swing. At one time or another several Semitic words made their way into Greek: names of products (byssus, libanos [incense], cane, cummin), also camel and sack, and the word for 'pledge' (*arrabôn*, Fr. *arrhes*); and the trade in papyrus is of special interest, since the Greek name for it (*biblos*) was derived from Byblus (like 'parchment' from Pergamum), and from it, in turn, is ultimately derived the word 'Bible' (cf. vol. ii. p. 119, col. 2). For long the Phœnicians must have been content with trading-posts, settlements, and factories, so that 'the history of Phœnician trade and colonisation presents many analogies with those of Portugal and Holland' (Eduard Meyer). Hence

it was that in time the places were swallowed up, or, under favourable conditions, could assert political supremacy, as, notably, in Cyprus, and in Carthage and elsewhere in North Africa. ^c

The Phœnicians appear as navigators in the earliest Greek (Homer, *Odyssey*, xv. 415-484), and in some of the earliest biblical (1 Kings, v. 9) sources. They were regarded as familiar with the sea in times anterior to the Trojan war (Herod. i. 1). Their ships, though small, according to our ideas, were well built, and admirably fitted up and arranged (Xen. *Econom.* sect. 8). For trading purposes they employed ships of a broad, round make (γάβλοι), but in war they used galleys of a considerable length, which were ordinarily impelled by oars, the rowers sitting on a level, or else in two ranks, one above the other, or sometimes in three. The earliest representations of Phœnician vessels which have come down to us are in the sculptures of Sargon and Sennacherib (c. 700 B.C.); those of the latter showing a double tier of rowers. The crews of these vessels do not appear to exceed the number of twenty-five; but the Phœnician war-galleys in the fleet of Xerxes (480 B.C.) carried a crew of 200 sailors, besides thirty men-at-arms (Herod. vii. 184). Phœnician trade was in part a land trade conducted by travelling companies of merchants, in part a traffic by sea. Of the land trade the best account which we possess is that given in the 27th chapter of Ezekiel (verses 3-24), by which it appears that this traffic extended over the greater part of western Asia, including northern Syria, Syria of Damascus, the land of Israel, Arabia, Mesopotamia, Assyria, Babylonia, parts of Armenia, and much of central Asia Minor. Northern Syria furnished the Phœnician merchants with linen, embroidery, and precious stones. Israel supplied food, oil, balm, and honey, and agents collected the homespun cloth (Prov. xxxi. 24). Caravans travelling by way of Hamath or Damascus would feed the ports, though the more northerly road running east and west to India and Asia Minor would usually lie outside their reach. Arabia provided spices, ivory, and ebony, precious cloths, jewels, and gold; but the Arabian trade might otherwise pass through Gaza to the Levant. Accordingly, a powerful Phœnicia, when on friendly terms with Israel and with Edom, would seek to exploit the trade that reached the Gulf of Akabah from East Africa and India. Tarshish (Tartessus), in south-west Spain, was so regularly visited for its silver and other mines (of proverbial richness) that 'Tarshish-ships' became a name of wide application, like our 'East Indiamen.' Copper was obtained from Cyprus (whence the name), and tin from the Scillies; despite late and fanciful tradition, there is no definite evidence that the Cornish mines were worked by Phœnicians. They collected the *murex* shell-fish in order to obtain the brilliant dyes for the textiles wherein they excelled. Glass (q.v.), said to have been discovered accidentally on the Phœnician coast, was known to the Egyptians centuries before the prominence of the Phœnicians; though the excellence of the siliceous sand near Sidon and in the Bay of Acre may have given rise to the tradition. In any case, the Phœnicians passed on the fine Egyptian glass.

Apart from early Egyptian representations of objects in precious metal, vases, and the like, brought by vassals from Phœnicia and Syria, most of the examples of Phœnician workmanship come from the 8th century and later, and reflect Egyptian and Mesopotamian influence. Phœnician art is clumsy, eclectic, with little originality. The Phœnicians were a money-making merchant-folk, and on this account disliked. In the Persian age and later, Greek influence became exceedingly strong, and it is this persistent indebtedness to

external influence which makes it improbable that they even *invented* the alphabet. Of their literature little is known. The 'Amarna Letters' from Byblus, Beirut, Sidon, and Tyre (about seventy in all) are, as regards style, not dissimilar from those of Palestinian origin; the way in which the writers address their divine overlord, the king of Egypt, points to a wealth of idea which sometimes reminds one of the Old Testament. No doubt the archives of Tyre, which Menander of Ephesus translated into Greek (Josephus, *c. Ap.* i. 17 sq.), would be mere chronicles; but the Greek fragment of a translation of the voyage of Hanno along the west coast of Africa (c. 500 B.C.), if authentic, would show that African Phœnicians could write interesting books of travels. Latin writers speak highly of Hiempsal, Mago, Hamilcar, and others, who composed works on history and geography. One, Mochus of Sidon, a reputed founder of Eastern philosophy, had a modified form of a Sidonian cosmogony which Damascius took over and gave a neo-Platonic interpretation, and another cosmogony from Philo of Byblus is preserved by Eusebius. Both represent a tendency to prove the superiority of Eastern lore; and Philo, in particular, is characterised by his effort, following Euhemerus, to explain mythology as misunderstood history by turning the deities into men and women who had been deified after death ('Euhemerism'). Both, though differing in details, agree in substance, and when allowance is made for their strange philosophical dress, they are found to contain some valuable traces of the old Phœnician religion.

The Phœnicians, like the Semites, were a people in whose minds religion and religious ideas occupied a very prominent place. In all their cities the temple was the centre of attraction, and the piety of the citizens adorned every temple with abundant and costly offerings. The monarchs who were at the head of the various states showed the greatest zeal in continually maintaining the honour of the gods, repaired and beautified the sacred buildings, and the kings and queens were often the priests and priestesses of the deity. The coinage of the country bore religious emblems, and proclaimed the fact that the cities regarded themselves as under the protection of this or that deity. Both the kings and their subjects commonly bore religious names—names which designated them as the worshippers, or placed them under the tutelage, of some god or goddess. Abd-alonim, Abd-astarte, Abd-osisir, Abdi-milkut, Abd-eshmun are names of the former kind; Abibaal ('Baal is my father'), Itho-bal ('With him is Baal'), Baleazar ('Baal protects'), names of the latter. The Phœnician ships carried images of the gods in the place of figureheads (Herod. iii. 37). Wherever the Phœnicians went they bore with them their religion and their worship; in each colony they planted a temple or temples, and everywhere throughout their wide dominion the same gods were worshipped with the same rites and with the same observances. The ordinary term for the god is Baal (fem. Baalath); other titles are Adōn 'lord,' whence the famous Adonis (q.v.), whose actual name is unknown, and Milk, Melek, 'king' (cf. the Old Testament Molech). We hear of a Baal (of) Sidon, (of) Lebanon, &c.; the Baal of Tyre was called Melkart, which simply means 'king of the city'; he was identified with Hercules. Baal Hammon, common in North Africa, was the god of (i.e. inhabiting) the pillar, or he was the glowing, burning god (perhaps Saturn), and the name may also have been associated with Jupiter Ammon. Of special interest is the Baal of the Heavens (Shamem) or Sky-god, who became supreme, and was equated with the 'Most High Zeus' of the Greeks. The Baalath of Byblus was known to the

Egyptians from an early date; she was no doubt an Astarte, whose name (in the Old Testament Ashtoreth) is the same as the Babylonian Ishtar. Of more distinctive names, Resheph (flame, lightning) was identified with Apollo, Anath (identified with Athene) was an ancient warrior-goddess, Tanith of Carthage (identified with Demeter and Artemis) is of perplexing origin. She is called 'the face of Baal,' i.e. a manifestation of the god, even as Astarte, who is represented as Isis, and identified with Aphrodite-Venus, is once called 'name of Baal.' Both usages find parallels in the Old Testament (Exod. xxxiii. 14, xxxii. 21). The name of Sidon seems to preserve that of some 'hunting' god, and Dagon was probably some food-god (corn or fish as the case might be); Beirut, too, could be explained as 'food.' But while some names are entirely in accord with the intensely practical character of early and simple religion, tendencies to frame cosmic powers are to be recognised, especially in the Greek age, when, also, foreign deities take a more prominent place in the religion.

The gods were worshipped with perpetual sacrifice in their temples, with votive offerings and with festivals. A spring festival to Melkarth, 'The Baal of Tyre,' in the month Peritius (Joseph. *Ant. Jud.* viii. 9, sect. 3), and another to Ashtoreth called 'the brand-feast' (Lucian, *De Dea Syria*, sect. 10), are especially noticed. Anciently it was not considered right to erect statues to the gods in their temples; but the practice was to represent them by conical pillars of stone or wood (Tacit. *Hist.* ii. 3). Two terrible rites particularly characterised the religion—human sacrifice and religious prostitution. A divine original was found for the former of these, El having in a time of great danger immolated his only son upon an altar to avert the evil wherewith the land was threatened. Henceforth such sacrifices were from time to time offered by the state when great disasters seemed impending, and individuals appeased the divine anger against themselves by the offering of their children. At Carthage, we are told (Diod. Sic. xx. 14), an image of El, made of metal, was heated to a glow by a fire kindled within it, and the victims, deposited by their parents in its arms, thence rolled into the fiery lap below. First-born, and especially only sons, or virgin daughters, were deemed peculiarly acceptable to the divinities. The godhead, it was thought, demanded the holiest and most costly gifts possible; and this idea, which lay at the root of the child-sacrifice, may be regarded as also explaining the prostitution of virgins in the temples and groves of the 'Queen of Heaven,' which was certainly an established custom.

Phœnician history is very fragmentary. The friendship between Hiram of Tyre and the Israelite kings, David and Solomon (c. 1010–940), was marked by joint enterprise in trade, and the employment of Phœnician artisans to build Solomon's palace and temple testifies to the dependence of the inland state upon its more cosmopolitan neighbour. Close relations recur in the alliance between Ithobaal (or Ethbaal), priest-king of Tyre and Sidon, with Omri and Ahab of Samaria. Jezebel the daughter of the former, was married to Ahab, and their daughter Athaliah was married to Jehoram, son of the Judean king Jehoshaphat, and for a short time reigned as queen-mother (c. 840). Both Ithobaal and Omri were usurpers and active monarchs, and once more there were joint trading-journeys. To the biblical writers the age of Ahab, and the alliance with Phœnicia and all it entailed, constitute a landmark; and it is a noteworthy fact that, while they record the drought broken after the famous scene on Mount Carmel and Elijah's prayer to the God of Israel, the native Phœnician historian Menander (cited by Josephus) knew of a

year's drought which, however, was broken by the supplication of the priest-king Ithobaal to his own god. It was the age of Assyrian aggression, and henceforth the Phœnician cities are often mentioned in the Assyrian records. Meanwhile the colonies were growing: first, Lixus in Mauretania, Gades (Cadiz), Utica—all ascribed by tradition to the 12th century. Some time later Botrys, north of Byblus, and Anza, in North Africa, are attributed to Ithobaal. Then a dispute between the young Pygmalion and his uncle Sicharbas (Zacharbaal), who was married to his sister Elissa, or Dido (q.v.), led to the murder of the uncle, Dido's flight to North Africa, and the foundation of Carthage (q.v.). By the time of Tiglath-pileser III. (c. 732 B.C.) the wealth of Tyre can be gauged from the enormous tribute of 125 talents of gold imposed upon her. To this age belong the fragments of a bronze bowl dedicated to the Baal of Lebanon, which, until the recent discovery of the Byblus inscription, was regarded as the oldest specimen of Phœnician writing. In the next century Egypt, whose petty Delta-kings had been in regular intercourse with the Greek world, slowly waking up from her long sleep, began to entertain ambitions of recovering her influence over south-west Asia, and the history once more begins to be on a far-reaching international scale. In the new Egyptian-Assyrian rivalry Phœnicia remained generally faithful to its old Egyptian connections; but when, after the fall of Assyria (612 B.C.), Babylonia came to the front, and Nebuchadrezzar, at the battle of Carchemish (605 B.C.), defeated the hopes of Egypt, Phœnicia passed under a new master, though Tyre held out and endured a thirteen-year siege (from c. 586 B.C.), a crowning proof of her natural strength. Then, in due course, as the Persians overcame the new Babylonian empire, Phœnicia again changed masters, and her fleet was the chief mainstay of the Persian dynasty in its wars in the west. Her history thus becomes part of that of Carthage and of Greece, and her colonies were stronger than the mainland. Sidon now surpassed Tyre in importance, so that her king actually took precedence next to the great king of Persia himself. Not confined like Tyre geographically, Sidon was a more cosmopolitan city, the seat of the Persian satrap, and with strong partiality for Greek culture. This is most marked in the 4th century B.C., when we have a series of royal Sidonian inscriptions extending into the middle of the 3d century (an earlier date is improbable), invaluable for the light they throw upon the strength of native Phœnician belief and usage in spite of the influence of both Greece and Egypt. And a similar story is told by the coins, even of the Roman period.

Apart from the admirable though naturally now rather antiquated history of Phœnicia by George Rawlinson (1889), some of whose original article to this *Encyclopædia* is here retained, the subject is not usually treated by itself. Reference may be made for (1) geography, topography, &c. to Bædeker's *Palestine*; (2) history, &c. to the usual larger histories; (3) religion, to Lagrange, *Études des Rel. Sem.* (Paris, 1905); Baudissin, *Adonis und Femun* (Leipzig, 1911); and J. G. Frazer, *Adonis, Attis, Osiris* (London, 1919); (4) inscriptions, G. A. Cooke, *North-Semitic Inscriptions* (Oxford, 1903); (5) coins, G. F. Hill [*Coins of the British Museum*]; see also E. Meyer's article 'Phœnicia' in *Ency. Biblica*, and below, article SEMITES.

Phoenix, the name of a mythical Egyptian bird, supposed by some to be a kind of plover, by others to be the sacred *bennu*, or nycticorax, while some regarded it as a kind of eagle. The Phoenix legend presents great variations. According to some writers it visited Egypt after the death of its father, and buried its parent in the shrine particularly dedicated to it at Heliopolis, putting the body

into an egg or case made of myrrh. Another account is that the Phœnix, when about to die, made a nest for itself in Arabia, from which a new Phœnix sprang of itself. This bird proceeded to Heliopolis, and there burned and buried its father. But the more popularly-known version is that the Phœnix burned itself, and a new and young Phœnix sprang from the ashes. The Phœnix was, according to the most authentic accounts, supposed to visit Egypt every 500 years; the precise period, however, was not known at Heliopolis, and was a subject of contention till its appearance. Some chronologists uphold the connection of the Phœnix period with that of the Sothic cycle, as well as the statement that it designated the soul and the inundation of the Nile. A great difference of opinion has prevailed about the Phœnix period—a cycle generally of 500 years, but varying also from 250 to 7000 years. Lepsius makes it a cycle of 1500 years. The Phœnix was fabled to have appeared four times in Egypt. A fellow of an Oxford college argued in 1840 in favour of the existence of the phoenix (see *Notes and Queries*, 22d December 1882). He followed Clement, Tertullian, Epiphanius, and other church fathers.

Phœnix. See DATE PALM and PALM.

Phœnix, capital of Arizona, in the Salt River Valley, centre of a farming, grazing, and mining district. Pop. 30,000.

Phoenix Park. See DUBLIN.

Phoenixville, a town of Pennsylvania, on the Schuylkill River, 28 miles by rail NW. of Philadelphia. Here are the extensive works of the Phoenix Iron Company, besides factories for under-clothing, silk, and much else. Pop. 10,500.

Pholas, a genus of marine boring bivalves, of the family Pholadidae. The shell is thin but hard, gapes at both ends, and has accessory valves. The two principal valves are beset with inequalities, producing a rasp-like structure. By twisting or rocking on the fulcrum of the sucker-like muscular



A piece of rock bored by *Pholas*.

foot and bringing the teeth or spines of the shell-valves against the substratum, these boring molluscs make cylindrical holes in the rocks or in wood. Over thirty living species are known—e.g. the common *Pholas dactylus*, popularly known as the *piddock*. It is used both for food and bait. Some species are markedly luminescent. The allied genus *Pholadidea* is also represented on British coasts, and so is the wood-boring *Xylophaga*. To the family

Pholadidae also belongs the ship-worm, or *Teredo* (q.v.). See also BORING-ANIMALS.

Phonetics is that branch of the general science of Linguistics (q.v.) which is concerned with pronunciation in all its aspects. It is concerned notably with the manner in which speech-sounds are formed by the organs of speech, the ways in which speech-sounds are put into sequence so as to form words and sentences, their length (quantity) and stress (force accent) in connected speech, the rise and fall of the musical pitch of the voice, and the effects which speech-sounds and sequences of speech-sounds produce on the ear.

The Applications of Phonetics.—It is at once evident that the science of phonetics has numerous practical applications. These include its application to (1) the learning and teaching of foreign languages; (2) the teaching of the mother-tongue; (3) the study of dialects; (4) the curing of individual speech defects; (5) the teaching of speech to the deaf; (6) the construction of alphabets for languages hitherto unwritten; (7) the construction of systems of writing for special purposes (e.g. systems of shorthand, alphabets for the blind, telegraphic codes); (8) philology.

It is not possible in this article to deal with all these applications of phonetics. The treatment of the subject will be confined mainly to its most important aspect—namely, the use of phonetics in the study of foreign languages.

Phonetics helps language learners both to pronounce and to understand foreign spoken languages better than is possible without phonetics. Ordinary language learners cannot hope to pronounce a foreign language perfectly unless the language has been subjected to 'phonetic analysis,' and the learner acquires the pronunciation by means of 'phonetic training.' By 'phonetic analysis' is meant the determination of the mechanism by which each sound of the language is uttered, and of the usage of the language in the matter of length, stress, and intonation; also the preparation of phonetic transcriptions (to show how the sounds are used in words and sentences). 'Phonetic training' includes (1) ear-training; (2) exercises for the organs of speech; (3) learning to use the right sound in the right place in connected speech; and (4) learning to pronounce the sounds and syllables of connected speech with the correct length, stress, and intonation.

Ear-Training.—The importance of ear-training for students of spoken languages cannot be over-estimated. There is only one satisfactory method of training the ear to recognise the speech sounds of a language. It is that a native teacher (or a teacher who pronounces as a native) should dictate meaningless words made up of sounds of the language. The learner writes these words by means of a phonetic transcription, and the teacher sees from what has been written whether the learner recognises accurately the various sounds of the language in different combinations. When the learner makes a mistake, the teacher repeats the word, firstly giving the pronunciation represented by the learner, and then with the pronunciation originally dictated. When the learner has heard the two pronunciations contrasted a number of times, he soon learns to distinguish the sounds with certainty. As the learner progresses, the teacher should (if possible) introduce sounds of the learner's mother-tongue, also cardinal vowels and sounds of other foreign languages. Those who contemplate undertaking phonetic analysis of languages not hitherto analysed should prepare themselves by thorough ear-training, comprising as many sounds as possible.

Training the Organs of Speech.—Those who wish to pronounce a foreign language properly must also learn to make all the speech-sounds of that lan-

guage. This is done by means of exercises for the organs of speech ('mouth gymnastics'). If a language has been phonetically analysed, the manner of forming every sound in it is known. This knowledge, supplemented when possible by a knowledge of the speech mechanism of the learner's mother-tongue, will suggest exercises which will enable him to produce accurately all the difficult foreign sounds both in isolation and in combination.

For example, the sound of French *u* in *lune* (phonetically [y])¹ is easily learnt by any one who knows that it is approximately the English sound of *ee* (phonetically [i]) said through rounded (pursed-up) lips. Control over this sound is facilitated by the exercise of alternating it with the English sound of *ee*, thus [iyiyiy . . .]. The Hindustani [t̪] and [t̪ʰ] are not difficult to those who know that the tip of the tongue must touch the edge of the upper teeth for the former, and must touch the hard palate for the latter. Control over these sounds may be acquired by practising rapidly tatata . . . and other combinations containing these sounds. The Japanese [ɸ] (as in *Fuji*) can be acquired by noticing that it is formed by the two lips, whereas the English [f] is formed by the lower lip against the upper teeth. Other foreign sounds are more difficult than those mentioned here, but a knowledge of the mechanism by which they are produced will always help the learner to improve his pronunciation, and will often make it perfect.

The Use of Phonetic Transcription.—Phonetic transcription is generally described as a system of writing which provides one symbol for every speech-sound. A more accurate definition is given in the section on Theory of Phonetic Transcription (below). The following are the chief uses of phonetic transcription: (a) One of them has already been mentioned in connection with ear-training (see above). If the learner does not write the dictated words by means of a phonetic system, the teacher cannot tell whether he has recognised the sounds correctly, and cannot, therefore, give him the necessary ear-training practice. (b) Those who write about the theory of speech-sounds must necessarily have unambiguous phonetic symbols to represent the sounds with which they deal. (c) Phonetic transcription is the means of showing which of the sounds of a language are the appropriate ones to use in given words and sentences. Phonetic transcriptions, therefore, help the learner to use the right sound in the right place in connected speech. Thus foreign learners of English do not, as a rule, know when to use the 'strong' and 'weak' forms of such words as *and*, *from*, *have*. Phonetic transcription will, however, show them that *and* is reduced to [n̩] in *bread and milk* [brɛdn̩mɪlk], *from* has its strong form [frɒm] in *Where does he come from?* but its weak form [frəm] in *He comes from London*, that *have* has its weak form [(h)əv] in *I should have thought so*, and so on. Phonetic transcription will likewise show, in which cases the two values of French *eu* are used—e.g. the 'closer' vowel [ø] in *peu* [pø], *Meuse* [møːz], *feutre* [føːtr], and the 'opener' vowel [œ] in *neuf* [nœf], *peur* [pœːr]. (d) Special phonetic signs may also be used to indicate length, stress, and pitch; such signs are essential for transcribing languages in which words are distinguished by any of these 'sound-attributes,' though the utility of such signs is by no means confined to such languages.

The methods of teaching a normalised pronunciation of the mother-tongue to those who speak in a dialectal manner are similar to the methods used in teaching the pronunciation of a foreign language. So also are the methods of curing individual peculiarities of pronunciation (lispings, &c.).

¹ Letters enclosed in square brackets [] are phonetic symbols (International Phonetic System).

Phonetic Analysis of Languages.—The phonetic analysis of languages is carried out (a) by auditory methods, and (b) by experimental methods. Of these the auditory methods are the most important, and give by far the most useful practical results. Analysis by auditory methods can only be satisfactorily carried out by persons endowed with an exceptionally keen ear, who have been through a thorough course of general phonetics, and have thereby learnt to recognise and to make the sounds of numerous languages. Phonetic investigations into a language not hitherto analysed are carried out as follows: The investigator asks a native speaker to repeat, as many times as may be necessary, words and phrases containing the sounds to be analysed. Some of the sounds will prove to be already familiar to him; others may be closely related to sounds he already knows, while other sounds may be entirely new to him. To determine the mechanism of such sounds the investigator imitates them, and gradually adjusts his organs of speech until he produces the sounds to the satisfaction of the native. This, however, is not enough, since natives are only too often satisfied with approximations to the correct sounds, especially if the pronunciation is better than that usually heard from learners of their languages. The investigator must, therefore, test his native instructor by intentionally mispronouncing sounds in various ways. If the native is as well satisfied with any intentional mispronunciations as he is with the attempts at the real sound, the investigator will know that he cannot establish the formation of the sound with certainty with that native instructor. If, however, the native will not accept as correct the slightest deviation from a particular mode of production, then the investigator will be satisfied that the mode of production is the correct one. By similar procedure the investigator can establish the usage of the language in the matter of length, stress, and pitch.

By 'experimental methods' we mean analysis by means of specially designed apparatus, such as the phonetic kymograph, thin artificial palates, X-ray photography. These methods are useful as corroborating the results obtained by auditory methods, but they cannot supplant auditory methods. A short description of experimental methods will be found in Jones' *Outline of English Phonetics*, and in an article on 'Experimental Phonetics and its Utility to the Linguist,' by D. Jones in the *Proceedings of the Royal Institution*, 1919.

Sketch of Phonetic Theory.—In the following paragraphs we give a brief outline of the theory of phonetics. Speech, regarded from the point of view of the hearer, may for practical purposes be considered as being made up of sequences of sounds uttered by the speaker. Thus the words *sun*, *thing* each strike the ear as being composed of three sound-qualities pronounced consecutively without any intervening silence; these sounds would be represented in phonetic transcription by [sʌn], [θɪŋ] respectively. In continuous speech the sequences of sounds are broken from time to time by silences. It is necessary for practical purposes to regard the silences of voiceless stop-consonants (see section on plosive consonants below) as particular cases of 'sounds.' The acoustic effects known as speech-sounds are also called *Phones*. Phones, then, are the effects produced on the ear by particular types of air vibration, namely vibrations which are set up when a person produces certain kinds of air currents by means of his organs of speech. (The term has also to be extended in the case of voiceless stops to the silence produced by causing air vibrations to cease.)

From the point of view of the *speaker*, speech may be regarded as successions of movements of

the organs of speech (larynx, vocal cords, soft palate, tongue, lips, &c.); these movements give rise to the acoustic effects known as phones. In continuous speech the sequences of movements are broken from time to time by rests. The complete movement or set of movements required to produce a phone is called a speech-movement or *Gest*. (This term has also to be extended so as to include the cessation of movement occurring in voiceless stops.) A phone may therefore be described as the acoustic effect of a *gest*.

A sequence of phones pronounced without pause may be termed a *speech-chain*. In other words phones may be regarded as the units of which a speech-chain is composed. (It should be observed that the delimitation of these units is in some cases arbitrary and conventional, and that in consequence it is not possible to give a scientifically accurate definition of a phone.)

Phones and Phone-attributes.—It is convenient to restrict the meaning of the term phone to the 'tamber' or 'quality' of a sound emitted by the organs of speech. Every phone has, however, one or more of certain other characteristics known as *phone-attributes*. These characteristics are *length*, *stress*, and *voice-pitch* (see below). Our use of the term phone may be compared to the use of the terms 'tamber' or 'quality' as applied to musical instruments. We speak of the characteristic tamber of (say) a clarinet, though that tamber cannot exist apart from the length, force-accent, and pitch of every sound issuing from the instrument.

Phonetic Theory covers (1) the manner of production and the acoustic effect of every phone in any language or mode of speech; (2) the order in which phones are placed in uttering words and sentences; (3) the ways in which the various phones of any language may be grouped into what are called 'phonemes' (see below); (4) the usage of languages in the matter of phone-attributes. We will consider these matters in order.

The Organs of Speech.—The air-current required for producing phones is generally supplied by the lungs. Chiefly owing to the mobility of the lips, tongue, soft palate, and vocal chords, the passages through which the exhaled air may pass during speech are capable of taking a great variety of shapes. Different configurations or movements of the organs of phonation give rise to different phones or groups of phones. A section of the organs of phonation with the names of those parts which

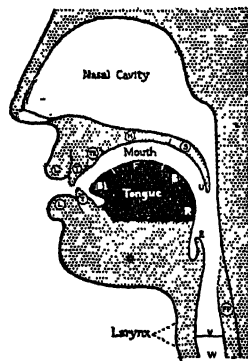


Fig. 1.—The Organs of Speech.

are of particular importance in the study of speech is shown in fig. 1. It should be observed that the divisions marked on the tongue ('blade,' 'front,' and 'back') are arbitrarily chosen as being convenient for the purpose of the study of speech; they do not correspond to any physiological features of the tongue. The blade of the tongue is defined as that part which normally lies opposite the 'teeth-ridge' (the convex part of the roof of the mouth just behind the upper teeth); the 'front' and the 'back' are defined as the parts of the tongue which normally lie opposite the hard palate and soft palate respectively. The 'root' of the tongue is defined as that part of it which forms the front wall of the pharynx.

The vocal cords are like a pair of lips situated horizontally in the larynx. They can be (1) held wide apart so that when air is exhaled the sound known as 'breath' is produced; (2) brought close together so that when the air is expelled from the lungs they vibrate producing 'voice'; (3) closed completely, giving rise to the consonant known as the 'glottal stop'.

The false vocal cords (another pair of lips situated in the larynx just above the true vocal cords) can be brought together, though not throughout their entire length. Constriction of the false vocal cords gives rise to one type of 'whisper.'

Classification of Phones.—We distinguish two main classes of phones, Consonants and Vowels. Consonants are made by complete or partial closure at one or more parts of the air-passage with or without accompanying voice. Vowels are voiced sounds which require that the air should issue in a continuous stream through the centre of the mouth, there being no narrowing sufficient to give rise to audible friction. (See in greater detail Trofimov and Jones, *Pronunciation of Russian*, chap. iv.)

Classification of Consonants.—Some consonants are 'voiced'; others are 'breathed' (also called 'voiceless'). That is to say, in producing some consonants the vocal cords are made to vibrate and produce voice, while in the case of others the vocal cords are kept wide apart. To every voiced consonant there corresponds a breathed consonant; thus the breathed phone [f] corresponds in articulation to the voiced phone [v]; to the voiced consonant [l] there corresponds a breathed sound represented in phonetic transcription by [l̥]. There is one consonant which is neither voiced nor breathed, namely the glottal stop (see below).

Consonant-phones are further classified according to the nature of the *gests* by which they are made. They are classified (1) according to their places of articulation; and (2) according to their manner of articulation. The following are some of the most important classes of consonants where classification is made according to place of articulation.

Bi-labial: articulated by the two lips. Examples [p, m], Japanese *f*.

Labio-dental: articulated by lower lip against upper teeth. Examples [f, v].

Dental: articulated by tip of tongue against upper front teeth. Examples: the English sounds of *th*, Spanish [t̪], Hindustani [t̪].

Alveolar: articulated by tip or blade of tongue against teeth-ridge. Examples: English [t, s].

Retroflex: articulated by tip of tongue against hard palate. Example: Hindustani [ʈ].

Palato-alveolar: articulated by blade of tongue against teeth-ridge, there being in addition a certain raising of the main body of the tongue towards the palate. Examples: the English sounds of *sh, ch*.

Palatal: articulated by 'front' of tongue against hard palate. Examples: English sound of *y* in *yet*, German *ch* in *ich* (one variety), Hungarian *gy* in *Magyar*.

Velar: articulated by 'back' of tongue against soft palate. Examples: [k], [g] as in *get*, *ng* as in *sing*, German *ch* in *Buch*.

Uvular: articulated by back of tongue against extremity of soft palate, with or without vibration of the uvula. Examples: Parisian [R], Arabic [q].

Pharyngeal: made by contraction of the pharynx. Example: Arabic [ħ].

Glottal: made by the vocal cords. Example: the glottal stop (the sound which replaces [t] in dialectal pronunciation of *little*).

The formation of dental, alveolar, retroflex, palato-alveolar, palatal, velar, and uvular consonants are illustrated in figs. 2-8.

Other types of consonant exist which are made in positions intermediate between those mentioned above. Thus the Spanish sound of *s* is not the same as the English but is intermediate between

this and the dental [θ¹]. The [s] in Sinhalese is somewhat similar. There exist also varieties of alveolar consonants made with the blade of the tongue against the teeth-ridge, the tongue-tip being kept down near the lower teeth. Most

French people use a [s] of this type; some English people (apparently about 25 per cent.) do the same. In Polish, sounds exist which may be described as alveolo-palatals; they have simultaneous palatal and alveolar articulation, the palatal element

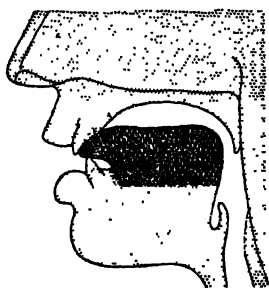


Fig. 2.—Formation of a Dental Consonant (dental [t]).

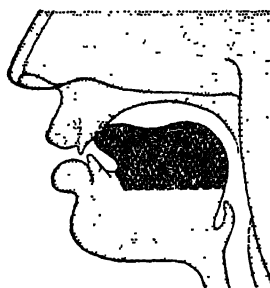


Fig. 3.—Formation of an Alveolar Consonant (alveolar [t]).

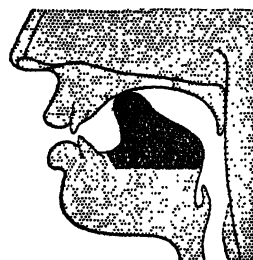


Fig. 4.—Formation of a Retroflex Consonant [ʈ].

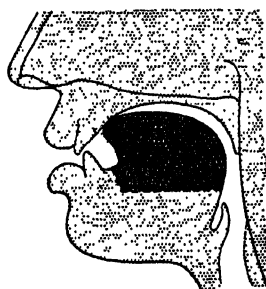


Fig. 5.—Formation of a Palato-alveolar Consonant (English *ch* [tʃ]).

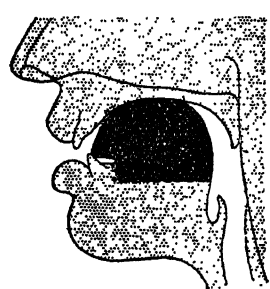


Fig. 6.—Formation of a Palatal Consonant (Hungarian *gy* [j]).

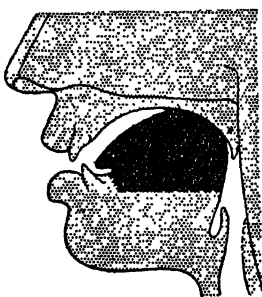


Fig. 7.—Formation of a Velar Consonant [k].

preponderating; they are written *ś, ź, ċ*, in Polish orthography. (The Pekingese sound commonly written *hs* is similar to the Polish sound of *ś*.) Other important sub-classes of consonants are 'palatalised,' 'velarised,' and 'pharyngalised' consonants. A palatalised consonant is one which has

its primary articulation further forward than the palatal position, but which has as a secondary articulation a raising of the front of the tongue towards the hard palate; the effect is to make the consonant reminiscent of the vowel [i]. Thus there exist labial palatalised consonants, labio-dental palatalised, dental palatalised, and alveolar palatalised

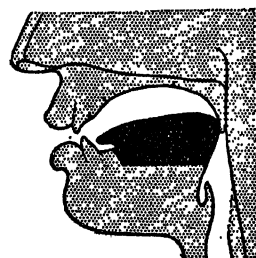


Fig. 8.—Formation of a Uvular Consonant (Arabic [q]).

consonants. Such consonants occur in Russian. A velarised consonant is one which has its primary articulation further forward than the palatal position, but which has as a secondary articulation a raising of the back of the tongue towards the soft palate; the effect is to make the consonant reminiscent of [u]. The [l] of *people* as pronounced in the South of England is an alveolar velarised consonant. Pharyngalised consonants have a constriction of the pharynx in addition to the primary articulation. The Arabic so-called 'emphatic' *t, d, z*, etc., are really pharyngalised *t, d, z*, etc.

¹ The English sound of *th* in *thin*.

The sounds last mentioned may be said to have double articulation. Many other consonants can be made with double articulation. Notable among them are plosive consonants with simultaneous or almost simultaneous glottal stop (phonetically, *p' t', &c.*), which occur in Zulu and numerous other languages of Africa, and the sounds known as 'clicks.'

The following are some of the most important classes of consonants when classification is made according to manner of articulation:

Plosive: air-passage completely closed for an appreciable time, then opened; the sudden escape of air produces a plosion (see below). Examples: [p, d].

Affricate: a kind of plosive in which the closure is released more slowly than in a normal plosive; the result is that the ear perceives the corresponding fricative while the articulating organs are being separated. Examples: the English sounds of *ch* in *church*, *j* in *jug*, the German sound of *z* (as in *zehn*), the Italian sounds of *z* (as in *zio, mezzo*).

Nasal: mouth passage closed, but soft palate lowered so that air escapes through the nose (as shown in fig. 9). Examples: the sounds of *m, n, ng* (as in *sing*).

Lateral: air passage obstructed in the centre of the mouth, but air issues on one or both sides of the obstruction. Example [l].

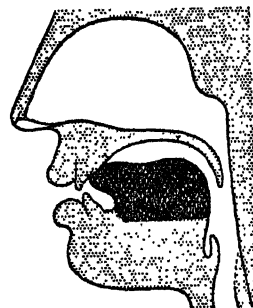


Fig. 9.—Formation of a Nasal Consonant (alveolar [n]). Compare alveolar [t] (Fig. 3).

Rolled (also called *trilled*): when a part of the organs of speech is so held that the air current causes it to vibrate rapidly. Example: rolled [r], as in some varieties of English, and in Italian; Spanish initial *r* (as in *rei*) and *rr* as in *perro*.

Flapped: formed as rolled consonants, but consisting of one single tap. Examples: Spanish single [r] as in *pero*, Hindustani *r*, Hindustani *r*.

Fricative: air passage narrowed so that when the air-current passes, a frictional sound is heard. Examples: [f, z, ʃ].

Semi-vowel: a gliding sound formed by putting the organs of speech in position for a vowel and immediately proceeding to another vowel-position without remaining any appreciable time in the first vowel position. Examples: *y* (as in *you*), *w* (as in *well*).

It will be observed that plosive consonants consist of two parts, viz. the part where there is complete closure during an appreciable time, and the part known as the *plosion*, which may be regarded for all practical purposes as instantaneous.

The first part is known as the *stop*. When the *stop* of a plosive consonant is very short, it is sometimes difficult to distinguish the sound from a flapped consonant. It is possible to make a stop without plosion, but it is not possible to make a plosion without a preceding stop. Stops without perceptible plosion are a characteristic feature of languages of the Chinese type. They also occur in other languages in groups of consonants; thus the [k] of the English word *act* is generally pronounced without plosion.

The Classification of Vowels.—It is convenient to use as the basis for the primary classification of vowels the position taken up by the tongue in forming them. The approximate limit of height of the tongue for the production of a vowel is shown approximately by the dotted line in fig. 10. If the tongue were nearer to the palate a fricative consonant would be produced. If the tongue is at or near this limit the vowel is called *close*; such

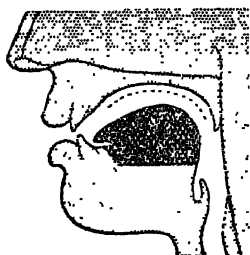


Fig. 10.—Formation of Vowels. Tongue must be below the dotted line.

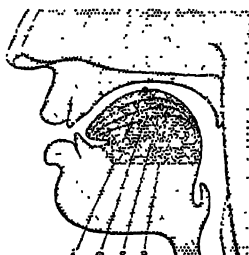


Fig. 11.—Tongue-positions of Front Vowels.

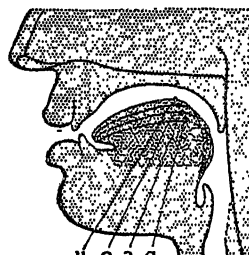


Fig. 12.—Tongue-positions of Back Vowels.

are the English sounds of *ee* as in *see* and *oo* as in *moon*. If, on the other hand, the tongue is kept as low as possible in the mouth the vowel is called *open*; such is the sound of *a* in *father*. It is convenient to distinguish two intermediate degrees, *half-close* and *half-open* (see figs. 11 and 12).

Vowels are also classified as *front* and *back* according as the raising of the tongue is in front (as shown in fig. 11) or at the back (as shown in

fig. 12). Examples of front vowels are the English vowels in *feet*, *get*, *cat*; examples of back vowels are the English sound of *au*, the German vowels in *gut*, *wohl*. Vowels also differ from one another in lip-position as well as in tongue-position; with any given tongue-position the lips may be *spread*, *neutral*, *open-rounded* or *close-rounded* (figs. 13, 14, 15, 16) or in positions intermediate between these.



Fig. 13.
Spread Lip-position.



Fig. 14.
Neutral Lip-position.



Fig. 15.
Open Lip-rounding.



Fig. 16.
Close Lip-rounding.

The Cardinal Vowels.—One of the objects of phonetics is to describe foreign vowels in such a way that people who have never heard them may form a good idea of what they sound like. To this end certain vowels have been selected, by reference to which any vowel may be described. These are eight in number² and are represented in phonetic transcription by the letters [i, e, ε, a, ɔ, o, u]. They have approximately the tongue-positions shown in figs. 11 and 12. [i, e, ε, a, ɔ] have spread to neutral lips, [ɔ] has open lip-rounding, [o] and [u] have close lip-rounding.

It will be seen from figs. 11 and 12 that the

¹ The English sound of *sh*.

² We describe here the system most generally adopted at the present time. Other systems have been devised, the most important of which is the Bell-Sweet system, which takes nine cardinal vowel-positions as its basis.

tongue-positions of vowels may be conveniently shown by marking the highest point of the tongue on a diagram of the shape shown in fig. 17. The circumference of this figure represents approximately the limits of possible tongue-positions in every direction, so that the tongue-position of any vowel will be marked either on the circumference or in the interior of the figure. The tongue-positions of the cardinal vowels are indicated by dots on the circumference of the figure, as shown in fig. 18. The relations of other vowels to the cardinal vowels can be indicated by placing dots at the appropriate places on this diagram. Thus the tongue-position of a half-close vowel intermediate between front and back would be indicated by the dot lettered *e* in fig. 18, and so on. Vowels whose tongue-positions are intermediate between 'front' and 'back'

and which are not 'open' are called *central* vowels. Such are the English sounds of *a* in *about* and the Russian sound of *Ы*. It is convenient to regard the 'central vowel' area as triangular in shape, as shown in fig. 18.

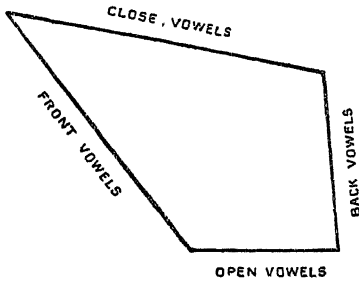


Fig. 17.—Diagram representing the limits of Tongue-positions for Vowels.

The cardinal vowels can only be learnt from a teacher who knows them, or failing that, with the aid of a gramophone record.¹ They cannot be learnt from written descriptions or by reference to the sounds of any language (owing to variations

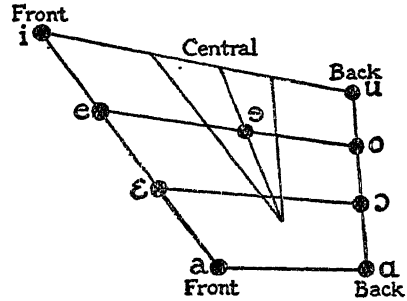


Fig. 18.—Representation of Vowel Tongue-positions by Dots on this diagram.

in the pronunciation of different speakers). It is the vowels occurring in languages which have to be described by reference to the fixed cardinal scale.

A scale of eight secondary cardinal vowels is derived from the primary cardinal vowels by altering the lip-rounding, viz. by adding lip-rounding to Nos. 1 to 5, and by unrounding Nos. 6, 7, and 8.

Students of languages who have mastered the cardinal vowels, and have acquired good control over the movements of the lips, will find the acquisition of foreign vowels relatively easy if they are provided with vowel diagrams of the type shown in fig. 19. For instance the numerous foreigners who have difficulty in distinguishing between the vowels in *man* and *men*, *cat* and *get*, &c., are greatly helped if they know that the vowel in *man*, *cat*, is about half-way between cardinal vowels 3 and 4, and that the vowel in *men*, *get*, is half-way between cardinal vowels 2 and 3.

Further information regarding the cardinal vowel system and its application may be found in *The Pronunciation of Russian* by Trofimov and Jones, chap. vi.

Phonemes.—It is important to distinguish between phones and certain families of phones existing in any given language and known as 'phonemes.' The nature of this grouping of the phones of a language is best shown by illustrations. It will be observed, for instance, that the k-sounds in *keep* and *cottage* are not identical, the [k] in *keep* being formed in a more forward position than that in *cottage*. Similarly the varieties of [k] used before other vowels are not all the same. Nevertheless, as the particular kind of [k] used in any particular case in English is determined by the nature of the adjoining vowel, it is convenient to regard this whole family of k's as a single entity and call it the English k-phoneme. Again, in French when

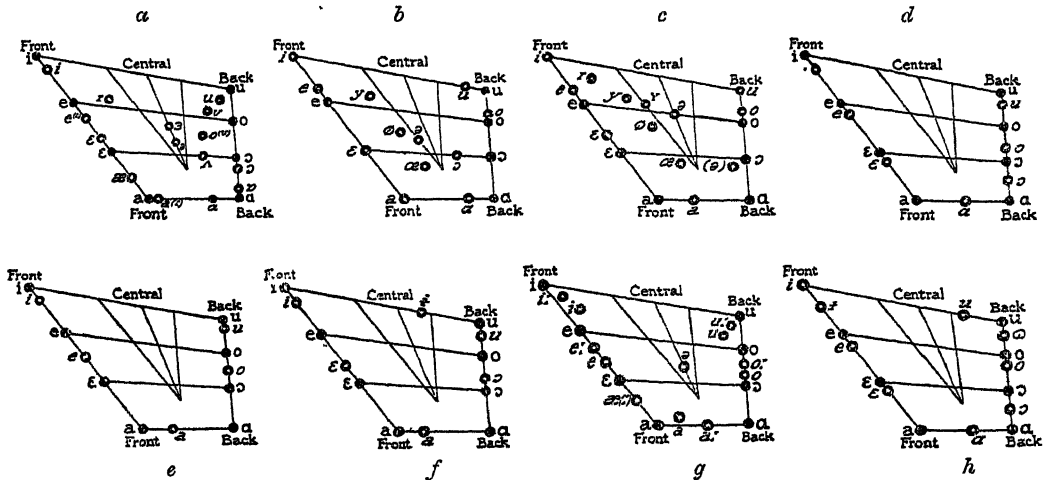


Fig. 19.—Representation of Tongue-positions of the Vowels of various Languages.

a, English; b, French (excluding the nasal vowels); c, German; d, Italian; e, Spanish (principal members of the Phonemes); f, Russian (principal members of the Phonemes); g, Sinhalese; h, Sechuana.

words like *people*, *oncle* occur finally, the sound of the *l* is voiceless [l̥]; but as this sound only occurs in this position and the ordinary [l] only occurs in other positions, the two sounds do not strike French people as being essentially different; they may be considered as members of the same phoneme in

French. This does not mean that they are necessarily members of the same phoneme in other languages; the Welsh sound of *ll*, for instance, is a variety of voiceless [l̥], but it does not belong to

¹ Record No. B 804, published by His Master's Voice Co., 363 Oxford Street, London, W.1.

the same phoneme as [l] in *Welsh*, because its occurrence is not dependent upon its situation in the word or sentence. Again, the Arabic [a] in *la* (no) is to an English ear quite different from those in *Allah*; to an Egyptian, however, the two sounds may be treated for grammatical and other practical purposes as a single entity; they are members of one phoneme, because the exact value of the [a] in every case depends on the nature of the surrounding consonants (for the rules see Gaidner's *Phonetics of Arabic*, published by the Clarendon Press, Oxford). It is *phonemes* which distinguish one word from another in spoken language; two *sounds* which are members of the same phoneme in a given language cannot distinguish one word from another in that language.

Theory of Phonetic Transcription.—Languages may be transcribed phonetically with any desired degree of exactitude. The simplest kind of transcription for a given language is one which provides one letter for each *phoneme* of that language. Such a system is called a 'broad' transcription; it is unambiguous, that is to say it distinguishes in writing all words which are distinguished in speech, and it indicates the correct pronunciation to all foreign readers who are familiar with the rules governing the use of the subsidiary members of the phonemes.

For some purposes, however—and especially in language teaching—it is useful to adopt a more detailed form of transcription. Such transcriptions are called 'narrow' transcriptions, and they provide not merely symbols for each phoneme of the language but also symbols for subsidiary members of

some of the phonemes. Thus in Gaidner's *Arabic Phonetics* a narrow transcription has been adopted in connexion with the a-phoneme, by introducing special symbols for two subsidiary members.

Systems of Phonetic Transcription.—There are three main types of phonetic transcription in existence: (1) alphabets of entirely new letters (such as the Bell-Sweet Organic Alphabet); (2) alphabets based on the Roman character supplemented by Roman letters with diacritical marks to denote sounds which cannot be represented by Roman letters (e.g. the Lepsius alphabet); (3) alphabets based on the Roman character with additional letters to denote sounds which cannot be represented by Roman letters (e.g. the alphabet of the International Phonetic Association). The third type of alphabet is the most satisfactory, in the opinion of the present writer. In such an alphabet it is not possible to dispense entirely with diacritical marks, but they are reserved as far as possible for representing length, stress, and pitch, and for the subsidiary members of phonemes. The essential feature of this type of alphabet is that every phoneme of a language should, as far as possible, have a letter of distinct design to represent it.

The following Table shows the International Phonetic signs for the speech sounds of the more important languages:

BIBLIOGRAPHY.—*General Phonetics*: Arnfield, *General Phonetics*; Sweet, *Primer of Phonetics*; Ripman, *Elements of Phonetics*; Jespersen, *Lehrbuch der Phonetik*; Jespersen, *Phonetische Grundfragen*; Roudet, *Éléments de Phonétique Générale*; Vietor, *Elemente der Phonetik*.

	Bilabial	Labio-Dental	Dental and Alveolar	Retroflex	Palato-Alveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
CONSONANTS	Plosive	p b	t d	ʈ ɖ		c ɟ	k g	q ɢ		ʔ
	Nasal	m	n	ɳ		ɲ	ŋ	ɴ		
	Lateral		ɬ ɮ	ɭ		ʎ	(ʝ)			
	Rolléd		r ʀ					ʁ		
	Flapped		ɾ	ɽ				ʀ		
	Fricative	f v	θ ð s z ʃ ʒ	ʂ ʐ	ç ʝ		(h) x ɣ	χ ʁ	ħ ʕ	h ɦ
	Semi-vowel	w ɥ			j ɟ		(w)			
VOWELS	Close	(u ɥ)				Front Central Back i y ɨ ɥ ɯ ʉ				
	Half-close	(o ɤ)				e ø ɘ ɵ				
	Half-open	(ɔ ɶ)				ɛ œ ɜ ɞ				
	Open					æ ɶ a ɑ				

Sounds appearing twice on the chart have a double articulation, the secondary articulation being shown by the symbol in brackets.)

Phonetics of English: Jones, *Outline of English Phonetics*; Jones, *Pronunciation of English*; Sweet, *Primer of Spoken English*; Ripman, *Sounds of Spoken English with Specimens*; Jones, *English Pronouncing Dictionary*.

Phonetics of French and German: Passy, *Sounds of the French Language*; Nicholson, *French Phonetics*; Michaelis-Passy, *Dictionnaire Phonétique Français*; Vietor, *Die Aussprache des Schriftdeutschen*; Vietor, *German Pronunciation*; Vietor, *Deutsches Aussprache-wörterbuch*.

Phonetics of other Languages: Trofimov and Jones, *Pronunciation of Russian*; Calzia, *Italiano*; Viana, *Português*; Dijkstra, *Holländisch*; Gaidner, *Phonetics of Arabic*; Meinhof, *Lehrbuch der Bantusprachen*, and other works; many volumes of the Hamburg University and Kolonialinstitut series of books on African languages. (See also *Phonetic Readers*.)

Intonation: Klinghardt, *Französische Intonations-übungen* (also English edition); Klinghardt, *Übungen im Englischen Tonfall*; Palmer, *English Intonation*; Armstrong and Ward, *Handbook of English Intonation*; Barker, *Handbook of German Intonation*.

Phonetic Readers. It is only possible here to mention a few of the numerous phonetic readers; special attention may be called to the series published by the University of London Press (English, French, German, Italian, Welsh, Polish, Czech, Cantonese, Panjabi, Bengali, Burmese, Sechuana); many of these volumes contain outlines of the phonetic theory of the language dealt with. Other useful readers are: Passy, *Lectures Phonétiques Françaises*; Vietor, *Lehrbuch in Lautschrift*; Meyer, *Deutsche Gespräche*; Peers, *Spanish Phonetic Reader*; Gaidner, *Egyptian Colloquial Arabic*; Jones and Perera, *Colloquial Sinhalese Reader*.

Phonograph, an instrument for mechanically recording and reproducing articulate human speech, song, instrumental music, or other sound of which a record may be desired. The phonograph was invented by Mr T. A. Edison (q.v.) in the summer of 1877, at his Menlo Park Laboratory, New Jersey, the idea being evolved while studying certain phenomena in one of the many lines of experiment upon which he was engaged. Prior to 1877 Mr Edison had developed a successful system of automatic telegraphy; and in the summer of that year he was experimenting on an automatic method of recording telegraph messages on a disk of paper laid on a revolving platen, similar to the modern disk talking-machine. The platen had a spiral groove on its surface, like the disk. Over this was placed a circular disk of paper. An electromagnet with an embossing point connected to an arm travelled over the disk; and any signals (dots and dashes) given through the magnets were embossed on the disk of paper. Upon removing this disk and placing it on a similar machine provided with a contact lever, the latter was actuated by the embossed record so as to control the circuits and repeat the signals into another telegraph line. Mr Edison observed that if the disk was moved very rapidly the vibration of the lever resulted in the production of an audible note. From his experiments on the telephone he knew of the power of a diaphragm to take up sound vibrations, and indeed had made a toy with which this power was illustrated in a practical manner. In this toy a diaphragm was placed at the small end of a funnel, and to the diaphragm was connected a pawl, which engaging in a ratchet-wheel served to give continuous rotation to a pulley. The pulley was connected by a cord to a little paper toy representing a man sawing wood. If one recited loudly into the funnel, the vibrations of the diaphragm caused the pawl to operate the ratchet-wheel and rotate the pulley, when the paper man would start sawing wood. With all these facts before him Mr Edison reasoned that if he could *record* the movements of the diaphragm properly, he could cause such a record to reproduce the original movements imparted to the diaphragm by the voice, and could thus succeed in recording and reproducing the human voice. He therefore designed a machine for this purpose. Instead of using a disk at this time, his design provided for the employment of a cylinder with grooves around its surface. Around the periphery of the cylinder was to be placed a sheet of tinfoil, in which the movements of the diaphragm could be easily impressed by means of a tiny-pointed stylus attached to it. Mr Edison made a sketch of the machine, and gave it to one of his best workmen to be made up. Some of his men thought that the idea of recording and reproducing speech was absurd, and bets were made that the machine would not work. Mr Edison himself expected only that he might hear a word or so that would give hope for the future. When the machine was finished the tinfoil was put on, and he shouted into it, 'Mary had a little lamb,' &c., and upon adjusting the reproducer the machine reproduced it perfectly. This original model was loaned to the South Kensington Museum, London. In 1878 Mr Edison made a number of phonographs, which were exhibited in America and Europe, and attracted universal attention. The records in these machines were made of soft tinfoil sheets fastened around metal cylinders. In the autumn of 1878 Mr Edison commenced his investigations of the electric light problem, and was occupied for nearly ten years afterwards in completing and introducing his system. About 1887, however, he reverted to the phonograph, and worked it out to the practical commercial form in which it exists to-day. There was no change whatever in

the fundamental principles, but the mechanism was changed, and instead of employing tinfoil, a cylinder or disk of wax is used, the record being *cut* thereon by a sapphire cutting-tool attached to a diaphragm, while the reproduction is effected by means of a blunt diamond stylus similarly attached. The cutting-tool and stylus are minute devices, and they have to be cut, formed, and polished to an exact nicety by means of diamond dust, most of the work being performed under high-powered microscopes. The wavelike record cut into the wax by the cutting-tool being only about as deep as one-third the thickness of tissue-paper, some difficulty was experienced in keeping the reproducing stylus in perfect engagement with these minute waves. Mr Edison therefore introduced a 'floating weight,' which presses the stylus to its work; but because of its mass, it cannot respond to the extremely rapid vibrations of the stylus; they are therefore communicated to the diaphragm. Some of Edison's most ingenious inventions relate to the duplication of phonographic records. It is quite obvious that original records of celebrated musicians, singers, speakers, &c. could not be sold to the public, as in some instances a single record might cost hundreds of dollars. Hence means must be provided for making exact replicas in unlimited quantity. This has been the subject of much work and experiment. The methods now employed consist generally in putting the original wax cylinder or disk master record into a plating-bath, where it is electroplated with a heavy coat of copper; after which the record is withdrawn, leaving an exact metallic negative of the original, from which any number of positive replicas can be made through a method employed by Mr Edison, involving the use of a hard material which is softened by heat and pressed into or upon the metallic negative. After the impression is made, the mould and contents are cooled and the duplicate record is drawn out.

The most extensive employment of the phonograph has been for amusement purposes. Its use for commercial correspondence has advanced to a very great extent, and its usefulness and economy as an office adjunct have been thoroughly demonstrated. For dictation purposes, blank wax cylinders are furnished, capable of receiving about 1500 words. After the dictation has been transcribed by the amanuensis, the record may be shaved off, leaving a new and smooth surface for fresh dictation. The cylinder may be used several hundred times.

Phonography. See SHORTHAND.

Phonolite. See CLINKSTONE.

Phormium. See FLAX (NEW ZEALAND).

Phoronis, a marine worm-like animal, living socially, each worm enclosed in a membranous or leathery tube. The Phoronidea, species of which are found off the New England coasts and in European and Australian waters, are by some associated with the Polyzoa (q.v.), but by some made a separate group.

Phosgene, a colourless suffocating gas, derived from carbonic oxide and chlorine exposed to the action of sunlight; it is also called carbonyl chloride and oxychloride of carbon (COCl_2).

Phosphates. See PHOSPHORUS, MANURE; also BONE, BONE-ASH, BONE MANURES.

Phosphatic Diathesis, in Medicine, designates the condition in which there is a tendency in the Urine (q.v.) to deposit white gravel.

Phosphorescence. Strictly speaking, the term is applied to the phenomenon, exhibited by certain bodies, of remaining luminous in the dark for some time after being exposed to a strong light. Certain preparations, such as calcium sulphide (see LUMINOUS PAINT), indurated limestone, &c.,

possess this property in a very high degree. With the great majority of phosphorescent bodies, however, the duration of the phenomenon is very short, rarely more than a small fraction of a second. Becquerel, who studied this phenomenon with great care, invented a very ingenious instrument for the purpose, called a *phosphoroscope*. The body to be tested is placed in a small drum, which has an opening at each end. In this drum there revolve two discs, mounted on the same axle, and pierced symmetrically with the same number of holes. They are so adjusted that when a hole in one disc is opposite to the hole in the corresponding end of the drum the second disc closes the hole at its end of the drum, and *vice versa*. Light is admitted by one of the holes in the drum so as to fall on the object, and it is examined through the other hole. It is obvious that, when the discs are made to revolve, the object is alternately exposed to light and presented to the eye. By a train of multiplying wheels, these alternations may be made to succeed each other as rapidly as the observer pleases, and thus the object is presented in the dark to his eye as soon after its exposure to light as may be desired. Almost all bodies are found to be phosphorescent; for instance, some kinds of pink rubies when exposed to sunshine in this apparatus appear to glow like live coals in the dark. When phosphorescence is continuous, bodies receiving light and giving off radiation of a lower refrangibility, we have the phenomenon observed by Brewster and Herschel in quinine and certain crystals of fluor-spar, and thence called *Fluorescence*. The green colouring matter of leaves, a decoction of the bark of the horse-chestnut, and the common canary glass (coloured with oxide of uranium) are bodies which exhibit this phenomenon very well. Perhaps the most striking method of studying the phenomenon is to receive in a darkened room the solar Spectrum (q.v.) on a sheet of white paper, and to pass over the coloured spaces a brush dipped in a solution of sulphate of quinine with sulphuric acid. No change is produced on the less refrangible rays, but in the blue and indigo spaces a strange change of colour is at once apparent where the liquid has been spread. This appears more strongly in the violet, and vividly in the spaces beyond the violet, where rays fall which excite no luminous sensation in the eye. By this experiment the visible length of the spectrum may easily be doubled. By using the electric light, which is peculiarly rich in these highly-refrangible rays, a prism of quartz, which allows them to pass very freely, and various fluorescent substances, Stokes has obtained spectra six or eight times as long as those otherwise visible. The characteristic of all these rays is that they are *less* refrangible than those from which they are produced. The entire phenomenon is, as Stokes first showed, identical in principle with Leslie's photometer, in which light was measured when changed into heat by absorption in the coloured glass, of which one of the bulbs of his differential thermometer was formed. Ordinary phosphorus (from which the phenomenon took its name) becomes luminous in the dark by slight friction; whence the common trick of drawing self-luminous figures on doors and walls with a stick of phosphorus, or an ordinary lucifer match wetted.

PHOSPHORESCENCE IN ORGANIC BEINGS.—The emission of light by minerals after insulation and the cognate phenomena of luminosity on heating, friction, cleavage, crystallisation, &c., are of quite different nature from the production of light by organisms, to which we now turn.

Luminosity due to Putrefaction or to Disease.—That many organic substances (especially fish) become luminous when decaying has long been known, and the explanation of this luminosity of

decay is now certain. It is due to several kinds of luminescent bacteria, such as may be seen, by their light, on herring and haddock hung up to dry.

Luminosity of Healthy Living Organisms.—(1) In the vegetable kingdom the instances of luminescence are few, and the majority of these are among algae and fungi. Most of the luminous fungi are Hymenomycetes (*Agaricus*, spp.): in some cases the mycelium (root-like threads) gives out the light; in others, as in *A. olearius*, not uncommon at the roots of olive-trees, it is the under surface of the mushroom-like head. The light is only seen while growth is progressing; it ceases so soon as the fungus is mature. Some grasses, a Euphorbia (*E. phosphorea*), a lily (*Lilium bulbiferum*), a poppy (*Papaver orientale*), and a nasturtium (*Tropaeolum majus*) have all been recorded as luminous. The last instance is worthy of note as having been observed by the daughter of Linnaeus in 1762. It is probable, however, that there is no intrinsic luminescence in any flowering plants. The appearance may be due to luminescent bacteria or moulds. In the so-called 'luminous moss' (*Schistostega osmundacea*), which lives in caves, lens-like cells in the threadwork (or protonema) focus the scanty rays of light and then reflect them. But this is just like the cat's or sheep's eyes shining in the dark. There is no light-production in these cases.

(2) In the animal world most of the larger groups, up to and including the fishes, afford examples of luminescence. Among the Protozoa the pinhead-like *Noctiluca miliaris* is the chief cause of the 'phosphorescence' of the sea. On the high seas *Noctiluca* seems to be replaced by species of *Pyrocystis*, one of the discoveries of the *Challenger* expedition. Among the Porifera (sponges) the only recorded luminous form is the larva of a species of *Reniera*. In contrast to the dullness of sponges is the abundant luminosity of the Coelentera. The common hydroid colony *Obelia geniculata* shines in the dark on the fronds of the sea-tangle. Numerous Medusæ (jelly-fishes) are luminous, and the light is variously emitted in different species. Sometimes the same genus includes both luminous and non-luminous forms. Most Pennatulids (sea-pens) shine brightly; such are the long, reed-like *Funiculina* found in Loch Torridon (Ross-shire) and on other parts of the Scottish coast, and Pennatula, the subject of classic researches by Panceri. Alcyonarians, Siphonophores, and Ctenophores also furnish contributions to the list; amongst the last the small ovoid *Beroë* was shown by Allman not to give out its light until it had remained for some time in the dark.

A few species of Ophiuroids (brittle-stars) and the deep-sea asteroid *Odinia* are instances of luminosity among the Echinoderms, but the worms furnish a larger array. More than one case has been noticed among earthworms; thus in *Photodrilus*, studied by Professor Giard, the luminous material is due to a series of glands opening into the oesophagus. In these forms the luminosity ceases immediately after sexual congress. Among the marine Chætopods there is luminescence in many cases—in the dorsal scales (elytra) of the Polynoidæ, the tentacles, dorsal tubercles, &c., of Chætopterus, and the bunch of cephalic tentacles of *Polycirrus*.

Of phosphorescent mollusca the small pelagic *Phylliroë bucephala* is of importance, because the transparency of its tissues permits of the localisation of its luminosity, which is found to reside around the nerve ganglia, as well as in certain small rounded cells situated at the ends of the nerve twigs. The rock-boring bivalve (*Pholas*) is one of the longest known instances of animal

phosphorescence, being recorded by Pliny, who noticed that if any one chews the animal the whole interior of his mouth becomes luminous. In this form the light is emitted from five definite patches all situated within the mantle cavity.

Interesting observations upon bacteria as the cause of phosphorescence have also been made on Crustacea of the genera *Talitrus* and *Orchestia* (sand-hoppers) in a state of disease; the malady, and the consequent luminosity, can be transferred to healthy specimens by inoculation, and the germs can be reared in artificial media in the usual manner. It seems that the sand-hoppers are infected from dead fish, on which they habitually feed. Many other Crustacea, however, are luminous apart from any question of disease, as in Cypridina and Sapphirina, and still more markedly in the Schizopoda, one of which, *Nyctiphanes norvegica*, is not uncommon in the deep waters of Loch Fyne as well as on the Norwegian coast. Definite organs (photospheria) are here present for the production of light; one in the stalk of each eye, one at the root of each first, and one at the root of each penultimate, thoracic limb, and one under each of the first four segments of the abdomen. Each organ, as has been proved by microscopic sections, is in reality a miniature bull's-eye lantern, only equalled in complexity by the organs of certain fishes. Several phosphorescent Ascidians are known, the most conspicuous being the pelagic colony *Pyrosoma*, in which each individual zooid has two rounded luminous organs. The researches of the various deep-sea expeditions have revealed quite a large number of phosphorescent fishes, with specialised organs of many different types. Some of these appear to be glandular, whilst others are optical instruments of great complexity, with spheroidal and parabolic reflectors to send the light in definite directions and with lenses to concentrate it. In some of the abyssal Lophioids (angler-fish) the modified dorsal fin-ray, believed to be a lure, has a phosphorescent extremity, which may render it more attractive.

In two East Indian fishes (*Anomalops* and *Photoblepharon*) the luminous organs are very large and give out light continuously, while in other cases the luminescence follows some stimulus. Newton Harvey's investigations point to the conclusion that the light-organs of these two fishes are incubators for the growth and nourishment of luminous bacteria living in symbiosis. When animal luminescence is intrinsic and due to some ferment-like action, not to bacteria, the oxidisable material may be oxidised within the cells where it is formed, as in deep-sea fishes, or it may be secreted to the exterior and oxidised outside the cell. Of the latter a fine instance has been discovered by C. F. Hickling in a Macrurid fish, *Malacocephalus laevis*, which lives in deep water from Ireland south to Morocco. By muscular contraction it puffs out a secretion from a skin-gland between and behind the pelvic fins. This secretion is oxidised in the water and gives forth 'a cloud of light.'

There still remain for consideration the phosphorescent insects, which belong almost exclusively to the Coleoptera (beetles) in the families Lampyridæ and Elateridæ. The glow-worm (*Lampyrus spendidulus*) and the Italian firefly (*Luciola italica*) are good examples of the former. In both cases the organs, which are situated in a certain number of the posterior segments of the abdomen, consist of two layers, of which the dorsal contains large quantities of uric acid salts, and the ventral clear cells, which are arranged in cylindrical lobules. In some species both sexes are luminous, in others only one. In the Mexican firefly or Cucuyo (*Pyrophorus noctiluca*), which belongs to the Elateridæ or click-beetles, the organs are three in number,

one in each upper and hinder angle of the prothorax, and one much larger occupying the centre of the ventral surface of the first abdominal segment. This last is invisible while the insect is at rest, but shines forth when it spreads its wings and raises its abdomen in flight. Both the eggs and larvæ of this species are luminous. The so-called Lantern-flies (Fulgoridæ) in the order Hemiptera are not really luminous.

As regards the physical peculiarities of the light, it varies in colour in different cases, being blue in the mycelium growing in rotten wood, in *Cunina*, *Beroë*, *Pyrosoma*, and *Lampyrus*; green in a species of *Agaric*, in *Pteroeides*, in Ophiuroids, and in *Pyrophorus*; yellow in *Noctiluca*, *Bolina*, and with a reddish tinge in a species of *Cestum*; purple in *Funiculina* and others; whilst in *Pyrosoma atlanticum* and an *Appendicularia* observed by Giglioli it has been stated that the light varies in colour. The important general fact is that the animal light is all visible light, with no infra-red or ultra-violet rays, and that there is no heat associated with it.

As regards the production of the light, it may be said that just as muscle cells produce heat and the electric organs of some fishes produce electricity, so certain cells of luminous organisms produce light *in situ* or exude material that is luminescent. In the firefly, the small crustacean Cypridina, and the piddock, it seems practically certain that a protein-ferment called luciferase acts on a light-producing peptone-like substance called luciferin, and brings about a rapid oxidation resulting in oxy-luciferin and light. In some other cases, however—e.g. some fishes, fire-flames, and cuttlefishes—the evidence points to the conclusion that the light comes from groups of partner or symbiotic bacteria. Yet it has not been shown that these are luminescent when isolated.

As to the significance of animal luminescence, it may sometimes be no more than the by-play of some physiologically important chemical change. If the contraction of a muscle is associated with an electrical change, so may the life of a bacterium or a firefly's egg be associated with the production of light. It is not necessary to search for any special use. But the problem is different when there is an elaborate luminous organ or a definite arrangement of organs. In such cases there must be some use or uses. There are various possibilities. (1) The light may serve to scare, distract, or warn intruders, e.g. from a big Sea-pen. (2) The light may be a lure, attracting victims, as in the Deep-sea Anglers (e.g. *Melanocetus*), where the luminous organ dangles near the mouth. (3) The light may serve as a lantern, helping animals, e.g. abyssal squids and fishes, to find their way. But the hypothetical guide is sometimes in a very inappropriate place for food-capturing purposes. (4) The light may facilitate the recognition of kin by kin, and may serve as a sex-signal in mating. This fits in with what is known of fireflies; and it is noteworthy that the toad-fish, *Porichthys*, to take one example, is luminous only during the spawning-season. There is obviously urgent need for more facts. See FIREFLY, GLOW-WORM, and works there cited; and Kayser's *Handbuch der Spectroscopie* (iv. 1908); E. Newton Harvey, *The Nature of Animal Light* (1920); P. Buchner's *Tier und Pflanze in intrazellulärer Symbiose* (1921).

Phosphorus (sym. P; atom. no. 15; atom. wt. 31; molec. wt., vapour, $P_4=124$; at white heat, $P_2=62$) is one of the metalloids or non-metallic elements, although in its combining relations it is closely connected with the metals arsenic and antimony. This substance affords an excellent example of Allotropy (q.v.). Ordinary phosphorus and the red variety are the only impor-

tant forms. We shall speak of them as phosphorus and red phosphorus respectively.

Phosphorus at ordinary temperatures is an almost colourless or faintly yellow solid substance of sp. gr. 1.836, having the glistening appearance and the consistence of wax, and evolving a disagreeable alliaceous odour, which, however, is probably due to the action of the oxygen of the air upon it. It fuses at 44.2°C . (111.5°F .) into a colourless fluid; and, if the air be excluded, it boils at 290°C . (554°F .), and is converted into a colourless vapour of sp. gr. 4.35 (air = 1.00). If, however, it be heated to about 60°C . (140°F .) in the air it catches fire, burns with a brilliant white flame, and is converted into phosphoric anhydride; and indeed it is so inflammable that it will catch fire at ordinary temperatures by mere friction. As the burns which it occasions are often severe and dangerous, great caution is required in handling it; and in consequence of the readiness with which it catches fire, and of its tendency to oxidise when exposed to the air at a temperature higher than 0°C . (32°F .), it is always kept in water, in which it is insoluble. It is slightly soluble in ether, but dissolves freely in benzol, in the fixed and essential oils, and in bisulphide of carbon; and, on allowing its solution in a volatile solvent to fall upon filtering paper, the finely-divided phosphorus absorbs oxygen so rapidly as spontaneously to catch fire as soon as the solvent has evaporated. Phosphorus shines in the dark from the slow combustion which it undergoes; and hence its name, from the Greek words *phos*, 'light,' and *phoros*, 'bearing.' Its power of forming ozone is noticed in the article on that substance. Taken internally, phosphorus is a very powerful irritant poison; and it is the active ingredient of some of the preparations employed for the destruction of vermin. Its fumes give rise to a peculiar form of necrosis of the jaw and to fatty degeneration of the kidney, which used to be common amongst the makers of lucifer matches.

Red phosphorus is prepared from the ordinary variety by heating the latter in a closed iron vessel to a temperature of 240°C . (464°F .). It was discovered by Schröter in 1845, and is a compact solid substance of a dark red colour, and with a metallic lustre. It differs much in its properties from common phosphorus, being devoid of odour, does not shine in the dark, undergoes no change when exposed to the air even for years, and cannot be set on fire by moderate friction or percussion. Moreover, it is insoluble in all the solvents of common phosphorus, and is not poisonous. It bears heating to nearly 260°C . (500°F .) without taking fire, and has a specific gravity of 2.16. By using red instead of white phosphorus for lucifer matches there is no risk to the health of the operatives. Safety matches contain chlorate of potash and ignite on a surface containing a mixture of red phosphorus and sulphide of antimony (see MATCHES).

Phosphorus is not met with in nature in an uncombined state; but it occurs in rocks of various kinds and ages, and in some countries abundantly as apatite or phosphorite, both of which are composed of phosphate of lime. It is also found in the form of Coprolites (q.v.), or the dung of extinct animals, and more rarely as wavellite (phosphate of alumina) and vivianite (phosphate of iron). In many volcanic rocks apatite is found in minute crystals or particles, and by the decomposition of these rocks it passes into the soil. From the soil it is extracted by plants, which accumulate it (especially in the seeds of the cereals) in quantity sufficient for the wants of the animals which they supply with food. In the animal system phosphate of lime forms 57 per cent. of the bones; phosphates of the alkalis, especially of soda, occur freely in

the animal fluids; and in fibrine, albumen, and nervous matter phosphorus is universally present, although we do not clearly know in what form of combination it occurs.

Phosphorus was originally discovered in 1669 by Brandt, a Hamburg chemist, who obtained it from urine. Gahn and Scheele were, however, the first to discover its presence in bone, and to employ that material for its preparation. The following was the method employed for obtaining it on the large scale. Bones were burned to whiteness, and powdered; and this bone-ash then mixed with sulphuric acid in such quantity as to decompose the phosphate of lime occurring in the ash, $\text{Ca}_3(\text{PO}_4)_2$, partly into insoluble sulphate of lime, partly into a soluble superphosphate of lime, whose composition is represented by the formula $\text{H}_2\text{Ca}(\text{PO}_4)_2$. The solution of the superphosphate was evaporated to a syrup, mixed with charcoal, and submitted to distillation in an earthen retort exposed to a red heat. Phosphorus rose in vapour, and was conveyed by means of a bent tube into water, in which it condensed in yellow drops. It is now prepared by heating in an electric furnace a mixture of calcium phosphate, sand, and coke. After being pressed in a fused state through wash-leather, and further purified, it is forced into tubes, in which it is allowed to solidify, giving it the usual form of sticks. Sombrierite (see APATITE) is largely used in the manufacture of phosphorus.

Phosphorus forms two known oxides—phosphorous anhydride, P_2O_3 , obtained by the slow oxidation of phosphorus in dry air; phosphoric anhydride, P_2O_5 , obtained by the combustion of phosphorus in an excess of dry air or oxygen. The latter is a snow-like substance which has a great avidity for water, and is therefore very useful in the laboratory as a desiccating agent.

Phosphorus forms five acids—hypophosphorous acid, $\text{H}_2\text{P}_2\text{O}_3$, monobasic (the anhydride, P_2O_3 , is not known); phosphorous acid, $\text{H}_2\text{P}_2\text{O}_4$ ($= \text{P}_2\text{O}_3 + 3\text{H}_2\text{O}$), dibasic, obtained by slow oxidation of phosphorus in moist air or by passing chlorine gas through phosphorus under hot water; metaphosphoric acid, HPO_3 ($= \text{P}_2\text{O}_5 + \text{H}_2\text{O}$), monobasic, obtained by dissolving P_2O_5 in water or by heating ordinary phosphoric acid to redness; pyrophosphoric acid, $\text{H}_4\text{P}_2\text{O}_7$ ($= \text{P}_2\text{O}_5 + 2\text{H}_2\text{O}$), tetrabasic, obtained by acting upon lead pyrophosphate with sulphuretted hydrogen, the lead salt being prepared from soda pyrophosphate, which is obtained by heating such a phosphate as Na_2HPO_4 , of which two molecules give off one of water and form $\text{Na}_4\text{P}_2\text{O}_7$; phosphoric or orthophosphoric acid, H_3PO_4 , tribasic, prepared by boiling P_2O_5 in water, or from bone-ash and sulphuric acid; the last-named acid has three sets of salts, the hydrogen in the acid being more or less completely replaced—e.g. NaH_2PO_4 , Na_2HPO_4 , and Na_3PO_4 , which are obtained by more or less completely neutralising phosphoric acid with soda.

The discovery of phosphoric acid was made in 1740 by Marggraf; the discovery of its true chemical nature is, however, due to Lavoisier, and that of its various modifications and its polybasicity to the investigations of Graham. The salts of phosphoric acid are phosphates; and they are of great value, when in a soluble form or when they can become soluble through weathering, as manures (see MANURE). Of late years mineral phosphates have been largely worked up; and a new source of phosphatic manure has become available in the alkaline slag of the Thomas-Gilchrist process, whereby the phosphorus is removed from iron by means of lime.

Phosphorus combines with hydrogen in three proportions to form phosphuretted hydrogen gas,

PH_3 ; liquid phosphide of hydrogen, P_2H_4 ; and solid phosphide of hydrogen, P_4H_2 . Of these the first alone requires notice in these pages. There are various processes for obtaining the gas, one of the simplest being by boiling fragments of phosphorus in a concentrated solution of hydrated potash, in which case hypophosphite of potash is formed, while phosphuretted hydrogen gas is extricated. The reaction is explained by the equation $4\text{P} + 3\text{KHO} + 3\text{H}_2\text{O} = 3\text{KPO}_3\text{H}_2 + \text{PH}_3$. The gas thus evolved is colourless, possesses a characteristic fœtid odour, and has the remarkable property of taking fire spontaneously in atmospheric air or in oxygen gas, with the production of anhydrous metaphosphoric acid and water. There is reason to believe that *perfectly pure* phosphuretted hydrogen gas does not possess the power of igniting spontaneously, and that the self-lighting gas always contains a minute quantity of the vapour of the liquid phosphide, P_2H_4 . The luminous phenomenon known as *Ignis Fatuus* (q.v.) has been referred to the natural evolution of the gas. The compounds of phosphorus with chlorine, iodine, bromine, &c. are not of practical importance. With sulphur it forms a sulphide used for making matches since the use of yellow phosphorus has been forbidden.

The symptoms of phosphorus poisoning are those of acute inflammation of the stomach and bowels; the treatment is the administration of large quantities of mild demulcent fluids, and of magnesia. For medicinal phosphates, see SYRUP.

Photius, Patriarch of Constantinople at a critical period, was a member of a patrician family of Constantinople, and was born in the early part of the 9th century. Distinguished by his abilities, he served in various important public offices, and secured the favour of the Emperor Michael and his powerful favourite Bardas. The patriarch Ignatius, having in vain tried to correct the vices of the profligate emperor, was deposed and banished. Photius, although a layman, was appointed in his stead, hurried in a few successive days through all the stages of sacred orders, and finally installed as patriarch. Two successive councils of bishops under court influence confirmed the deposition of Ignatius and the election of Photius. In 862, however, Pope Nicholas I. (q.v.) called a new council at Rome, which declared Photius' election uncanonical and invalid, deposed and excommunicated him, and reinstated Ignatius in his see. Being supported, however, by the emperor, Photius retained possession, and retaliated on the pope by assembling a council at Constantinople in 867, in which he raised a controversy of doctrine and discipline between the churches of the East and West themselves. In all these doctrinal differences the council condemned the Western Church, excommunicated Nicholas and his abettors, and withdrew from the communion of the see of Rome. Michael being put to death by Basilus the Macedonian in 867, Photius was banished to Cyprus, and Ignatius reinstated; and in 869 the eighth general council, at which Pope Adrian II.'s legates presided, was assembled at Constantinople. Photius was again condemned and excommunicated, and the intercommunion of the churches restored. Yet on the death of Ignatius Photius was reappointed to the patriarchate. In 879 he assembled a new council at Constantinople, renewed the charge against the Western Church, and erased from the creed in the article on the Procession of the Holy Ghost the word *filiogue* (see SPIRIT). The separation of the churches, however, was not completed till the time of Michael Cerularius (see GREEK CHURCH). Photius was finally deprived, and exiled to Armenia by Leo, the son of Basilus, in 886, and

died soon afterwards, probably in 891. His chief remains are *Myriobiblon*, called also *Bibliotheca*, a summary review of 279 works which Photius had read, many of which are now lost; a *Lexicon*; the *Nomocanon*, which is a collection of the acts and decrees of the councils and ecclesiastical laws of the emperors; several minor theological treatises; and a collection of letters, interesting and elegant. See Hergenröther's monograph on Photius (1869), and Kattenbusch in Herzog-Hauck (1904).

Photography. Observation shows that a large number of substances which are permanent in the dark become altered when exposed to light. The extent of such changes, though varying for different substances, is proportionate in any particular instance to the amount of light energy the body receives (except in certain exothermal reactions, as with a mixture of hydrogen and chlorine, for example, when the change leading to combination is only initiated by light); in other words, the affectability varies for each material—a fact of everyday experience. In some cases the change is physical; as, for instance, the alteration in phosphorus. More frequently, however, the composition of the substance is changed, and such change is termed photo-chemical. It is upon these changes that the art of photography is based, and a photograph is the pictorial representation of an object produced by the action of light. To-day all changes in bodies produced by the agency of light are in chemical literature classified as photo-chemical changes, but very many of these are not serviceable for the purposes of photography, which confines itself almost entirely for material to the compounds of silver, iron, and chromium.

The fact that native chloride of silver (*cerargyrite*), the so-called horn silver, became darkened on exposure to daylight was known to Boyle (and probably to the alchemists in earlier times), though he considered the changes to be an effect of the air. In 1727 J. H. Schulze found that a mixture produced by the addition of nitric acid containing silver to chalk darkened upon exposure to light—the earliest recorded experimental observation. J. B. Beccari of Bologna showed in 1757 that the change in appearance following the exposure of silver chloride was an effect of light, and in 1763 Dr William Lewis confirmed Schulze's experiments. In 1777 C. W. Scheele confirmed Beccari's observation upon silver chloride showing that the change was due to light action; and, further, discovered the important fact that when this body was exposed to the spectrum the darkening was not proportional to the luminosities of the different regions, but that the violet was the most active influence. These experiments of Scheele's may be said to mark the commencement of the serious study of photo-chemical change. In 1801 Ritter showed that there existed a region beyond the visible violet capable of exerting an influence on silver chloride. The first utilisation of the facts observed for the production of pictures was made by Thomas Wedgwood, who in 1802, in conjunction with Davy, communicated to the Royal Institution a paper entitled 'An Account of a Method of copying Paintings on Glass and of making Profiles by the Agency of Light upon Silver Nitrate.' This paper has often been misunderstood, for it has been thought that the pictures the author produced were themselves upon glass—a condition only reached after many years' labour. It was the original pictures used that were upon glass. Wedgwood related how white leather and white paper which had been impregnated with silver nitrate darkened when exposed to light, though undergoing no changes in the dark, and the colour, at first gray, became ultimately black. It was found not possible to fix the effect, for even prolonged washing did not appear to elimi-

nate the silver salt, so that the picture darkened eventually on exposure.

No further advance appears to have been made until 1827, when Joseph Nicéphore de Niepce (q.v.) announced the production of pictures by the action of light upon asphalt. He showed that when a film of this body (produced by coating a silver plate with a solution of the body in oil of lavender) was exposed to light the asphalt became insoluble. Similar experiments appear to have been conducted by the French scene-painter and panorama proprietor, Daguerre, who in 1829 entered into a partnership with Niepce, and the two workers conducted many investigations. Niepce died in 1833, and on 6th February 1839 Daguerre published his process, which consisted in subjecting a polished silver plate to the vapour of iodine, when it became coated with a film of silver iodide. This plate was then exposed to an image in the camera obscura, with the result that the iodide of silver became changed, but there was no visible effect. It was subsequently treated to the vapour of mercury. The mercury vapour attached itself to the exposed portions of the silver iodide, forming an amalgam. The plate was then dipped into a solution of sodium thiosulphate, with which the iodide of silver formed a soluble double salt, afterwards removed by gently washing in water. The plate on drying presented an image in white amalgam upon a silver ground. The treatment by mercury vapour (discovered by pure accident) was the first process of development of an invisible photographic image. The exposure necessary in the camera was very prolonged, varying from three minutes to thirty minutes. In 1840 Goddard published the use of bromine vapour after iodine, and in 1841 Claudet used iodine and chlorine, which greatly enhanced the sensitiveness of the plates. It was in 1840 that the first photographic picture of the moon was made. This was produced on a daguerreotype plate by Dr J. W. Draper in New York. In 1844 Daguerre himself announced an improved method involving the use of bromine and iodine. So much was the sensitiveness increased that it was found possible to obtain instantaneous pictures.

At the Royal Institution on 25th January 1839 Faraday described a process due to Fox Talbot (who made a similar communication to the Royal Society on 31st January) termed 'photogenic drawing,' in which a sheet of paper was impregnated with silver chloride and then exposed to light under an opaque or semi-transparent object (as a fern or piece of lace), when a negative copy was produced. The image was fixed by immersion of the sheet in a solution of alkaline bromide and chloride.

In 1841 Fox Talbot patented a process termed 'calotype,' which was the first practical process for making negatives. In this method a sheet of paper is impregnated with silver iodide, which is, previous to exposure in the camera, wetted with an aqueous solution of silver nitrate and gallic acid. After exposure (when generally a faint image may be seen) the sheet is treated with a stronger solution of gallic acid and silver nitrate, which acts as a developer and produces an intense image of black silver. The negative is then immersed in a solution of sodium thiosulphate, and finally washed and then dried. By this discovery practical photography as we understand it may be said to have commenced, as the process was a true negative process from which positive copies could be produced. Strictly speaking, the calotype process was not due to Fox Talbot alone, but in no small degree to the Rev. J. B. Reade, to whom belongs the credit of the development by the gallic acid.

The next advance was the albumen process of Niepce de St Victor, a nephew of Nicéphore, which was introduced on 13th June 1848. Glass was

coated with white of egg and potassium iodide, and the surface dried. After this the film thus obtained was treated with silver nitrate, and then exposed either wet or dry in the camera, and eventually developed with gallic acid. For the first time we have a vehicle employed for the silver salt—the albumen—as distinct from the support, glass.

In 1846 Schönbein announced the discovery of the method of nitrating cellulose. One form of nitrocellulose is Gun-cotton (q.v.); but a mixture of the tetra- and penta-nitrates yields pyroxyline, which is soluble to a clear liquid in a mixture of ethyl ether and ethyl alcohol, yielding Collodion (q.v.), first prepared by Maynard of Boston in 1847. Its application to photography was possibly first suggested by Le Grey, but its practical employment was due to the labours of F. Scott Archer in England, who used it for negative-making as early as 1848, though his process was first published in 1851. In the collodion process glass is coated with collodion containing a soluble iodide or an iodide and a bromide. When the solvents evaporate there is left only a jelly-like film, and at this stage the plate is immersed in a solution of silver nitrate, when insoluble silver halide (or a mixture of halides) is formed, which remains embedded in the film. The plate is exposed in the camera wet, and afterwards the invisible image is developed with an acidified solution of ferrous sulphate (although an acidified solution of pyrogallol was originally used), and the plate treated with sodium thiosulphate and washed. The use of pyrogallol as a developer was first suggested by Scott Archer. In *La Lumière* for the 23rd April 1853 Martin and Gaudin recommended potassium cyanide as a fixing agent for the plates, and this is now universally used for the purpose. From this time onward photography became increasingly used and its popularity extended, but inconvenience attached to the necessity of using the plates in a wet condition and at the time of sensitising. This induced Gaudin in France and Muirhead in England in 1854 to experiment with the object of providing satisfactory dry-collodion plates. The first practical method was published in 1855 by Dr J. M. Taupenot, which consisted in washing the collodion plates after sensitising, and then flowing over the surface a solution of albumen of eggs, and drying afterwards. The dried film was then treated with silver nitrate solution containing acetic acid, washed, and dried. The plates would, thus prepared, keep several days. After exposure the image was developed with an acidified solution of pyrogallol to which silver nitrate had been added. Many dry-plate processes 'with the bath,' as they were termed, came into regular use, one of the most successful being the 'gum gallic,' due to Manners Gordon.

In 1862 Major Russell introduced the alkaline developer (although it is doubtful whether he was the first user) for the development of images. This consisted of a solution of pyrogallol and ammonia together with a restrainer, potassium bromide. In 1864 a great advance was made by Sayce and Bolton in England, who produced a collodion emulsion containing silver salts, although the emulsification of silver salts for photographic purposes had previously been tried by others. In Sayce and Bolton's process the soluble halide (a bromide) was dissolved in collodion, and to it was added an alcoholic solution of silver nitrate, when a fine precipitate of silver halide was formed, which remained in suspension. This emulsion was applied to glass, and the film so produced was then washed (to free it from the soluble products of decomposition) and exposed in the camera or exposed after previous drying. The image was subsequently developed by the alkaline developer.

This process, not entirely encouraging at first, became eventually of importance, and was the forerunner of the gelatine emulsion process. When Russell introduced the alkaline developer a dilute solution was recommended; but in 1873 Colonel Stuart Wortley advised a more concentrated solution—a very important step, inasmuch as it permitted of a reduction in the exposure. Where previously the procedure had been to use a weak developer it was quite necessary to give relatively long exposures; but with the Wortley system the camera exposure was reduced, and the effect of light was completed by the use of a powerful reducing agent. This apparently simple thing was in reality important, for it represents even to-day partially the means by which short exposures in the camera can be utilised for negative-making.

The inception of the gelatino-bromide dry-plate process, in which a halide of silver is emulsified in gelatine and applied to glass—the modern sensitive surface—was due to Dr R. L. Maddox, who in 1871 produced the first gelatine emulsion, by means of the addition of a solution of silver nitrate to a solution of gelatine containing cadmium bromide, the emulsion so prepared being applied to glass and paper. In 1873 an emulsion was placed on the market by Burgess, which, however, did not keep. In the same year Kennett produced a practicable article, but the difficulties connected with its use induced Kennett to turn his attention to the manufacture of plates, and the first batch was issued in 1874. Still it was not until 1880 that dry plates came into general use. Gelatine emulsion was applied to paper for the production of positive prints by development, and the first commercial bromide-paper was announced by Peter Mawdsley, of the Liverpool Dry Plate Company, Clapham Junction, in 1874.

So far pyrogallol had been the reducing agent in the developers used. In 1877 ferrous oxalate in a solution of potassium oxalate was introduced independently by Carey Lea and by Willis, and in 1880 an alkaline solution of hydroquinone (quinol) by Eder and Toth. The form of the developer used has always had an important bearing upon negative production, and since the introduction of hydroquinone many agents—generally benzene and naphthalene derivatives—have been added to the list. The improvement in the sensitiveness of dry plates which has taken place since their introduction by Kennett, and in the other qualities necessary, is matter of common knowledge, and their manufacture is now an extremely important branch of chemical industry. Probably the greatest triumph, so far as any single quality is concerned, is the enhancement of their spectral sensitiveness. As far back as the days of Scheele the fact was known that a silver salt, though sensitive to light, possessed a selective sensitiveness to colours, and that the effect was not in correct proportion to the order of their luminosity. In 1874 Dr H. W. Vogel of Berlin showed that by treatment of the film with certain easily oxidisable coal-tar colours (corallin, eosin, Magdala red) an increase in the sensitiveness for certain spectral regions took place. Eosin was applied to the sensitising of gelatine dry-plates on a commercial scale by B. J. Edwards in 1886, and such plates became known as isochromatic or ortho-chromatic, in spite of their insensitiveness to red and orange. The increased sensitiveness to green and yellow gives a much better rendering in landscape work, but for the satisfactory recording of reds continued efforts had to be made till the introduction by Miethe of isocyanin dyes, and later of carbocyanins by König, provided plates sensitive not only to red but even the infra-red region of the spectrum. Plates which are sensitive to the whole of the

visible spectrum are termed panchromatic, but the sensitiveness to the various wave-lengths is not equal, nor is it proportionate to the visual luminosity. In the panchromatic plate, as in the eosin sensitised ortho-chromatic plate, the inherent sensitiveness of the silver bromide to blue and violet preponderates over the effect of the dye, and in order to reduce the action of the more refrangible rays a correction filter or 'yellow screen' must be used on the lens. The absorption of such a filter is adjusted to the sensitiveness of the plate and the result required. With the modern panchromatic plate the colour of the filter adjusted to render colours in proportion to their visual luminosities is greenish-yellow.

The recent discovery that certain dyes destroy the light-sensitiveness of exposed plates without destroying the latent image allows development to be watched under white light of low intensity. Phenosafranine was the dye first introduced by Dr Lüpke Cramer, but has been largely superseded by pinacryptol green. The advantages of desensitising are obvious in the case of panchromatic plates which normally must be developed in total darkness. The exposed plates are bathed in a very dilute solution of the desensitiser before development, or densensitiser may be added to the developer.

In recent years much research work has been done on the theory of photography, and the application of modern developments in physics and chemistry, particularly colloidal chemistry, has proved very fruitful, though few general conclusions can be made as yet.

Film Photography.—Without doubt glass is the most convenient and satisfactory support for the sensitive surface, but its weight and the possibility of breakage are objections. When extreme portability in cameras became the aim of apparatus-makers, endeavours were made to find a suitable material to replace glass; many substances were tried, and eventually celluloid was adopted. In 1888 Carbutt of Philadelphia introduced sensitive coated celluloid film, followed by the Eastman Company in 1889, who in 1903 sent out 'non-curling' film—the curling tendency being overcome by coating the plain side with gelatine. Films in the form of flat sheets are used in place of glass plates or in a special form of packing called a 'film pack,' which enables each film to be brought to the front after the preceding one has been exposed. 'Rollable film' is wound on spools together with a longer strip of black paper so arranged that the spool can be inserted and removed in daylight. This method of winding the spools also makes it possible to wind the exposed film into a special tank so that it can be developed and fixed without the aid of a dark room. The Eastman 'Kodak' cameras have made rollable film the most popular type of sensitive material for the amateur, and it lends itself to development and fixing with the minimum of handling.

Rollable celluloid film is used in enormous quantities for both the negative and positive films used in the Kinematograph (q.v.).

Printing Processes.—In photography the term 'printing process' is applied to those methods by which positive copies are produced from negatives. The process described by Fox Talbot at the Royal Institution, by which paper impregnated with silver chloride was exposed to light under an opaque or translucent flat object, was the earliest printing method introduced. The pictures after fixation were always weak in intensity and poor in colour, especially after the use of sodium thio-sulphate, which attacked vigorously the darkened silver salts. To avoid these defects excessive printing was adopted, and the prints were immersed in

a solution of acidified chloride of gold (introduced first by Le Grey), and afterwards fixed. To check the excessive loss an alkaline solution of gold chloride was next tried, and this eventually became the method of toning. To impart a gloss to the surface of the paper the salt solution originally used was replaced by salt (or ammonium chloride) and albumen of eggs (introduced by Fox Talbot in 1854), with the result that when the paper was sensitised there resulted silver chloride, together with a complex compound of insolubilised albumen and silver, as well as an excess of silver nitrate, this latter being quite necessary for sensitive paper and for a vigorous result. This form of paper gave prints with considerable gloss, and was known as 'albuminised silver' paper. Soon after introduction it became extensively used, and was employed by photographers as the chief silver-printing process until about 1892, when it was gradually replaced by the growing use of gelatino-chloride of silver emulsion paper. As well as albumen and ammonium chloride, gelatine and ammonium chloride was used. Such paper had no gloss after sensitising upon silver nitrate solution, and was known as 'plain paper.' In 1864 Wharton Simpson worked out a process for the production of a 'print-out' emulsion, suitable for application to paper and glass, which contained silver chloride, silver nitrate, and citric acid; and in 1881 Abney introduced a print-out gelatine emulsion containing silver chloride and silver citrate, there being no free silver nitrate present. 'Self-toning' papers, which contain the gold salt in the emulsion and complete the toning during fixing, effect a considerable simplification, and are still used to some extent, but the convenience and speed of working of bromide developing-out papers has very greatly reduced the amount of 'print-out' paper or 'P.O.P.' used for ordinary work.

Chromium Processes.—In 1839 Mungo Ponton (foreign secretary then to the Society of Arts for Scotland) observed that paper impregnated with potassium bichromate darkened upon exposure to light, and he suggested the employment of such paper in lieu of that containing a silver salt. The darkening was due to the reduction of the chromium salt in the presence of the material used for sizing the paper—probably glue. In 1855 Poitevin patented a method of printmaking by exposing a mixture of gelatine and a bichromate to light, the gelatine becoming insoluble in warm water. In this way the gradations of the negative were rendered by various amounts of insoluble gelatine which contained in suspension a colouring matter. This idea was more fully carried out by Pouncy in 1859; but because of the fact that he exposed his sensitive surface from the front he failed to produce more than two tones—black and white; a defect which Burnett tried to overcome by reversing the operations and printing through the paper support. Improvement was made by Fargier in 1860 by coating the face of the exposed paper with collodion, which was then removed by soaking the combination in warm water, the collodionised coated gelatine film being received upon glass for development. Little advance, however, was made until the difficulties were attacked by J. W. Swan and his eventual associates Johnson and Sawyer, to whose labours the perfection of the carbon process is almost entirely due. The method as worked at the present day is extremely simple. A sheet of paper coated with gelatine, colouring matter, and potassium bichromate (carbon tissue) is exposed to light under a laterally reversed negative. It is then soaked in water together with a sheet of paper coated with colourless insolubilised gelatine, and the two are squeezed into close contact and kept for a short space of time under slight

pressure. They are then placed in water at 100° F., when, after a short time, the tissue backing-paper is easily detached, and on lavage with water the soluble unchanged gelatine washes away, leaving the picture in insoluble gelatine behind. The picture is then rinsed in clean cold water, soaked in a solution of alum, rinsed again, and dried. This is the single-transfer process. If an ordinary unreversed negative is to be printed from, the exposed sheet is transferred for development to a piece of prepared opal or paper, and the image is eventually transferred again to another sheet of paper. This is the double-transfer process. Except in those rare instances where carbon tissue is prepared with fugitive pigments, carbon prints are quite permanent.

A film of gelatine containing potassium bichromate exposed to light loses its power of absorption of water, and therefore of swelling to a degree proportionate to the exposure. If, therefore, a sheet of prepared paper be exposed under a negative, and be afterwards placed in cold water, the swelling will vary according to the tones in the negative. If the excess of water be removed with a clean cloth, and a brush charged with lithographic printing-ink be applied to the surface of the exposed and damp paper with a dabbing motion, in a little time the ink will be taken by the film in proportion to the degree of swelling, little in the least exposed and most swollen parts, and the greatest amount in the darkest tones, where the gelatine has been rendered insoluble, and consequently has not swollen. This is termed 'oil-printing.' In skilful hands it is capable of yielding results of considerable beauty, and because of the amenability to control is much used by pictorial photographers. A modification of this process is 'bromoil,' due to Mr C. Welborne Piper. In this process a suitable bromide print is treated with a solution containing an alkaline bichromate, bromide, ferrocyanide, alum, and citric acid. The bleached print is rinsed with water, treated for a minute or two with a 5 per cent. solution of sulphuric acid, washed and fixed, and is again washed, when it is treated as an oil-print. Many modifications of the bleaching solution have since been used, and the process is very popular.

Platinum Prints.—In the prints produced by the platinotype process the image consists of metallic platinum, which is produced by the intermediary of the reducing action of an iron salt—viz. ferrous oxalate. In 1873 W. Willis, taking advantage of the reducing action of ferrous salt, produced prints the images of which were platinum. He prepared his sensitive paper with a coating of potassium chloroplatinite, silver nitrate (or lead nitrate), and ferric oxalate. This was dried and exposed under a negative, and subsequently floated upon a hot solution of potassium oxalate. The ferrous oxalate formed by light was dissolved by the potassium oxalate, and at the moment of solution it reduced the platinum salt with which it was surrounded, and an image in platinum resulted. An improvement was made in 1878, when the silver was eliminated, and paper was produced coated with potassium chloroplatinite, lead chloride, and ferric oxalate, and the prints were developed upon a solution of potassium oxalate containing potassium chloroplatinite. In 1880 another patent was taken out for a modification in which the paper was coated with the platinum and the iron salt alone, the prints being developed upon a solution of potassium oxalate; subsequently washed in water acidified with hydrochloric acid to remove the whole of the iron salt, and finally in plain water. This is the process so largely in use at the present day, furnishing results of extreme beauty and quite permanent. The scarcity of platinum during the Great War led to the introduction of

palladium as a substitute, but this class of process is now used only for very high-class work.

The processes hitherto described have been such as require the use of daylight for printing, or are light of high intensity. The halide salts of silver are, however, employed for the production of sensitive papers, by means of which short exposure to lights of low intensity, as gas, lamp, or candle light, suffices when the exposed image is subjected to development as in negative making. Such papers are known as bromide or chloride papers, these being the halides used. The first bromide paper was introduced by Peter Mawdsley in 1874, and since that time much skill has been shown in the preparation of papers of different kinds to suit all classes of negatives, both for contact-printing and for enlarging. By the use of silver chloride a particular class of emulsion papers is produced, known as 'gaslight,' the original of which was due to the labours of Baekland in the United States. The advantages of these gaslight papers lies mainly in their allowing manipulation in a much stronger light than is possible with ordinary bromide papers, and hence there is greater convenience in the dark room. The great majority of modern photographic prints are made either on bromide or gaslight papers, which are manufactured in a wide range of qualities and surfaces from glossy to that of the roughest water-colour paper. A considerable variety in tone can be produced by modification of the conditions of development, and further changes can be produced by converting the image into sulphide, or by toning with ferricyanide and suitable salt of iron, copper, uranium, &c. Developed prints upon bromide and chloride of silver papers are also used for the production of carbon prints by indirect means, as in the 'ozobrome' process of Manly introduced in 1906. Insolubility is produced in the gelatine by squeezing a bromide print into contact with a sheet of carbon tissue which has been soaked in a solution containing an alkali bichromate, bromide, and ferrocyanide.

Photographs in Colours.—Seebeck, making some experiments with chloride of silver in 1810, found that this body, when exposed to the spectrum, became changed, and in place of the normal gray or grayish-violet colour obtained by exposing to ordinary daylight, the substance changed differently under the various spectral hues. In the violet the chloride became reddish-brown, sometimes inclining to blue or violet, in the blue to a blue fading away towards the green to a lighter shade. No change took place usually in the yellow, but sometimes a pale-yellow tint was produced, and in the red and beyond the colour produced was pale red or lilac. There appears to be little doubt that this was the first observation of colour produced by the action of light upon a sensitive body. Since that time numerous workers—Wollaston, Nicéphore de Niepce, Herschel, Hunt, Poitevin, Becquerel, Simpson, Zenker, Carey Lea, Wiener—have obtained similar effects; but though the results furnished material for interesting and valuable speculations, they have not contributed very greatly towards the fulfilment of photography in colours as usually understood. Wiener conceived a black, light-sensitive surface composed of yellow, pink, and greenish-blue elements, each of which absorbs and is totally bleached by coloured light approximating to one of the colour sensations. This surface would be bleached to white by white light, to red by red light, yellow by yellow light, and so on. Among numerous attempts made to realise this conception the most successful worker has been Dr J. H. Smith, who introduced a black film paper in 1906 with one coating much more sensitive to light than had been previously produced. Dr Smith made a further

improvement in this so-called 'Uto' paper in 1911. The sensitiveness—rapidity of bleaching—is enhanced by the addition of certain substances, of which anethol is one, but the material was far too insensitive to be used in the camera, and could only be used for contact printing under a coloured transparency.

Becquerel exposed to coloured light a layer of the halide produced by electrolytic means upon a silver plate, and obtained a coloured image, which Zenker in 1868 stated was due to the structural alteration in the film. Zenker's hypothesis was that the colour was produced by the so-called stationary or standing waves, which was confirmed by Wiener in 1889, but more completely by Lippmann, who communicated to the French Academy of Sciences on 12th February 1891 the details of the colour process now associated with his name. According to Zenker, if two similar systems of light-waves meet, which occurs when a ray of light is reflected back along the same path as that of its incidence, there is produced interference, which results in a wave system where the crests and the nodes of the waves are not progressive as in ordinary light-waves, but are stationary. If such stationary waves are produced in a particular kind of sensitive film, the result is that strata of the particular product of the light action occur. If the layers be transformed into permanent form (as the silver produced by development of an exposed plate), and be again illuminated, they will reflect light of the same wavelength as the original light, and in consequence the same colours will result.

In the process of Lippmann a glass plate is coated with a very thin film of a grainless transparent bromide of silver emulsion. It is then exposed in the camera to the image of a coloured object, with the glass side of the plate facing the lens. In contact with the back of the film is a layer of clean, pure mercury, which forms a reflecting-mirror, and the light which traverses the film is reflected back again, when the reflected light meets the incident light and stationary waves are produced, and these produce the effect in the film. The plate is afterwards developed, fixed, washed, and dried. The method of Lippmann is of great scientific interest but is difficult in operation, and the process has found few workers.

All the successful methods of colour photography in regular use are due to the application of the Young-Helmholtz theory of colour-vision. In brief, this theory postulates that our colour-feeling is due purely to a physiological sensation produced by the stimulation of certain nerve fibrils. It is assumed that there exist in the eye three sets of fibrils which respond to certain influences, the results of which are termed 'fundamental colour sensations.' *Particular regions* in the spectrum of white light, a red, a green, and a blue, excite the nerve fibrils to a maximum effect, and these are termed 'the sensation hues.' If a particular amount of stimulus be applied to each one, the combined effect is the sensation of white, to the red and green alone the sensation of yellow, which inclines to orange or to green according as the red or green predominates. Any colour of the spectrum, and therefore any colour in nature, may be produced by the stimulation of one or more of the fundamental sensations—i.e. produced by mixture of certain proportions of the sensation hues. If we can analyse the colour composition of any coloured object—i.e. resolve it into three components which are identical in form—we can utilise such to produce the appearance of the object by synthesis, using the fundamentals. That it was possible to regulate such mixture by photographic means was first expressed by Clerk-Maxwell at a meet-

ing of the Royal Society of Edinburgh in 1855. Three photographs of the object are produced by photographing the object upon a suitable sensitive surface (a panchromatic dry plate or collodion emulsion) through three adjusted transparent colour-screens respectively, a red, a green, and a blue, by which operation we obtain records of the colours of the object in terms of the fundamental hues. Thus, in the three negatives made through the screens, white will be opaque and of equal value, pure green in the object will be represented in the negative made through the green screen as opaque, in the two other negatives as transparent, and so on. The negatives must all be equal in size. In applying the principles given two methods are open, the synthetic and the subtractive. The synthetic method involves the adding together of three *lights* corresponding to the three sensation hues, the summation of the three resulting in the sensation of white. The subtractive method *starts* with white light, or a surface reflecting white light such as white paper, and subtracts the colours affecting each sensation in turn, the total subtraction giving black. The hues of the dyes or pigments used in the subtractive methods are therefore *complementary* to the colour sensations they subtract. The subtraction of the red sensation is effected by a dye absorbing red, and reflecting white minus red, which appears greenish-blue. The dye which absorbs the green is a magenta-pink, and that which absorbs the blue is a yellow. The first to apply the principles practically was Louis Ducos du Hauron, who in a work published in 1869 (*Les Couleurs en Photographie*) gave practical instruction for the production of colour pictures by synthesis so far as it was possible under the then existing circumstances.

In 1888 F. E. Ives showed at the Franklin Institute a method of producing colour pictures, working according to the Young-Helmholtz-Maxwell principles on the synthetic method, by optical superimposition of three photographic images in their sensation hues by means of the lantern. Some time afterwards the same principles were followed in the construction of an apparatus termed the heliophotochromoscope (eventually *kroniscop*).

In 1889 Ives published his first method of making lantern-slides on the subtractive principle. Using a blue ferroproussiate print in gelatine from the red screen negative, he combined with it a reversed 'wash-out' gelatine print stained with eosin (pink) on another glass from the green screen negative, and mounted these face to face with a yellow colotype print (see below) on gelatine from the blue screen negative. In this process it was possible to vary the rendering by manipulation. At a later date the pink and yellow prints were produced as gelatine images on celluloid. This method was afterwards elaborated by Mr Sanger-Shepherd, and is now used by a number of workers.

Using the synthetic principle we can proceed in another way. If we place side by side small discrete particles of three pigments matching the fundamentals, taking care that there are no interstices and no overlapping; and if, moreover, the elements of such assemblage are so small that when examined at the ordinary distance of vision these elements are not separately distinguishable by the eye, an optical mixture will be produced and the surface will appear white, though such white will be less bright than the original paper; a white of low luminosity—a neutral gray—will result. If there be only green and red particles yellow will be produced, green and blue, peacock-blue (greenish-blue). If there be an assemblage producing white, and by any means we can obliterate one set of the units, the residue will give the complementary hue to the one destroyed—take away

the red, the surface will appear greenish-blue. Such a surface may be formed of lines or dots or by irregular particles. In practice the difficulties attendant on the production of pictures upon an opaque ground by the synthetic method have not been overcome.

The principles just described are, however, the basis of the beautiful autochrome process of Lumière Brothers, introduced in 1904, which is the most successful of the so-called screen-plate processes for synthetic heliochromy. The original idea for such dates back to Du Hauron in 1869, and was put into practice with fair success by Professor Joly of Dublin in 1896, who used a plate ruled with lines alternately red, green, and blue, which was placed in contact with a colour-sensitive plate during exposure to an image in the camera. From this negative—the image of which was in lines—a positive transparency was produced; and this, when backed by a screen ruled in a similar fashion to the 'taking-screen,' but with tints corresponding to the fundamental sensation hues, gave a picture in colour. In the process of Lumière Brothers the screen plates for 'taking' and 'viewing' are identical, and are necessarily combined with the sensitive surface. A sheet of glass is coated with a tacky medium, and is then evenly dusted with a mixture of transparent starch-grains coloured red, green, and blue-violet, and mixed in correct proportion to produce a neutral white. Such grains being irregular, the assemblage leaves interstices which are filled with black, and when the surface has been satisfactorily prepared it is coated with a transparent waterproof varnish. The sheet now receives over this film a coating of colour-sensitive gelatino-bromide emulsion, and the plates are dried. The plate is exposed in the camera with the glass side towards the lens, so the light before reaching the sensitive film must pass through the starch-grains, each of which acts as a colour-filter. The plate is afterwards developed. In the white parts of the picture light will pass through all three sets of starch-grains and act on the silver bromide, which will be reduced and form an opaque image on development.

If the picture contains any red, green, or blue-violet parts the light from those parts will pass through only the red, green, or blue-violet grains respectively, and on development the opaque image will obscure these respective grains, while the grains through which no light passes will remain covered by the unaltered, translucent, silver bromide. Other colours will be transmitted in varying amounts by two or more of the sets of grains and produce a corresponding opacity on development. An interesting case is that of a bright yellow which passes through both the red and green starch-grains, and on development causes both red and green to be obscured, while the blue-violet grains have only the translucent silver bromide over them, so the result is that only blue-violet light is transmitted. It will be seen that the colours are complementary to those of the original picture, and that we require a positive image in place of the negative one we have obtained. To effect this reversal the developed but unfixed plate is treated with a solution which is a solvent of silver but not of silver bromide. The grains which were obscured are now left clear, and the picture appears somewhat faintly in its natural colours owing to the obscuring action of the unaltered silver bromide now left in inverse ratio to the amount of reduced silver removed. The plate is washed, exposed to white light, and the developer again applied, reducing the silver bromide to opaque silver, and the picture appears in its full colours.

Other screen-plate processes have been produced on the same principles as the autochrome, but most

of these have employed a geometrical arrangement of the units instead of the haphazard irregularity of the starch-grain layer. In a geometrical arrangement, such as is employed in the Paget screen-plate, it is possible to have the sensitive emulsion on a separate glass from the screen, and the negative is developed and fixed in the usual way. From this negative a positive is made by contact-printing, and bound up in register with the screen plate or, preferably, a viewing screen of identical arrangement but slightly different colours.

The subtractive method has been adopted in a number of processes, most of which have aimed at the production of prints on paper, but none of these processes have been sufficiently successful to be widely used. The chief application of the subtractive method is in relation to the various processes of photo-mechanical photography (see next section) and printing (see ILLUSTRATION OF BOOKS).

PHOTO-MECHANICAL PHOTOGRAPHY.—Reference has already been made under the heading of *Chromium Processes* to the fact that the gelatine in a mixture of that substance with an alkali bichromate loses its solubility in warm water after exposure to light. The chromium salt becomes reduced, the chromium sesquioxide eventually formed uniting with the gelatine to form an insoluble body. What is true of gelatine is equally true of its degradation product, gelatose (fish-gel and the like), of albumen, of starch, and of gum-arabic. This change in solubility, and some physical properties which accompany such change, form the basis of a number of technically important processes in which photography is united with the printing-press in the production of pictures in printers' ink, processes which come under the heading applied to this section. Such processes supply the greater number of the illustrations produced at the present time, and are therefore of considerable importance. The following typical processes may be taken as examples: collotype and photo-lithography; *intaglio*, woodburytype and photogravure; *relief*, line and half-tone process blocks. The processes may be used in two ways, either for the multiplication of photographic pictures of natural objects in place of one of the printing methods belonging to pure photography, or for the reproduction of copies of drawings and paintings. For the former all but the line processes are admissible; that is to say, given a photographic negative of the natural object, copies may be produced by any of the processes given. Any process may be employed for reproduction of drawings and paintings, but it will be obvious that the line block and line photo-lithographic processes can only be used for the multiplication of copies of drawings already existing in line.

Commercially, those processes are the most important which can be employed in conjunction with type, so that picture and text matter can be produced at one and the same printing, and for this purpose the line and half-tone relief methods are the only ones available. On the other hand, from the purely æsthetic aspect the processes of photogravure and collotype are far superior, although the cost of production is relatively higher than the other methods. See ILLUSTRATION OF BOOKS.

Collotype.—The surface of a sheet of ground-glass is coated with albumen and sodium silicate, and dried, heated, and washed in water. It is afterwards covered with a solution of gelatine and potassium bichromate in water, and dried by evaporation at an elevated temperature. This is exposed under a negative, washed, and dried. The surface is then moistened with ammonia, water, and glycerine until the film is softened, the excess removed, and the plate fixed in the printing-press. If a leather roller charged with a thin coating of

varnish ink (linseed varnish and pigment) be rolled to and fro over the surface, the ink will be transferred to the film, and will be taken by the different parts of the surface in direct proportion to the original action of light. A sheet of paper is then laid over the inked surface and pressure is applied, when the ink is transferred to the paper. With care considerable numbers of prints can be obtained from a plate which may be printed either in a hand-press or in a machine. Any colour of ink may be used, and the process admits of the use of many different kinds of paper. The process is remarkable for the beautiful rendering of the gradations of the negative, and is capable of giving pictures of charming character.

Photo-lithography.—This process may be used for the multiplication of copies of line drawings, and is generally used in map and plan work. Suitable subjects may be reproduced either by the 'transfer' or 'direct' method. A sheet of paper coated with gelatine is sensitised by immersion in a solution of potassium bichromate and dried. It is afterwards exposed under a clear line negative, when the gelatine becomes changed (so as to be insoluble in water) under the lines. The sheet is coated with a thin film of fatty ink by means of a roller, and placed in water. The exposed line parts do not swell; the unexposed portions absorb water and swell. Under those conditions the latter will not retain ink against rubbing. By the application of a tuft of cotton-wool the ink from the unaffected parts can readily be removed, leaving the ink firmly attached to the lines. The transfer is dried, and afterwards damped, laid on the surface of a clean lithographic stone, and pressure is applied. The ink by this operation is transferred to the stone. The paper is pulled away, the stone coated with gum solution, and dried. It is afterwards treated in the same way as the stone bearing an ordinary lithographic image. Paper prepared with a ferric salt is also used in place of the alkali bichromate. The transfers are equally applicable to the production of images on zinc and aluminium, both of which are used in surface printing in the lithographic manner. Images are obtained in the 'direct' method by coating the grained zinc or aluminium plates with bichromated albumen solution, exposing under a line negative, coating with ink, and developing in water. The portions of the albumen film not insolubilised by the light action dissolve out, and on gently rubbing with cotton-wool under water the ink comes away from these parts, leaving the image in hardened albumen with a covering of greasy ink which fulfils the conditions necessary for lithographic printing (see LITHOGRAPHY).

Photogravure.—A modern photogravure plate consists of a sheet of copper which has been selectively etched into *intaglio*. The ink-bearing portions hold ink in proportion to the light and shade of the subject represented, and this ink is afterwards transferred to paper. The process generally used is that known as the Talbot-Klic. Upon the surface of a sheet of polished copper a fine layer of resin or bitumen dust is deposited ('graining'), and is fixed by heat. From the negative a laterally reversed positive is made upon glass, and from this positive a carbon-tissue print which will be negative. The print is developed in the correct position on the grained surface of the copper plate and allowed to dry. This negative carbon image is termed the 'resist,' and its function is to regulate the action of the etching mordant, ferric chloride. All parts of the plate but the resist are protected by an impervious varnish, and the plate is then placed in the mordant. The fluid penetrates the different thicknesses of the resist in different times, and reaching the metal, etches it tone after tone.

There is thus a differential action, and as time goes on the copper is etched to different depths. When the action is completed the resist and grain are cleaned off, when it will be found that a series of cavities has been formed. The function of the 'grain' is to protect minute areas of the metal from the action of the mordant. A patch of uniform tone of appreciable size is not a cavity etched to a uniform depth, but is made up of a number of small ones (not separately distinguishable by the unaided eye), owing to this protective action of the grain. To produce a print the plate is covered with suitable ink (stiff linseed varnish and pigment), the excess of which is removed, leaving the surface clean and the ink for the picture in the cavities. It is at this stage that the 'grain' exerts influence, for if the cavities were of appreciable size the ink would be dragged out of the cavities in the operation of wiping the excess from the surface. The print is taken by pressure upon damp, soft, sized (plate) paper in the ordinary copperplate press, and success or failure to produce good pictures by the photogravure process is largely dependent upon the skill of the printer. Usually the plates require considerable modification at the hands of a skilful engraver, and by a process of selective etching by which certain portions are re-etched. Before printing any number of copies the plate is 'steel-faced' by electro-deposition.

Prints in colour are produced by a selective inking of the plates by hand by means of different coloured inks applied by sponges, dabbers, and stamps, and are printed, each copy, at one impression. Such prints are often very beautiful, but are extremely costly. During recent years pictures of a high standard have been produced at a low cost by means of 'rotary' photogravure. In this process the etched surface is cylindrical, and is prepared as above, except that the graining is replaced by a second exposure on the carbon tissue under a screen consisting of clear thin lines crossing at right angles on an opaque ground. The effect of this exposure is to form, in the carbon tissue, a network of hardened lines which are almost impervious to the ferric chloride. After etching, the surface of the copper, examined under a magnifying lens, somewhat resembles a very minute and extremely shallow honeycomb, with the cells of varying depth according to the light and shade of the picture. The 'ink' used is a fine pigment or dye suspended in a highly volatile spirit, and it is applied by a roller very liberally to the lower side of the etched cylinder as it revolves. Immediately above the ink roller a flexible steel blade presses lightly against the cylinder and removes all the ink that is not held in the cells except a very thin film which acts as lubricant and prevents the steel blade wearing away the etched surface. This thin film dries instantly, so that when the paper is pressed into contact with the cylinder on the upper side the only ink transferred to the paper is the moist ink contained in the cells.

The paper is generally fed from reels, not cut sheets, and as the motion is a perfectly continuous rotation, very high speeds can be attained. This process is now widely used for printing illustrated magazines and other purposes where the number of copies required is sufficiently large to cover the expense of preparing the cylinders. The process has recently been successfully employed for the production of pictures in colour, and, on theoretical grounds, the varying depth of colour deposited on the paper by this process makes it the most promising field for the application of the principles of colour photography by the subtractive method.

RELIEF PROCESSES—*Line*.—A sheet of zinc coated with bichromated albumen or fish-glue is printed under a clear line negative, coated with fatty ink,

washed in water, when an image of insolubilised matter bearing fatty ink on its surface is produced. Upon this plate, by the application of dilute nitric acid, the bare portions of the metal corresponding to the whites of the drawing may be etched away, leaving the inked parts in relief, and when sufficient relief has been obtained an inked roller passed over the etched plate will ink merely the surface of the lines, which ink may be transferred to paper. In practice it is necessary to reinforce the sides of the lines from time to time to enable them to withstand the lateral action of an acid bath sufficiently strong to etch away the unprotected portions in a reasonable time. The amount of relief required for the lines depends upon the width they are apart—with close lines little; but when they are far apart considerable depth must be obtained. When the etching is complete the superfluous metal is cut away, and the plate is mounted upon a slab of wood to type-height, when it is ready for the press.

Tone.—Without modification the type-high process as described would not be able to represent a photographic portrait or landscape, or indeed any object existing in nature where the gradations of light and shade are continuous. But such subjects are represented, and the interest of the modern type-high 'half-tone' process, so called, lies in the optical device which is used to secure such representation. The system consists in translating the continuous tones or shading of the drawing or photograph into isolated masses or dots, the area of which in proportion to the area of white paper between them depends upon the brightness of the tone represented. If the units are small enough to be separately indistinguishable, or are viewed at a sufficient distance to make them indistinguishable, the illusion of smooth continuous tone will be produced. In the half-tone process this translation is effected by means of the 'ruled' screen, a sheet of glass ruled with a series of parallel opaque lines so that there are alternate dark and light spaces of equal width, the latter being the transparent glass ground. Two such plates are cemented with these ruled surfaces in optical contact, and this leaves a series of rectangular transparent openings. Given a drawing or a photograph from which a half-tone block is to be made, it is re-photographed, and during the exposure the ruled screen is supported close in front of but separated from the sensitive plate. The effect of this screen is to break up the shading into dots, which are largest in the brightest tone, and decrease in size to the darkest tone. From the negative a print in insolubilised bichromated fish-glue on metal—generally copper—is produced, which, after being strongly heated, forms a resist capable of withstanding the action of the mordant ferric chloride by which the dots are etched into relief. The relative tones can be altered by a system of selective etching termed 'fine etching,' the result of which proceeding is to vary the relation of the brightness of the tones, a method frequently necessary owing to errors in negative-making, in printing the resist, inherent limitations of the automatic process, and also to the fact that many originals are unsuitable to the process or furnish pictures not pleasing to those for whom they are intended. The plate, when etched, is trimmed and mounted type-high upon a block of hard wood, when it is ready for the printer (see ILLUSTRATION OF BOOKS).

Tricolour.—In principle the application of the three-colour system to the production of type-high printing-blocks for making pictures in colours is simple, although in practice there are many difficulties. Two methods are in vogue, the indirect and the direct. In the former three negatives are made of the object, equal in size, through colour filters on the lens, red, green, and blue-violet, and

from these negatives suitable transparencies. From these screen negatives and process-blocks are produced. Impressions are superimposed upon one sheet of paper in yellow from the blue-violet screen block, in pink from the green screen block, and in greenish-blue from the red screen block. This process, which is necessary when making pictures of objects in relief, has been largely superseded by the direct process applicable to almost all classes of flat subjects in colour. In the direct process the colour negatives are made as screen negatives at one and the same operation upon special panchromatic dry plates or on collodion emulsion, with colour-filter on the lens and ruled screen in front of the sensitive plate. In this way negatives are produced which can be used for printing on metal, and intermediate operations are saved. The half-tone plates are produced as described above. In all cases they require very skilful 'fine etching' to render the appearance of the original subject with even a fair approximation to accuracy, and afterwards highly skilful printing. Frequently a fourth block is used in addition to the tricolour set, which is usually prepared from a photographic negative giving in the first instance a good monochrome rendering. Such a block, after correction, is printed generally in a dark gray or black ink, and permits the use of brighter colour inks without loss of depth in the shadows, or uncertainty in the grays. It also permits of a little more latitude in the printing.

See Abney, *Treatise on Photography and Instruction in Photography*; Chapman Jones, *Science and Practice of Photography*; C. E. K. Mees, *Fundamentals of Photography*; E. J. Wall, *Dictionary of Photography and Practical Colour Photography*; Emerson, *Naturalistic Photography*; Lummer (translated by Silvanus P. Thompson), *Photographic Optics*; Child Bayley, *The Complete Photographer*; Hübl (trans. by Klein), *Three-colour Photography*; Martin and Gamble, *Colour and Methods of Colour Reproduction*; *Photography as a Scientific Instrument* (a collective work); also *British Journal Photographic Almanac* (annual). For Photo-mechanical Photography, see Gamble, *Line Photo Engraving*; Verfasser, *Half-tone Process*; Horgan, *Half-tone and Photo-mechanical Processes*; Denison, *Treatise on Photography*; Clerc, *Ilford Manual of Process Work*; see also *Penrose Annual* (1895 et seq.).

Photometry (Gr. *phōs*, 'light,' and *metron*, 'measure'), the art of measuring the intensity of a source of light, by comparison with a standard of reference (see GAS-LIGHTING). The principles involved in the usual instruments are: (1) Lambert (1760), Rumford: equality of shadows cast by two sources at different distances; when the shadows are equal the intensities are proportional to the squares of the distances. (2) Equality of illumination through slits in screens; distances and intensities as before. (3) Bouguer, Ritchie, Leonard Weber: reflection of light from two sources, so that they travel side by side to the eye, the distances being adjusted until they appear equal; calculation as before. (4) Wheatstone, the same; but the two reflections are from a polished sphere, which is set in motion, so that the comparison is between two looped luminous curves, produced through the persistence of vision. (5) Bunsen: a grease-spot on paper, equally illuminated on both sides, disappears. (6) Babinet: light from one is polarised by reflection, from the other by refraction; both pencils are sent through a double rotating quartz, and looked at through a double-refracting prism; they give coloured images, and the distances are adjusted until the images, on over-lapping, give a white field. All these methods are unsatisfactory when the sources of light are of different colours, as—e.g. a candle and an arc-lamp. Instruments have accordingly been devised for applying the above methods to each part of the

spectrum of the light from each source. The degree of sensitiveness of the eye of the observer, or a difference of sensitiveness between his two eyes, affects the result. In the 'flicker' method of photometry, the two lights are made to illuminate a white screen in rapid alternation; if their illuminations of the screen be unequal the effect is a flicker; if these be equal the effect is smooth and continuous, even though the two sources differ widely in colour (Simnace and Abady). In other instruments used as photometers what is measured is not the luminous intensity so much as the radiation: among these we may mention the Radiometer (q.v.); Leslie's photometer, which is a differential thermometer; Bunsen and Roscoe's, which measures the quantity of hydrochloric acid formed in a given time from chlorine and hydrogen; Léon's, which measures the amount of nitrogen liberated from iodide of nitrogen; and various instruments based on photographic reactions, which truly measure not the luminous, but the actinic intensity. Stellar photometry is generally contrived by stopping off more or less of the surface of the object-glass, or by polarising apparatus, so as to bring the apparent brightness of a star down to that of a standard of comparison. The usual photometric standards are (1) the English standard candle (see GAS, LIGHTING BY); (2) the Hefner-Alteneck amyl-acetate lamp, which has now displaced the candle in Germany; (3) the carcel, a standard colza-oil lamp, used in France; (4) the Electrical Standards Committee's unit, the light given off by one square centimetre of platinum at its fusing-point; and (5), in scientific work, an incandescent electric-lamp under stated conditions of resistance and current, maintained constant.

Photophone, an apparatus for transmitting articulate speech along a beam of light, first described in 1880 by Graham Bell (see TELEPHONE). Its possibility depends on the peculiarities of the metal selenium. Crystalline selenium offers a high degree of resistance to the passage of an electric current; it is eminently sensitive to light; and the resistance is less when exposed to light than in the dark, being in some cases only a fifteenth in the light of what it is in the dark.

Founding on these peculiarities, Professor Graham Bell, his friends, and assistants devised some fifty forms of apparatus, for so varying the transmission of light to prepared selenium as to produce audible sound. In the photophone found most serviceable the transmitter is a plane mirror of silvered microscope glass or thin mica; the receiver, fixed at a distance without any connection, is a parabolic reflecting mirror, in the focus of which is placed a sensitive selenium 'cell,' connected in local circuit with a battery and telephone. When the apparatus is used, a strong beam of light is concentrated by a lens in the plane mirror; the speaker directs his voice against the back of this mirror, which is thrown into vibrations corresponding with those of the voice. The reflected beam of light, to which corresponding vibrations are also communicated, is directed through a lens to the receiving mirror, and creates in the selenium cell a rapidly variable current, which at the end of the telephone attached becomes audible again as vocal sound. When first described, the photophone had been used effectively with a distance of 230 yards (over a furlong) between transmitter and receiver. The rays of the oxyhydrogen light, or of an ordinary kerosene lamp, suffice for transmitting articulate speech. The loudest sounds obtained from the photophone were produced by means of a perforated disc, noiselessly revolving so as rapidly to interrupt the light in transmission.

It was also found that a very audible sound could be procured from the selenium without the aid of

telephone and battery. A beam of intermittent light will produce a strong musical note from the selenium. Further experiment showed that selenium is not the only substance thus sensitive to light. Still louder sounds than these obtained from the selenium directly, though not articulate, were got from diaphragms of hard india-rubber and of antimony; and sounds of varying intensity were given out by many other substances, including gold, silver, platinum, copper, zinc, lead, paper, parchment, and wood.

Photosphere. See SUN.

Phrenology, Gall's name for the physiology of the brain, used especially for the system based on Gall's observations and theory. In Britain the system was amply expounded by Gall's pupil Spurzheim (q.v.), by George and Andrew Combe (q.v.), and by Dr Elliotson, founder and first president of the Phrenological Society; and in America by Dr Charles Caldwell of Kentucky, the brothers Fowler, and S. R. Wells. The connection of mind and brain was an old theory, and a kind of localisation of mental function in the brain had at various times been attempted from the days of Albertus Magnus downwards; but the first full-fledged system of empirical craniology or phrenology must be attributed to Gall, who established his scheme by inspecting the exterior of the heads of a considerable number of persons of different characters; and believing himself to find portions of the scalp corresponding to their mental and moral faculties, marked out on a model of the head the areas which were prominent in proportion to the strength of the various faculties. These faculties were by Spurzheim divided into two orders—Feelings and Intellect, or Affective and Intellectual Faculties. The Feelings were divided into two genera—the *Propensities* and the *Sentiments*; while the Intellectual embraced the *Perceptive* or *Knowing* and the *Reflective Faculties*. Various modifications of Gall's scheme of localising the faculties were made by his pupils. The new science made many converts and became popular in most European countries; but scientific study of brain and mind in their various relations have rendered it obsolete as a scheme. Gall was apparently no charlatan. He was 'a superb anatomist and demonstrator.' 'His contributions to the anatomy of the central nervous system are of far-reaching importance,' says Professor Elliot Smith, 'and to the physiology of the brain and to psychological theory he gave a new orientation and a new inspiration.' He made grotesque mistakes, however, and his followers have surrounded his name with an air of quackery, which has made it difficult till lately to be fair to him. For what is known of the localisation of functions, see BRAIN. Beyond this, as Professor Elliot Smith contends, 'There is something about the modelling of different parts of the skull, especially the forehead region just above the ears, which every human being seems able to interpret in a vague or general way as an index of the ability or the aptitude of the individual.' But a true phrenology has yet to be built up.

See GALL, SPURZHEIM, COMBE, SKULL, PHYSIOGNOMY, PSYCHOLOGY; Bernard Hollander, *The Revival of Phrenology* (1903); Elliot Smith, *The Old and the New Phrenology* (1926).

Phrygia, a country in Asia Minor, the extent and boundaries of which varied very much at different periods of ancient history. In prehistoric ages it is believed to have comprised the greater part of the peninsula, but at the time of the Persian invasion it was limited to the districts known as Lesser Phrygia and Greater Phrygia—the former stretching along the shores of the Propontis

and the Hellespont to Troas (afterwards part of Mysia), the latter occupying the centre of Asia Minor. Phrygia was in general a high and somewhat barren plateau, though its pastures supported immense flocks of sheep, noted for the fineness of their wool. The most fertile part was the valley of the Sangarius, but the most beautiful and populous district was the south-west, at the base of the Taurus, where the Mæander and other streams had their rise. The mountains and streams yielded gold; Phrygian marble was celebrated, and the vine was much cultivated. The Phrygians are now held to have been Aryans who came into Asia Minor through Macedonia and Thrace, disturbed the Hittites (q.v.) in the 12th century B.C., but were at first repulsed and then influenced by Hittite culture. By 718 B.C. the Phrygian Midas (q.v.) had broken the Hittite power and shared most of the Hittite territory with the Assyrians. Croesus had conquered Phrygia ere in 549 he succumbed to the Persians. Phrygian religion deeply influenced Greek mythology. Among their deities were Cybele, the Mother, and Sabazius (Odorcis, Attis), the Son; and Athys; and Phrygia was a great centre of orgiastic worship.

See Sir W. M. Ramsay's *Cities and Bishoprics of Phrygia* (1895-97); D. G. Hogarth in the *Cambr. Ancient Hist.*, iii. (1925) chap. xxi. For the Phrygian Mode, see HARMONY; for the Phrygian cap, see BONNET.

Phryne, a celebrated courtesan, was the daughter of Epicles, born at Thespiae in Bœotia, and originally earned a livelihood by gathering capers; but as the fame of her marvellous beauty spread she obtained numerous lovers, who lavished gifts on her so profusely that she became enormously rich. In proof of this the story goes that she offered to rebuild the walls of Thebes if the citizens would allow her to place this inscription on them: 'Alexander destroyed them; Phryne, the courtesan, rebuilt them.' The Thebans declined the proposal. Her enemies accused her of profaning the Eleusinian mysteries. Summoned before the tribunal of the Heliasts, she was defended by the rhetorician Hyperides, one of her lovers, who, perceiving that his eloquence failed to convince the judges, threw off her robe and showed her naked loveliness. She was immediately acquitted, and carried in triumph to the Temple of Aphrodite. The famous 'Venus Anadyomene' of Apelles is said to have been a portrait of Phryne. Praxiteles, also a lover of hers, employed her as a model for his 'Cnidian Venus.'

Phrynichus, (1) an Athenian tragic poet, who gained his first dramatic prize in 511 B.C., twelve years before Æschylus, and his last in 476, when Themistocles was his *choragus*. He seems to have gone to the court of Hiero in Sicily, and to have died there. He introduced masks representing women, and to the light mimetic chorus of Thespis added the sublime music of the dithyrambic choruses. His most famous tragedies were the *Phœnisæ*, which is supposed to have inspired the *Persæ* of Æschylus, and another which had for its subject the capture of Miletus by the Persians. So overpowering was its effect that the audience burst into a passion of tears, fined the poet a thousand drachmæ for so harrowing a description of the sufferings of a kindred people, and forbade the piece ever again to be represented. His scanty fragments will be found in Nauck's *Tragicorum Græcorum fragmenta* (1837).

(2) A poet of the old Attic comedy, who was honoured by the abuse of his great contemporary Aristophanes (*Ran.* 14) for his low buffoonery. His fragments are collected in Meineke's *Fragmenta Comicorum Græcorum* (1839-57) and Koch's *Comicorum Atticorum fragmenta* (1880 et seq.).

(3) A Greek grammarian and sophist who flourished under Marcus Aurelius, and wrote a collection of select specimens of Attic usage intended for the benefit of his friend Cornelianus, secretary to the emperor. It consists of about four hundred short unconnected *dicta* on the orthography, signification, and use of particular words, and upon the rules of accidence, especially in verbs. The edition by Lobeck (1820) was followed by *The New Phrynichus*, by W. Gunion Rutherford (1881).

Phrynosome (*Phrynosoma*), a genus of squat Iguanid lizards with keeled scales on the body and sharp bony spines on the head, badly called 'Horned Toads.' They live in arid sandy places in the western half of the United States and Central America; and their yellowish, gray, brown, black colouration is well suited to conceal them against their sun-baked background. They are often about five inches long. Their food consists of small insects, which are caught by rapidly shooting out the tongue. They require water in the shape of dew or drops; they bask in the sunshine by day and bury themselves in the sand for the night. During the winter they lie comatose and hidden. About a dozen species are known, all viviparous. Their peculiarities are many. They look like miniatures of some of the extinct horned reptiles; they pass into a hypnotic state when the top of their head is stroked; when much irritated they squirt drops of blood from their swollen eyelids.

Phthiotis, the south-east corner of Thessaly (q.v.), the home of Achilles.

Phthisis. See TUBERCULOSIS.

Phylactery (Gr. *phylaktērion*, 'an amulet'), the name given in the New Testament to small square boxes of parchment or black calf-skin, containing strips of parchment or vellum with certain texts of Scripture (Exod. xiii. 2-10, 11-17; Deut. vi. 4-9, 13-22) written on them. The phylacteries are worn on the left arm and on the head by all Jews (except Karaites) above thirteen years of age on week-day mornings during the time of prayer. This is done in accordance with their interpretation of Exod. xiii. 9-16. Some Russian and Polish Jews wear phylacteries all day; and they have at times been worn as amulets against demons. The writing of phylacteries is in the hands of privileged scribes (*Sopherim*) only, and many and scrupulous are the ordinances which they have to follow in the execution of this task.

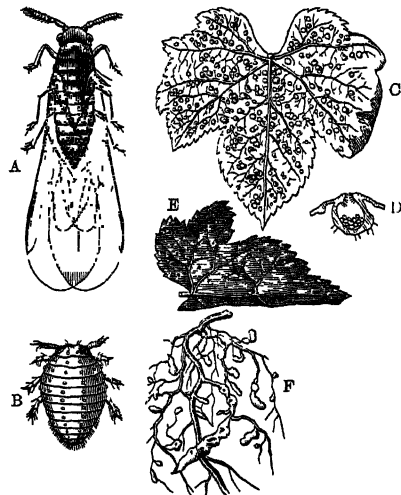
Phyllite, a schistose clay-rock, containing a variable proportion of quartz in grains, together with mica, usually chlorite, and sometimes many accessory minerals. The rock is more crystalline than clay-slate, and passes into mica-schist. The surfaces of the folia in phyllite are frequently finely wrinkled.

Phyllocladus, a genus of Taxaceæ with so-called phylloclades, that is, leaf-like expansions arranged along the axial growth, performing the functions of leaves. Such phylloclades, it may be mentioned here, are very common amongst the Australian wattles, where they present the most diverse forms. True leaves appear in the juvenile state of *Phyllocladus*, to disappear in the third year and to be represented during the adult state by minute scales at the bases of phylloclades. *Phyllocladus* is dioecious and monoecious. The fruit resembles that of the yew. There are four species in New Zealand and Tasmania: *P. glaucus* (vernacular, toa-toa); *P. trichomanoides* (tanekaha); *P. alpinus* (the celery-pine), all in New Zealand; and *P. asplenifolius* (celery-topped pine), in Tasmania. *P. hypophyllus* is found in Borneo, *P. protractus* in Papua and the Philippines.

Phyllopoda. See CRUSTACEA.

Phyllotaxis. See LEAF.

Phylloxera (Gr. *phyllon*, 'a leaf,' and *xiros*, 'dry'), a genus of insects belonging to a family (Phylloxerinae) nearly related to aphides and coccus insects, and included within the sub-order Homoptera in the order Hemiptera or Rhynchota. Two or three species occur in Europe, living like many related forms as parasites on plants. Most important is *P. vastatrix*, which ravages the vine, and has cost France alone a pecuniary loss far exceeding that of the Franco-German war. It seems to have been discovered in North America in 1854, and in all likelihood was carried thence to Europe, where it appeared about 1863. It now occurs in all vine-growing countries. In some of its features it is like a little aphid, measuring about $\frac{1}{8}$ th of an inch in one of its stages, or only a fourth of that in others, varying from yellow to reddish brown in colour. The antennæ are thick,



Life-history of *Phylloxera* (from Leunis).

A, a winged female; B, a wingless female from the root; C, under surface of a vine-leaf, showing the wart-like galls; D, an enlarged section of one of the galls, showing the eggs within it; E, upper surface of a vine-leaf, showing the openings of the galls; F, some of the roots of the vine, showing the nodosities caused by the parasites.

with three joints; the legs are short and thick; there is no trace of the 'honey-tubes' characteristic of aphides; the winged forms, which are all parthenogenetic females, have four wings. As in the nearly related genus *Chermes*—a destructive parasite of conifers—the life-history is exceedingly complex.

Let us begin with the winged females, which in Europe appear from August to October. Each lays about four parthenogenetic ova on the under surface of the vine-leaves. These ova develop in late autumn into males and females—wingless and without the characteristic piercing and sucking mouth-organs—which migrate to the stem of the vine. There each female lays a single egg under the bark. This egg lies dormant throughout the winter, and develops in April or May into a wingless but voracious 'vine-louse.' This form may pass to the leaves, on which it lays parthenogenetic eggs, and forms galls; but in Europe it attacks the roots, and lays its eggs there. From these in about eight days young develop, which become mature females in about twenty days, and lay more eggs in the roots. Half a dozen or more of these parthenogenetic generations follow in rapid succession throughout the summer. The roots become knotted and deformed; the whole plant suffers, and, though it may survive for several seasons, eventually dies.

In midsummer, among the subterranean forms, a generation is born whose members, after four, instead of the usual three, moultings associated with adolescence, become the larger winged females with which we began.

The destruction of this scourge of the grape-vine, without also injuring or destroying the plants, long proved almost impracticable, owing to the difficulty experienced in reaching its subterranean haunts without disturbing or destroying the roots. Water, wherever it can be applied to the soil so as to saturate and keep it saturated for a time, has proved a safe and effectual destroyer, because the insect cannot live in a medium saturated with water for long. Chemical remedies, such as bisulphide of carbon, have been employed experimentally with success, but are found to be too expensive for general application on a large scale, even were the practical difficulty of conveying them into all depths of the soil and diffusing them in it surmountable. Several cases of attacks of phylloxera on vines in vineries in England have occurred since 1865. These attacks have been usually met by the process of 'stamping out.' The vines were destroyed by burning, the earth in which they grew was wholly removed, the walls of the vinery and the floor of the border on which the earth rested were thoroughly cleansed with salts or corrosives, and a fresh start was made with new earth and new vines; but while practicable to this limited extent, the remedy is obviously inapplicable to vineyards in districts collectively covering thousands of acres. In some of the French vineyards grafting the cultivated vines on certain of the native vines of America or replanting the vineyards with American vines was found the most effective remedy. Although the insect seems to feed on the roots of these vines, the greater vigour of the American stocks appears to enable them to resist the injuries inflicted on them. Sulpho-carbonate of potassium is another chemical aid. Another method tried is the cherishing and multiplication of the numerous natural enemies of the phylloxera—*Hophlophora arcuata*, *Polyænus lagurus*, *Thrips*, *Aphidius*, &c. The devastations were not serious in Austria and Portugal till 1872, in Germany till 1881; the Cape, Algeria, and Australia were reached in 1880–85; but France (q.v.), suffered by far the most. Other species or varieties occur on the oak, the hickory, the chestnut, and the willow.

See M. Cornu, *Études sur le Phylloxera vastatrix* (1879); J. Lichtenstein, *Histoire du Phylloxera* (1878); Planchon, *Les Mœurs de la Phylloxera* (1877); Dreyfus, *Ueber Phylloxerinen* (1889); Majet, *Les Insectes du Vigne* (1890); and Taverner's *Report on the phylloxera in Victoria* (1899).

Phylogeny (Gr. *phylon*, 'race,' and *genesis*), a biological term applied to the evolution or genealogical history of a race or tribe. It is used in contrast to 'ontogeny'—the development or life-history of an individual; witness Haeckel's 'biogenetic law': 'Ontology is a recapitulation of Phylogeny.' See DARWINIAN THEORY, EMBRYOLOGY, EVOLUTION, HEREDITY.

Phyong-yang (Jap. *Heijo*), the leading city of northern Korea, historically important; pop. 86,000.

Physalia. See PORTUGUESE MAN-OF-WAR.

Physalis, an American genus of Solanaceæ. See CAPE GOOSEBERRY, WINTER CHERRY.

Physeter. See WHALE.

Physical Chemistry. The recognition of physical chemistry as a distinct branch of natural science may be said to date from the foundation of the *Zeitschrift für physikalische Chemie* by Ostwald in 1887.

The first volume contained an account by Van't Hoff of the analogy which he had shown to exist between gaseous pressure and the osmotic pressure of a substance in solution, and another by Arrhenius developing his theory of the electrolytic dissociation of substances dissolved in water. The following year Ostwald was made professor of Physical Chemistry at Leipzig, which became the centre from which early enthusiasm for the subject radiated. He was joined by Nernst, who developed the theory of the electromotive force produced by the solution pressure of ions, by Arrhenius from Sweden, by Beckmann, who worked out the methods of molecular weight determinations based on the new theories, and by a succession of men since distinguished by the success of their labours in applying the principles and methods of the more exact and more abstract science of physics to the problems arising from the rapidly-increasing mass of chemical data. Journals have since been founded in America, France, and England dealing exclusively with physical chemistry.

On the experimental side, the physical chemist applies the methods and apparatus of the physical laboratory to the practical problems of chemical change, measuring changes of energy, determining the velocity and acceleration of chemical change, and the conditions of equilibrium, the dependence of these upon temperature, upon the medium, upon radiation and electric charge. He uses the calorimeter, the thermocouple, the galvanometer, the electrometer, the spectroscope, polarimeter, refractometer—in fact, the whole range of physical instruments. On the theoretical side he accepts those laws of physics which are most fundamental, and have been most firmly established, the first and second laws of thermodynamics, the kinetic theory of gases, the laws of electrostatics and electro-magnetism: a physical chemist discovered the third law of thermodynamics, and several of the Nobel prizemen in chemistry have utilised almost entirely the methods of physics. As regards theories of radiation, physics has not yet emerged from a state of revolution, and the physical chemist remains in a state of some perplexity and suspense.

Atomic Theory (q.v.).—The existence of atoms and molecules is no longer to be treated as a matter of speculation or mere theory, but as established fact. Though it is not possible to see a single unelectrified atom, yet the tracks of single atoms can be seen and photographed (charged helium atoms, so-called *α* particles). The fortuitous motion of very small particles (Brownian motion) can be seen with the aid of the ultra-microscope, and resembles the hypothetical motion of the molecules of a gas. It is not the existence of the atom but its structure which is now the subject of discussion and investigation.

The following data indicate the kind of exact knowledge now acquired about the atom and molecule:

The weight of an atom of hydrogen = 1.66×10^{-24} gram.

The diameter of an atom about = 1×10^{-8} cm.

The number of molecules in a gram-molecule = 6.06×10^{23} (Avogadro number).

The distance apart of the atoms of sodium and chlorine in a crystal of common salt = 2.81×10^{-8} cm.

Structure of the Atom.—The theory now generally accepted is that the atom consists of a central nucleus of positive electricity, of which the diameter is of the order 10^{-13} cm., round which are grouped electrons over a sphere of radius about 10^{-8} cm. It may be compared to the solar system. There are at present two working hypotheses—one, due to Sir J. J. Thomson, and extended by Kossel, G. N. Lewis, Langmuir, and others, regards the electrons as occupying or oscillating about positions of equilibrium in the atom, and this is the most convenient

model for the chemist to use when dealing with atoms in ordinary chemical change, not emitting light; the other, due to Bohr and elaborated by Sommerfeld and others, postulates motion of the electrons in orbits round the nucleus, and this model has achieved marvellous success in accounting for the spectrum of hydrogen and helium. The electron is supposed not to emit radiation while describing its orbit, but when it drops from one orbit to another with loss of energy it emits light of wave-length exactly determined by the 'quantum' of energy lost, and when it absorbs light it does so by receiving a 'quantum' of energy exactly sufficient to enable it to jump into another fixed orbit. The discovery of radium and the study of radio-activity, notably by Rutherford, has led to knowledge of the structure of the atom which previously was beyond the range of speculation. Not only was it found that well-known elements were formed by the spontaneous disintegration of heavier ones, but, further, that the products of radio-active change resulted in the formation of elements which, though chemically identical, possessed different atomic weights. For such the name *isotope* was coined by Soddy. Later, in 1919, Aston, by a refinement of existing methods of examining the positive rays produced by the electric discharge in rarefied gases, showed that the ordinary stable chemical elements were in many cases *mixtures* of isotopes, so that the atomic weights obtained for them by chemical methods were merely averages: the atomic weight of each isotope is a whole number (oxygen = 16). One important result of this was the removal of long-outstanding difficulties in the periodic table of the elements.

As the result of work on X-rays begun by Moseley in 1913, it is now known that the frequency of vibration of the X-rays which are characteristic of an element depends on the *atomic number* of the element. On the present nuclear theory of the atom it is considered that the atomic number is equal to the number of units of positive charge on the nucleus, and both are equal to the number of electrons surrounding the nucleus. The periodic law in the light of these new facts is a necessary outcome of atomic structure, the chemical properties of the elements depending on the number, arrangement, and stable configuration of the electrons. Thus, the atomic number of sodium is 11, it comes eleventh on the list of elements, and is regarded as containing a positive charge of eleven units and eleven electrons round the nucleus.

The difficulties which beset the theory of the atom affect the chemist chiefly when the theory is applied to molecules. The crystallography founded on work with X-rays has greatly increased our knowledge of the relative positions of the atoms in solids; in a crystal of rock-salt, for example, molecules do not exist as they do in gases; the atoms are held together by the electrostatic forces between the electrons of all the adjacent atoms and not merely by attraction in pairs. In the case of sodium and chlorine the union to form a molecule is probably the result of a loss of one electron by the sodium atom and the gain of it by the chlorine; the latter will have become negatively charged, the sodium positively; thus, the molecule is held together by the resulting electrostatic attraction between the two; the atoms in the chlorine molecule itself are regarded as held together by the sharing of two electrons. The problem of molecular structure has developed into the problem of locating the relative positions, not only of the atoms as a whole, but also of the electrons, and thus another bridge has been thrown across the gap separating chemistry from physics.

Gas Laws.—The major part of physical chemistry in the past has been the study of the well-known

gas laws in their application primarily to chemical change among gases and their extension to solutions, liquids, and solids.

The behaviour of a gas when subjected to changes of temperature, pressure, and volume is summed up in the statement that, for a given mass of gas, $pV = RT$. If the pressure is taken as one atmosphere and the volume as 22.4 litres, T the absolute temperature 273 (0°C.), then the value of the gas-constant, R , is .082, or in heat units nearly 2 calories per degree. For low temperatures or high pressures or for vapours near their condensing-points, deviations from this simple law become marked. In such cases the equation of Van der Waals is employed $(p - \frac{a}{v^2})(v - b) = RT$, where a denotes the coefficient of attraction between the molecules and b is four times the volume of the molecules.

The conception of a gas elaborated in the kinetic theory of gases regards the gas as composed of an enormous number of particles in rapid rectilinear fortuitous motion, making a prodigious number of collisions per second, so that their paths are exceedingly short. In a mixture of gases the heavier particles move more slowly, but the average energy of all particles, light or heavy, will become the same (equidistribution of energy).

Avogadro's hypothesis is a simple deduction from the theory which shows that equal volumes of gases under the same conditions contain the same number of molecules, and Graham's law of diffusion also follows—viz. that the rate of diffusion of a gas is inversely proportional to the square root of its density.

Liquids can be treated as very imperfect gases, and in dealing with them Van der Waals's equation may be used.

In a solid the forces between the particles are strong enough to prevent them wandering about, but if the temperature is raised the amplitude of vibration increases until at the melting-point they begin to slide over each other. Even in solids the molecules at the surface have sufficient energy to fly off and form vapour, the pressure exerted increasing as the temperature increases. This vapour-pressure is much greater for the liquid than for the solid, and at a definite temperature it has a definite value. If the substance is contained in a closed space, the molecules will be continually striking the surface, and the rate at which they condense will be exactly the same as the rate at which they fly off; on raising the temperature, the rate of escape increases more rapidly than the rate of return, and the vapour-pressure increases. When the pressure reaches that of the atmosphere, the temperature is called the ordinary boiling-point.

Osmotic Pressure.—If a solution of sugar is placed in a tube, the bottom of which is closed by a membrane, and the tube immersed in water, the level of the liquid in the tube will rise slowly owing to water passing in from below. Such a membrane, which allows water to pass through but not sugar, is called *semi-permeable*. As the level rises, the pressure on the inside of the membrane increases, and this will continue until it is sufficient to counteract the tendency of the water to come through. This phenomenon is known as osmosis, and the pressure as osmotic pressure. The apparatus can be modified so that the solution does not become appreciably diluted, and then it is found that the pressure depends on concentration and on the molecular weight, and is directly proportional to the absolute temperature. As already mentioned, Van't Hoff discovered that the osmotic pressure due to a substance is the same as the gaseous pressure which it would exert in the form of gas if it could exist in that form at the same temperature and occupying the same volume as that of the

solution. The gas-constant R has the same value for a substance in solution if p is the osmotic pressure. Quite analogously, knowing the osmotic pressure, volume, and temperature of a solution, we can calculate the molecular weight of the dissolved substance. Moreover, the effect of dissolving a substance is to diminish the vapour-pressure of the solvent directly in proportion to the osmotic pressure—that is, inversely as the molecular weight of the substance. The osmotic pressure is difficult to measure; the decrease in vapour-pressure is not. But still easier to measure are changes in the boiling- or freezing-points, and for dilute solutions these are almost exactly proportional to the change in vapour-pressure; hence, by an accurate determination of the rise of the boiling-point or depression of the freezing-point, the molecular weight of a dissolved substance can be determined. The method has proved of great value, particularly for substances which could not at all, or only with difficulty, have been obtained in the gaseous state.

Dissociation.—It was noticed that many substances gave results which did not agree with their known molecular weights. In water, for instance, the effect on the boiling- and freezing-points was much too big, as though their molecular weight was too small. Similar results were known for some gases, and had been explained as being due to dissociation of the molecule—e.g. ammonium chloride splitting up into ammonia and hydrogen chloride. A similar theory was introduced to explain the low molecular weights in solutions, but it was further noticed that such solutions were conductors of electricity, the salts were electrolytes, and that there was a very close parallel between the conductivity conferred on the solvent by a given weight of a substance and the osmotic pressure, rise in boiling-point, &c. The theory of electrolytic dissociation harmonised these facts. Thus, when sodium chloride dissolves in water, some of the molecules are supposed to split up into sodium and chlorine ions—i.e. sodium atoms which have lost an electron, and chlorine atoms which have gained one, and the motion of these in opposite directions constitutes the electric current. The more dilute the solution, the more the dissociation; the greater the conductivity for a given weight of substance, the greater the osmotic pressure, &c. Though the results are not absolutely concordant, the agreement is remarkably close. The theory met with considerable opposition at first, but its successful application in almost every branch of chemistry established it firmly as the working hypothesis at the beginning of the 20th century.

The rôle of the solvent in producing dissociation is not fully clear, but the most important factor appears to be its specific inductive capacity or dielectric constant. If two charged particles attract each other with a certain force in air, they will attract each other with only half the force in benzene, and only about one-eightieth the force in water, the dielectric constants being in the ratio 1 : 2 : 80. Probably the water acts, in part at least, by diminishing the electrical attraction between, say, the sodium and chlorine ions in the crystal, so that it passes into solution, and the ions are free to move about. Possibly also there is some kind of combination between the water, or other solvent, and the dissolved substance. One very important law has been discovered and appears to be accurately true for non-aqueous solutions—viz. that the undissociated part is proportional to the cube root of the concentration (i.e. directly proportional to the distance apart of the molecules of the substance) divided by the dielectric constant. Thus, if α is the fraction of the substance which is dissociated, $(1-\alpha)$ is the undissociated portion, v the volume

which contains the molecular weight, D the dielectric constant, then $(1-\alpha)^{1/3}/vD = \text{a constant} = \text{about } 41.5$.

Colloidal Solution.—Graham found that soluble substances could be divided into two classes according to whether they did or did not pass through certain membranes: those which could be called crystalloids, those which could not be called colloids. To the process of separation he gave the name dialysis. As many animal and vegetable substances are colloids, their solutions are of great importance in the chemistry of living matter. In colloidal solutions the particles are not single molecules, but aggregates of, say, 100 molecules, and these have an electric charge, which in the majority of cases is negative, though the hydroxides of the metals have a positive charge. Instead of speaking of the substance as being in solution, it is said to be in the 'dispersed' phase; if this is liquid, the substance is said to be an emulsoid; if solid, it is called a suspensoid. The latter may be coagulated by the addition of an electrolyte to the solution; if they can be readily re-dissolved, they are termed *lyophile*; if not, *lyophobe*. Gelatine is a good example of the former, for the addition of considerable quantities of neutral salts will coagulate the gelatine, but after the removal of the salt it will re-dissolve.

The rate of diffusion of colloids is very slow, the osmotic pressure very slight, the boiling- and freezing-points of their aqueous solutions only slightly different from those of pure water. Under the influence of electrical force the charged colloidal particles move slowly, the phenomenon being called 'cataphoresis.' The particles can be made visible by means of the 'ultra-microscope,' which consists of a horizontal beam of light sent through the solution, so that the light scattered by each particle can be viewed through a powerful microscope above it: bright points of light are seen moving rapidly in all directions. Colloids can be separated by 'ultra-filtration'; for this purpose an ordinary filter paper is soaked in gelatine and then placed in formalin to harden the film; a membrane is thus obtained, which when properly supported will withstand a pressure of several atmospheres; crystalloids will pass through these films, and it is possible to make them of varying permeability, so that under a certain pressure one colloid will pass through, but another not.

Soap solutions, a very important class of colloids, are salts of a weak acid and a strong base, but are only slightly hydrolysed in solution. They can exist either in the form of a fluid 'sol' or a transparent 'gel' or as a white curd.

Thermo-chemistry.—The quantity of heat required to raise one gram of a gas 1°C . (its specific heat) is greater if the gas is allowed to expand than if its volume is kept constant: the difference for a gram-molecular weight is very nearly two calories. If the gas contains only one atom in its molecule, the values for the two molecular heats will be 3 and 5, and their ratio 1:67. For gases containing two or more atoms in the molecule, the molecular heat at constant volume will be greater than 3, for, in addition to raising the temperature, some of the energy is used up inside the molecule; the ratio of the specific heats is then less than 1:67: thus the determination of the ratio gives valuable information as to the constitution of the molecule. By resorting to this method Ramsay found that argon contained only one atom in its molecule; he determined the velocity of sound in the gas, from which the ratio of the specific heats could be calculated.

Dulong and Petit, in the early days of the atomic theory, discovered that the atomic weight \times specific heat was roughly constant, about 6.4, the exceptions being few. It was thus possible to decide the

very important question as to which multiple of the equivalent weight was the atomic weight—viz. that value which when multiplied by the specific heat gave a product near to 6.4. Recent research has shown that close to the absolute zero the specific heat vanishes. As the temperature rises, the specific heat increases as the cube of the temperature, and is a *periodic* function of the atomic weight, like so many other properties of the atom; it is only at higher temperatures that Dulong and Petit's law is correct.

Heat of Formation.—When 12 grams of carbon are burnt to form carbon dioxide, 97,650 calories of heat are produced, and this value is termed the heat of formation of carbon dioxide. When 2 grams of hydrogen are burnt, the heat evolved is 58,300 calories: this is the heat of formation of steam.

In the case of a substance such as benzene, where the heat of formation cannot be directly determined, it can be derived from the above figures together with the known *heat of combustion*. Thus, when 78 grams of benzene are burnt, 777,000 calories are produced; but the combustion of the carbon and hydrogen in the benzene would, if burnt separately, have supplied 760,800 calories. In this case, as the benzene gives more heat than its constituents, it must have been formed with *absorption* of heat, and its heat of formation is $760,800 - 777,000 = -16,200$.

Most chemical changes which take place at the ordinary temperature, which must be regarded as low compared with such temperatures as those of the sun, say 6000°C ., result in the evolution of heat (exothermic). In all such cases, if the change is effected at higher temperatures, the heat evolved will be less, and it is a matter of great importance to know not merely the heat-change at any temperature, but also how this varies as the temperature is changed. Application of the second law of thermodynamics to chemistry enables us to calculate the extent of formation or decomposition of a given compound if we know how the heat of reaction varies with the temperature. The application of this law has led to results of the most far-reaching importance—e.g. the so-called 'phase rule' of Gibbs. The law of mass action (see below) was deduced from the second law by Van't Hoff, who also worked out the relationship existing between the heat evolved in a reaction and the rate of change of the equilibrium constant K (see below)

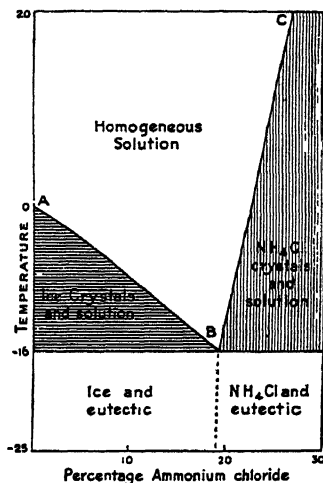
with change of temperature: $\frac{d \log K}{dt} = \frac{Q}{RT^2}$, from which, knowing the equilibrium constant for two neighbouring temperatures and the heat evolved, Q , at one temperature, T , we can calculate the equilibrium constant over quite a long range of temperature.

The reason for the heat of a reaction being different at different temperatures is that the specific heats of the substances taking part in the reaction are different at different temperatures. It is thus possible, with the help of data for the specific heats, to calculate the extent to which a chemical change will take place at some temperature at which it might be difficult or impossible to experiment. The third law of thermodynamics, which originated as a surmise by Nernst and was confirmed by determinations of specific heats at the lowest temperatures obtainable, is a consequence of the fact that the capacity for the heat of all pure substances vanishes as they approach absolute zero. Knowing this, Nernst has shown how it is possible to calculate in advance from purely thermal data the extent to which any chemical change will take place.

Chemical Statics and Dynamics.—A chemical reaction, which under certain conditions goes in one direction, can frequently be made to go in the opposite direction by altering the conditions: such a

reaction is said to be reversible. Thus, calcium carbonate when heated splits up into calcium oxide and carbon dioxide, but the two latter substances unite on cooling to form calcium carbonate again. If the heating is done at a certain temperature in a closed vessel, the carbon dioxide is given off until its pressure has reached a definite value and the change will appear to have ceased. In reality both the decomposition and the combination are proceeding simultaneously, and a condition of equilibrium has been reached. It is analogous to the equilibrium between a liquid and its saturated vapour. The actual rate of chemical change is often not easy to measure, but the composition of an equilibrium mixture is comparatively easy to determine.

Phase Rule.—In the case of water and aqueous vapour there is a definite equilibrium at a definite temperature, rise of temperature causing evaporation until the pressure of the vapour has reached a new value and a new equilibrium has been established; similarly, in more complicated cases where more than one species of molecule is present, and where solid liquid and gaseous states may all co-exist, equilibrium can be maintained under perfectly definite conditions. The study of such problems is greatly assisted by the help of diagrams such as that given in the figure, which represents the be-



haviour of ammonium chloride and water (simplified by neglecting the aqueous vapour). The line BC may be called the solubility curve for ammonium chloride; the line AB represents the effect of dissolved ammonium chloride in lowering the freezing-point of water. If a concentrated solution of ammonium chloride is cooled, the salt will crystallise out until the temperature -16 is reached, when ice will also crystallise out with it; if a dilute solution is cooled it will be ice that crystallises out, until at -16 it is joined by crystals of ammonium chloride. The mixture of ice and ammonium chloride crystallising together at -16 is called the 'eutectic' mixture.

The relationship between the number of phases which can co-exist and the number of chemical substances (components) present under definite conditions of concentration, temperature and pressure, can be expressed in very general form by the 'phase rule' worked out by Gibbs. Denoting the number of phases co-existing by n , the number of components by y , and the number of degrees of freedom by F (i.e. the number of conditions that can be fixed arbitrarily without altering the number of phases), then the rule is that

$$n + 2 = y + F.$$

Resort to the phase rule and phase diagrams has cleared up many difficult problems, such as that of the Stassfurt deposits of crystalline minerals, and has in very recent times led to important advances in chemical manufactures.

Law of Mass Action.—The fundamental law that the rate of a chemical change is proportional to the active mass or concentration of the reacting substances was first fully grasped by Guldberg and Waage, and elaborated in a book published in 1867. If one substance, A, unites with another, B, to produce a third, AB, and if their concentrations are a , b , and c respectively, then the rate of formation of AB is proportional to both a and b , and we may write: velocity of formation $= ab \cdot k$, where k is the 'velocity constant.' Similarly, the velocity of the reverse action $= k' \cdot c$.

When equilibrium has been reached the two rates will be equal, and we have $k \cdot ab = k' \cdot c$, or, $\frac{k}{k'} = \frac{c}{ab}$; we write $\frac{k}{k'} = K$, and call it the 'equilibrium constant': it has been referred to already. The law of mass action is applicable to the whole field of chemistry. A few instances will be given.

(a) *Gases.*—At ordinary temperatures the formation of hydrogen iodide from iodine and hydrogen is too slow to be measurable; at 250° C. it would take months to reach equilibrium, at 350° C. it would take days, but at 450° C. only hours; reaction velocity always increases with rise of temperature, also with increase of pressure. No matter whether we start with the hydrogen and iodine or with the hydrogen iodide, the composition of the mixture will be the same when equilibrium is reached, and the pressure in this case will not affect the composition, as the number of molecules does not change during the reaction. (b) *Liquids.*

—Here the most familiar example is the action of ethyl alcohol on acetic acid, forming ethyl acetate and water; the rate of formation can conveniently be measured by titrating the acetic acid remaining uncombined as the action proceeds. If equivalent quantities of alcohol and acid are taken, equilibrium is reached when two-thirds of each has been transformed. (c) *Solutions of Electrolytes.*—When, for example, acetic acid dissolves in water, it is partially ionised into hydrogen ions and acetions, and these tend to re-unite. Equilibrium will be established when the rate of dissociation equals the rate of re-combination. In a normal solution this is the case when about 4 per cent. of the acid is dissociated.

Ostwald's Dilution Law.—If c denotes the concentration of the undissociated acid, and c_1 that of either of the ions, then the equilibrium constant $K = \frac{c_1^2}{c}$. If we denote the fraction of the acid

dissociated by α , the remainder will be $1 - \alpha$, and if v litres contain one gram-molecule of electrolyte

$$C = \frac{1-\alpha}{v}, \quad c_1 = \frac{\alpha}{v}, \quad \text{and} \quad K = \left(\frac{\alpha}{v}\right)^2 \cdot \frac{v}{1-\alpha} = \frac{\alpha^2}{(1-\alpha)v}.$$

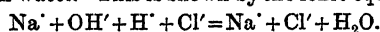
This dilution formula has been found satisfactory for a very large number of substances in dilute solution, but it is incorrect for 'strong,' i.e. highly ionised, electrolytes. As the strength of an acid depends on the number of H' ions it sends into the solution, we can compare the strengths of acids by comparing their equilibrium constants: thus, K for acetic acid is 0.000018, whereas for trichloroacetic, which is much stronger, K is 0.00155.

The effect of adding hydrochloric acid to a solution of acetic acid is to reduce the dissociation still further, for, with the increased number of H' ions present, the undissociated acetic acid can no longer maintain the equilibrium, and some of its ions will associate. Similarly, if sodium acetate were added, the increase in the number of acetions

would cause some of those present to associate with the hydrogen ions, and the solution would become less acid. This method of adding a common ion has many important applications.

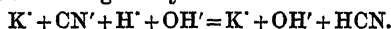
Neutrality.—Several lines of investigation show that water is itself dissociated into hydrogen and hydroxyl ions; at the ordinary temperature the ionic concentration of these is about 1×10^{-7} , i.e. a litre of water will contain about 1 ten-millionth of a gram of hydron and 17 ten-millionths of a gram of hydroxidion. This actual concentration is minute, but it plays a very important rôle in the explanation of many chemical facts.

As H' is the characteristic ion furnished by acids, and OH' is the ion typical of bases, when their concentrations are equal the solution is 'neutral.' Assuming a normal solution of a strong acid to be completely ionised, such a solution will contain one gram of H' ions per litre, and the OH' ions will be reduced to 17×10^{-14} of a gram. In a normal solution of, say, sodium hydroxide there will be 17 grams per litre of OH' ions and 1×10^{-14} of a gram of H'. The neutralisation of an acid by a base is essentially the combination of these ions to form water. This is shown by the ionic equation:



This explains the fact that the heat of neutralisation of all strong acids by strong bases is the same—viz. 37,400 calories per equivalent weight: it is the heat of association of water.

Hydrolysis.—The ionisation of water produces its most notable effect in solutions of substances which are themselves only slightly ionised, such as weak acids and bases and their salts. In such cases the H' and OH' ions produce a marked effect on the final equilibrium. Thus potassium cyanide in solution is 'hydrolysed' to about 1 per cent., due to the acid being a very weak one:



This accounts for its alkaline reaction and its smell of prussic acid. Similarly, sodium carbonate, the salt of the very weak carbonic acid, is hydrolysed and has an alkaline reaction. On the other hand, aluminium chloride and aniline hydrochloride are examples of weak bases whose salts consequently give an acid reaction.

Indicators.—Many substances are known which possess a different colour according as they are in an acid or an alkaline solution; their sensitiveness depends upon the concentration of the H' or OH' ions, at which the change in colour takes place. It is possible to choose an indicator so that the colour change occurs sharply at the point desired.

Chemical Kinetics.—The actual rate of chemical change was measured very simply in 1850 by Willhelmy in the case of the inversion of cane-sugar:



A solution of cane-sugar rotates the plane of polarised light to the right, but when allowed to stand in the presence of acids it slowly combines with water, splitting up into dextrose and levulose, the solution of which rotates the plane to the left. The rate of change can be timed by watching the solution through a polarimeter. It is found that the rate at any time is proportional to the concentration of the cane-sugar. As the rate also depends on the degree of dissociation of the acid, this method can be used for comparing the relative strengths of different acids. As in the above case, when the change in the solution results from the change of only one species of molecule, the reaction is said to be 'monomolecular.' Another somewhat similar example is the addition of water to methyl acetate resulting in the formation of methyl alcohol and acetic acid. In this case the

action can be followed by titrating the acid from time to time. The reaction proceeds more rapidly in the presence of a little acid.

Bi-molecular Reactions.—In the previous case, if an alkali is used instead of an acid, hydrolysis takes place, but its rate at any moment depends not only on the amount of ester left in the solution, but also on the amount of alkali, i.e. the hydroxyl ions, and *both* of these are changing simultaneously $\text{CH}_3\text{COOCH}_3 + \text{K}^+ + \text{OH}^- = \text{CH}_3\text{OH} + \text{K}^+ + \text{CH}_3\text{COO}^-$. The rate can be measured by titrating with acid at intervals as the action proceeds.

Catalysis.—The rate of a chemical change is often found to be greatly influenced by the presence of small quantities of certain substances which do not themselves suffer any final change. Such substances were called by Berzelius 'catalysts.' The phenomenon of catalysis covers a very wide range, for there are many different kinds of catalysts. Some may be compared with lubricants which facilitate the operation of machinery without being part of it; others to middlemen whose function is to acquire and then to re-distribute; in other cases they act like a siphon connecting a mountain lake over a ridge to a power-station below: if once the initial energy can be supplied to raise the water to the top of the siphon, then the energy in the lake becomes available, say, for driving turbines. Among the most familiar examples are the use of finely-divided platinum in promoting the combination of hydrogen and oxygen to form water, and of SO_2 and oxygen to form SO_3 , the use of acids and bases in hydrolysis, as described above, the necessity of traces of moisture as in the case of phosphorus burning in oxygen, recent important applications such as the synthetic manufacture of ammonia from nitrogen and hydrogen in the presence of certain metals, and the hydrogenation of liquid fats in the presence of nickel rendering them suitable substitutes for butter. The action of light may also be regarded as catalytic in producing certain photo-chemical changes.

Electro-chemistry.—The quantitative foundations of electro-chemistry were laid by Faraday in 1833. He discovered that when an electric current is passed through a solution of an electrolyte the amount of decomposition is proportional to the amount of electricity which passes through, and that the amount of each substance produced is proportional to its equivalent weight, one equivalent of each element requiring 96,540 coulombs (ampere-seconds). This quantity is now known as a 'faraday.'

Conduction.—We picture the electric current in a metallic conductor as being carried by swarms of electrons capable of moving with great speed: when these arrive at the surface of an electrolyte they attach themselves to the positive ions, which have been attracted to that electrode, and neutralise them: the anions carrying their negative charge are attracted to the anode, where they lose an electron and are neutralised. The resistance of electrolytes is in accordance with Ohm's law, and is measured in much the same way as for metallic conductors, except that an alternating current must be used to avoid effects due to 'polarisation,' and a telephone is often used in place of a galvanometer. As the conductivity depends on the number of ions present in the solution, Arrhenius perceived that it should be possible to calculate the degree of dissociation by comparing the molecular conductivity at different dilutions. Thus, if the molecular conductivity at dilution v is denoted by λ_v , and at very high dilution by λ_∞ when the dissociation may be regarded as complete, then the degree of dissociation at dilution v will be $\frac{\lambda_v}{\lambda_\infty}$. This

method has been extensively used for determining degree of dissociation.

Transport Numbers.—The solvent offers greater resistance to the passage of some ions than to that of others—e.g. hydrogen ions can travel most rapidly of all. In certain cases it is possible to measure the actual velocity: for hydrogen the speed is about 1 cm. in five minutes under a force of one volt per centimetre. The relative velocity, however, is easily determined as a result of the difference in concentration caused at the electrodes during electrolysis owing to the different rates of the two ions. This was first perceived by Hittorf in 1853. If u is the velocity of the kation and v that of the anion, the total current passing will be proportional to $u + v$, but $\frac{u}{u + v}$ will represent the fraction of the current carried by the migration of the kations and $\frac{v}{u + v}$ the fraction carried by the anions. Equivalent quantities must be *liberated* at the electrodes, but from the change in the composition of the solution round the electrodes the ratio $\frac{u}{v}$ can be calculated.

Electromotive Force.—When a metal is placed in a solution of one of its salts it tends to send out into the solution positively charged ions of the metal. The solution acquires a positive charge and the metal a negative one. The attraction of the charged metal holds the ions in a layer round it. This tendency, called by Nernst the solution pressure of the metal, is different in degree for each metal, and can be determined by the difference of potential between the metal and a normal solution of one of its salts. Placed in order according to the magnitude of this force, the elements form an electromotive series with the alkali metals at the positive end and the halogens at the other. If we have zinc dipping into zinc sulphate and copper into copper sulphate, the liquids being separated by a porous plate, then, on connecting the zinc and copper by a wire, electrons will flow along the wire from the zinc to the copper, and a voltmeter placed in the circuit will indicate about 1.1 volts. The explanation of this is found in the greater tendency of the zinc to send out positive ions into the solution. As soon as the circuit is completed the negative electrons move along the wires from the zinc to the copper, and the positive ions are no longer held in a layer closely attracted to the electrode, and can move through the liquid to the copper. It is probably this difference between the power of the zinc and copper to send out positive ions that constitutes the electromotive force of the arrangement. This simple form of primary battery is known as a Daniell's cell.

On the assumption that all the chemical energy is converted into electrical energy, the electromotive force can be calculated from the heats of formation of zinc and copper sulphate, and agrees closely with the value found experimentally; the slight divergence being accounted for by the fact of great *theoretical* importance that there is a slight variation of the force with temperature.

Decomposition Potential.—If a very small voltage is applied to a solution of an electrolyte, no decomposition takes place. If the voltage is then slowly increased a point will be reached at which decomposition just begins. This potential is the sum of the potentials required to discharge both the anion and the kation. The value can be found for each ion, and thus it is possible to calculate the minimum voltage that will be required to effect the decomposition of any combination.

Photo-chemistry.—It has been known for more than a hundred years that a mixture of equal

volumes of hydrogen and chlorine when exposed to light will combine with explosive violence; many other cases of photo-chemical change have been studied, both formation and decomposition, and the whole art of photography has resulted from the pursuit of the study in one direction, including the latest branch of colour-photography. The advent of the electrical theory of the atom, and the theory of radiation which followed immediately, culminated in Einstein's simple law of photo-chemical equivalence that the primary photo-chemical change is produced by the absorption of one light quantum by one molecule. The simple conditions which are necessary for the fulfilment of this law are seldom realised, for the energy gained by the molecules is quickly shared on collision with other molecules, or radiated again, and many qualifications have to be introduced. Nevertheless, the conception of the atoms and molecules as planetary electrical systems existing in normal states with fundamental periodic vibrations, which can be raised to definite states of higher activity by the absorption of radiant energy of definite wave-length, has given great stimulus to the study of the effect of radiation on the velocity of chemical reactions. Not only so; the increase of velocity which is caused by increase of temperature is quite inexplicable on the assumption that it is simply due to increase in the average energy of the molecules caused by increased thermal agitation. There are those who maintain that the rate of chemical change is determined not by thermal agitation but by the power the molecules possess of absorbing certain specific radiations. The problem is one of fundamental importance, and at present remains open.

Authors of books recommended on physical chemistry: Introductory, Sir James Walker; more advanced, Nernst, Eucken, H. S. Taylor, W. C. M'C. Lewis, Peirin, *Atoms* (trans. by Hammick).

Physicians, THE ROYAL COLLEGE OF (London), was founded by the munificence of Thomas Linacre (q.v.), a physician and scholar. In 1518, through the influence of Cardinal Wolsey, he obtained from Henry VIII. letters-patent granting to John Chamber, himself, and Fernandez de Victoria, the acknowledged physicians to the king, together with Nicholas Halsewell, Giovanni Franceschi, Robert Yaxley, and all other men of the same faculty in London, to be incorporated as one body and perpetual community or college. They were permitted to hold assemblies, and to make statutes and ordinances for the government and correction of the College, and of all who exercised the same faculty in London and within 7 miles thereof, with an interdiction from practice to any individual unless previously licensed by the president and College. Linacre was the first president, and held the office till his death in 1524. The meetings of the College were held at his house in Knight-bridge Street, which he bequeathed to the College, and which until the year 1860 continued in the possession of that body. About the time of the accession of Charles I. the College, requiring more accommodation, took a house at the bottom of Amen Corner, which was subsequently purchased by Dr Baldwin Hamry, and in 1649 was given by him to his colleagues. This was the seat of the College till 1666, when it was destroyed by the great fire of London. A new College was then built in Warwick Lane, and opened in 1674 under the presidency of Harvey's friend, Sir George Ent; and here the meetings were held till 1825, when the present edifice in Pall Mall East was opened under the presidency of Sir Henry Hallford.

The reason for forming the incorporation, as set forth in the original charter, is to check men who profess physic rather from avarice than in good

faith, to the damage of credulous people; and the king (following the example of other nations) founds a college of the learned men who practise physic in London and within 7 miles, in the hope that the ignorant and rash practisers be restrained or punished. The charter further declares that no one shall exercise the faculty of physic in the said city, or within 7 miles, without the College license, under a penalty of £5; that, in addition to the president, four censors be elected annually to have correction of physicians in London and 7 miles' circuit, and of their medicines, and to punish by fine and imprisonment; and that the president and College be exempt from keeping watch and ward and serving as constable in the city of London. Four years later, 1522-23, an act was passed confirming the charter, and enacting that the six persons before said named as principals and first-named of the said commonalty and fellowship shall choose to them two men of the said commonalty from henceforward to be called and cleped Elects, and that the same elects yearly choose one of them to be president of the said commonalty; and further directing that, in case of a vacancy by death or otherwise, the surviving elects shall choose successors.

In 1540 an act was passed in which it was declared explicitly that 'surgery is a part of physic, and may be practised by any of the company or fellowship of physicians'—a doctrine which in later times has been totally repudiated by the collegiate body, who, until recently, would not admit to their privileges a member of the Royal College of Surgeons unless he formally resigned his surgical diploma. Other acts were passed in 1553, 1814, and 1858; the last known as the 'Medical Act,' providing for the granting of a new charter to the College, which was obtained in 1862. Finally, in 1860, 'an Act to Amend the Medical Act' was passed, which repeals the provisions of the Act of 1522-23 as to the elects, and declares that the presidency shall in future be an annual office, open to the Fellows at large, who shall also be the electing body. As at present constituted, the College consists of Fellows, Members, and Licentiates (some 370 Fellows, 700 Members, and 16,000 Licentiates). The *Fellows* are elected from members of at least four years' standing, who have distinguished themselves in the practice of medicine, or in the pursuit of medical or general science or literature. The government of the College is vested in the president and Fellows only. The present *Members* consist of persons who have attained the age of twenty-five years, and who, with rare exceptions, must be graduates in medicine of a recognised university or licentiates of the College, who do not dispense or supply medicine, and who, after being duly proposed, have satisfied the College that they are fit and proper persons, and that their general education is sufficient. No candidate is admissible if engaged in trade or connected with a druggist's business, or who even practises medicine in partnership with another practitioner, so long as the partnership lasts, or who refuses to publish, when required, the nature and composition of any remedy he makes use of. The *members* are alone eligible for the Fellowship. They have the use of the library and museum and the privilege of admission to all lectures; but they do not take any share in the government or attend or vote at meetings. The examiners for the membership are the president and censors. The *Licentiates* are not members of the corporation; they have access to the museum, lectures, and reading-room, but are not allowed to take books away from the library; they may compound and dispense medicines for *patients under their own care*. Following upon the Medical Act

of 1886, the Colleges of Physicians and Surgeons combine to give a 'double qualification' entitling the holder to practise both medicine and surgery. Holders of the double qualification must be twenty-one years of age, and must have been engaged in professional studies for five years before being admitted to examination. The fee for admission as a Fellow is thirty-eight pounds, exclusive of stamp-duty; the Member's fee is forty guineas, and the Licentiate's twenty guineas.

The following bylaws of the College should be generally known: (1) No Fellow of the College is entitled to sue for professional aid rendered by him. This bylaw does not extend to Members. (2) No Fellow, Member, or Licentiate of the College is entitled to assume the title of Doctor of Medicine unless he be a graduate in medicine of a university. (3) No Fellow or Member of the College shall officiously, or under colour of a benevolent purpose, offer medical aid to, or prescribe for, any patient whom he knows to be under the care of another legally qualified medical practitioner.

THE ROYAL COLLEGE OF PHYSICIANS OF EDINBURGH had its inception in 1617, in an attempt to incorporate the practitioners of medicine, and raise the standard of the profession. King James VI. and I. looked favourably on the proposal, and granted an order for its establishment. King Charles I. also gave the matter his attention and referred it to the Privy-council, and Cromwell in like manner issued a patent in its favour; all these attempts, however, were frustrated by the religious and political dissensions of the times, and it was not until 1681 that the body became incorporated under a charter from Charles II. A new charter with many important provisions was issued in 1861. To the Physicians belongs the honour of having suggested in 1725 the plan of an infirmary in Edinburgh for the sick poor, which has developed into the present magnificent institution. From the first they undertook its medical charge gratuitously. The Royal Edinburgh Asylum for the Insane at Morningside was also first suggested by them in 1791. The College, which in 1926 had over 200 Fellows, possesses a library of about 100,000 volumes, a valuable and interesting museum of *matéria medica*, which is in the keeping of the Pharmaceutical Society at York Place, Edinburgh, and a splendidly equipped laboratory for the purpose of aiding the prosecution of scientific research. An important arrangement was made in 1859 between this college and the Royal College of Surgeons (q.v.) of Edinburgh, making it competent for the two to combine, in order, by a joint examination, to give a double qualification, embracing medicine and surgery. In 1884 a further consolidation of the Scottish medical corporations took place, by the institution of a triple qualification, granted by the Edinburgh colleges and the Royal Faculty of Physicians and Surgeons of Glasgow conjointly. This 'triple qualification' is held by some 4000 medical practitioners.

Physic Nut, a name for certain plants of the genus *Jatropha* (family, Euphorbiaceæ), tropical shrubs or trees, having alternate, stalked, angled or lobed leaves, and corymbs of flowers on long stalks. The Common Physic Nut of the East Indies (*J. Curcas*), now also common in the West Indies and other warm parts of the world, is a small tree or bush, with a milky juice. It is used for fences in many tropical countries, and serves the purpose well, being much branched and of rapid growth. The seeds are not unpleasant to the taste, but abound in a very acrid fixed oil, which makes them powerfully emetic and purgative, or in large doses poisonous. The expressed oil, commonly called *Jatropha-oil*, is used in medicine like croton-oil, although less powerful; it is also used in lamps.

Other species are *J. multifida* and *J. lobata*. *J. longifolia* is got in San Salvador.

Physics, or **PHYSICAL SCIENCE** (Gr. *physikos*, 'natural'), comprehends in its widest sense all that is classed under the various branches of mixed or applied mathematics, natural philosophy, chemistry, and natural history, which branches include the whole of our knowledge regarding the material universe. In its narrower sense it is equivalent to Natural Philosophy, which until of late years was the term more commonly used in Great Britain, and denotes all knowledge of the properties of bodies as bodies, or the science of phenomena unaccompanied by essential change in the objects; while chemistry is concerned with the composition of bodies, and the phenomena accompanied by essential change in the objects, and natural history, in its widest sense, includes all the phenomena of the animal, vegetable, and mineral world. The use (now obsolescent) of the term *Physic* for a branch of this last—viz. the science of medicine—is not peculiar to the English language. The Old French usage recognised *physique* in the sense of medicine; while almost all languages have used some form of the word *physician* for a practitioner of the art. See **SCIENCE**.

Physiocratic School, a school of political economists in France headed by Quesnay and Gournay, who, in opposition to the Mercantile System (q.v.), regarded agriculture as the great source of national well-being, and sought to regulate legislation accordingly. Turgot (q.v.) was the most conspicuous member. See **POLITICAL ECONOMY**.

Physiognomy (from a Latin shortened form of the Gr. *physiognomōnia*), the art of judging of the character from the external appearance, especially from the countenance. The art is founded upon the belief, which has long and generally prevailed, that there is an intimate connection between the features and expression of the face and the qualities and habits of the mind; and every man is conscious of instinctively drawing conclusions in this way for himself with more or less confidence, and of acting upon them to a certain extent in the affairs of life. Yet the attempt to reach this conclusion by the application of certain rules, and thus to raise the art of reading the human countenance to the dignity of a science, although often made, has never yet been very successful. Comparisons were instituted for this purpose between the physiognomies of human beings and of species of animals noted for the possession of peculiar qualities, as the wolf, the fox, &c. The subject was prosecuted by Della Porta (died 1615), Campanella, Cardan, Ingegneri, and especially by Lavater (q.v.). Darwin's *Expression of the Emotions in Man and Animals* (1873) is regarded as the first attempt to base a rational physiognomic system on a basis of modern scientific research; Mantegazza, in *Physiognomy and Expression* (Contemp. Sc. Series, 1890), claims to have begun where Darwin left off. Piderit, in *Mimik und Physiognomik* (2d ed. 1886), proceeds on the obvious fact that the most valuable data are not to be derived from the bony framework of the countenance, but in the mobile parts which express emotion; features which constantly express the same emotion come to be stamped with permanent physiognomic characters. Pathological physiognomy is a systematised effort to diagnose mental or bodily ailments by examination of the varying facial expression. Another practical application of physiognomic study is found in what has been called **Criminology**. See works named in the article under that head.

Physiography, a term formerly used of a branch of mineralogy, was adopted by Professor

Huxley as a convenient name for an exposition of the principles that underlie physical geography, including the elements of physical science. Physiology is thus understood to involve a compendious discussion of gravitation, heat, the composition of the crust of the earth, the movements of the sea, the phenomena of the atmosphere, and many cognate subjects, treated in this work under separate heads. See GEOGRAPHY.

Physiologus. See BESTIARY.

Physiology (Gr. *physis* and *logos*, 'discourse upon nature') is the science which treats of the behaviour of living beings, and of the functions of their parts. It is thus the sister-science to Morphology (q.v.), in which the form of living creatures and the structure and arrangement of their parts are considered. Both are included under the more general term Biology (q.v.). A peculiar use of the term *physis* is due to Hippocrates, who applied it to a spiritual entity which he supposed to be everywhere present, and to keep the processes of the body in order. This use of the word is still kept alive in oft-repeated phrases, as when in speaking of a sick person it is recommended that the cure be left to nature. There is an Animal Physiology, of which this article will mainly treat, and a Vegetable Physiology (q.v.); also a Comparative Physiology, which, however, is still imperfect, for the details of the life-processes have not been investigated in all animals, and our knowledge is most defective in those belonging to the invertebrate groups. In many cases, comparative physiology consists of inferences from morphological data, and such inferences are often erroneous. On the other hand our knowledge of human physiology rests to a great extent upon experimental data derived from the lower animals. Physiological processes, however, are fundamentally the same throughout the animal kingdom. Such differences as are present are differences in detail or degree rather than of kind. Still the animals closely related to man are obviously those which give the most decisive results from the human standpoint. Human physiology used to be termed the Institutes of Medicine, an expression which still prevails in some of the Scottish universities, and which has the merit of indicating that physiology is the corner-stone of pathological and medical science.

But physiology has a wider outlook than this. For as all the organs of the body are mutually related, so that if one is deranged all the others will be more or less affected, so are there close relationships between the various creatures of the globe. Thus, to quote Semper, *Animal Life* (1881): 'If the American prairies were to cease to produce grass, the first result would be the utter extinction of the now numerous herds of buffaloes, and on their existence depends that of the surviving remnant of the ancient Indian population of America. If the various insectivorous birds of North America were exterminated, within a very few years beyond a doubt all the produce of the rich agricultural districts of that continent would be destroyed. If we change the mode of life of any single animal, the change will instantly have an influence on all the other animals whose healthy existence was in any way dependent on its normal function before it was altered.' The most obvious relation of this sort is that which exists between plants and animals; similar ones hold good for human beings in their relationship to other living things, and to each other. Thus Political Economy, the science which treats of the laws of human activities, may from this point of view be regarded as a department of the science of physiology. It is customary to speak of such a wide aspect of physiological science as General Physiology. A

well-known text-book by Max Verworn (*Allgemeine Physiologie*) was one of the first to emphasise this point of view, and in the monumental work of the late Sir William Bayliss (*Principles of General Physiology*, 2d edition 1924), the aims of General Physiology are thus defined in his preface:—'It is "Abstract" Physiology as distinct from the "Applied" Physiology required by the agricultural, medical, or veterinary student for the purpose of his profession. The name of "General" Physiology which I have chosen corresponds very closely with what my honoured teacher, Burdon-Sanderson, used to speak of as "Elementary" physiology, defining it as "the study of the endowments of living material" from which he expected the greatest advances of the future to proceed. This is practically the same view as that taken by the great Claude Bernard, who was professor of "physiologie générale" in Paris from 1854 until he died in 1878. In the lectures which he gave he insisted on the fact that physiology, the science of life, is to be regarded as an autonomous and independent study; in other words, that it is to be cultivated for its own sake, and not merely for its application to the practice of medicine.'

In such endeavours Bayliss, like his predecessors, brought to bear upon the science his deep knowledge of all other branches of biology as well as of chemistry and physics. This is, indeed, the aim of all physiological workers and thinkers, but as a rule the subject is so large that specialisation is the consequence. Some devote their main attention to certain groups of phenomena such as one finds in the nervous system, others to certain modes of investigation as in the large branch which used to be called physiological chemistry, but which has now received the wider title of bio-chemistry. If Bayliss had any special bent it was in the direction of physical chemistry with its mathematical side, and the way such a study of ions, colloids, and the like can be called into service in the investigation of living phenomena.

Knowledge of the bodily functions has been gained in three ways: (1) by observing the normal states of living things; (2) by experiments upon these; (3) by studying the processes of disease. No science can advance rapidly or with certainty without experiment, and most of our precise knowledge of physiology has been gained in this way, from the time when Galen proved that the arteries during life contain blood, or when Harvey demonstrated the circulation of that blood.

Diseases are in a sense experiments made by nature or accident. As an example of how they teach us something of normal functions, we may note the recent progress of knowledge concerning the uses of the formerly mysterious organs now termed the endocrine organs such as the thyroid, pituitary, and suprarenal bodies. When these become hyperactive, their normal function is exaggerated; or when they atrophy the malady produced shows the opposite symptoms.

The functions of the body of the lowest up to the highest types consist essentially of the properties of the living material known as Protoplasm (q.v.). The principal signs of life are: (1) *Irritability*, that is, the property of responding by some change under the influence of an external agent or stimulus; the most obvious of these changes is *movement* (e.g. amoeboid movement, ciliary movement, muscular movement); (2) *Assimilation*, that is, the ability to convert into protoplasm the nutrient material or food which is ingested; (3) *Growth and repair*: this is the consequence of assimilation; (4) *Reproduction* (q.v.), which may be regarded as a variety of growth; (5) The power to *excrete*, or to give out waste materials which are produced in all vital activities.

Of all these signs those numbered (2) and (5) are the most essential. Living material is in a continual state of unstable chemical equilibrium, building itself up on the one hand, breaking down on the other; the term used for the sum total of these intra-molecular rearrangements is *Metabolism*, the building up or assimilative phase being called *Anabolism*, whereas the opposite or disintegrative phase is known as *Katabolism*. The chemical substances in the protoplasm which are the most important from this point of view are the complex nitrogenous compounds known as the *Proteins* or albuminous substances. So far as is at present known, protein material is never absent from living substance, and is never present in anything else but that which is alive, or has been alive, or formed by the agency of living cells. Recent research indicates that there are certain fat-like substances called *lipoids*, which, although present in minuter quantities, share with the proteins their characteristic and essential metabolic behaviour.

Metabolism (German *Stoffwechsel*, or exchange of material), or in more familiar language, nutrition, includes all those processes concerned in the supply of matter and energy to the body and the removal of waste materials. The word food should include not only the solids and liquids, but also the intake of oxygen (Respiration, q.v.); the entry of food is followed by its Digestion (q.v.), the Absorption of the digested food into the Blood (q.v.) and Lymph (q.v.). The movement (circulation) of these fluids ensues, and this insures that all the tissues are bathed in a nutrient stream, and by the same mechanism waste matters are removed from them (Excretion).

Movements are in the main performed by the contraction of muscles definitely arranged especially with relation to the skeletal or supporting structure.

In process of evolution a special portion of the body becomes modified to act as the co-ordinator of all its other processes; this is the Nervous System, which becomes more complex as we ascend the animal scale. It consists of the Central Nervous System (Brain and Spinal Cord), and the nerves by which these headquarters convey messages (nerve impulses) to motor and other effector organs (e.g. secreting glands), and receive impulses which course in the opposite direction, giving the brain information to guide it in the sending out of appropriate outgoing motor and similar impulses; the incoming sensory impulses start in the periphery of the body from the sense organs. These consist chiefly of the eyes, ears, the olfactory region of the nose, the gustatory region of the tongue, and the skin generally, where the impulses reaching the brain are interpreted as sensations of touch, temperature, and pain. The brain is the 'organ of mind,' and the highest faculties of consciousness and initiation have their seat in that portion termed the cerebrum.

The various functions of the body thus briefly enumerated are dealt with in separate articles, but here we may deal with some considerations of general importance.

The first of these topics may be introduced by considering the life of the simplest animals. Almost invisible to unaided sight, flourishing in the stagnant water of ponds, without separate organs, they are little more than tiny masses of the jelly-like substance called *Protoplasm* (q.v.). Their life seems to consist in movement, nutrition, growth, and reproduction; whether they possess the elements of consciousness we can only dimly conjecture; a nervous system is certainly absent. For movement a source of energy is required; this is found in their food—minute organisms, and organic particles dissolved in the water in which they live. These consist of substances of high

potential energy. They are either plants which are able to utilise the energy of the sun for their growth, or remains of plants or animals which have fed upon plants. See *PHYSIOLOGY* (VEGETABLE). Thus we see in animal protoplasm a machine for the transformation of potential energy into other forms of energy, such as the energy of motion, heat, and electrical disturbances. This machinery is constantly breaking down and being repaired, the protoplasmic matter is continually being replaced by new matter similarly combined. But, as the protoplasm is extremely complex, the simpler substances of the food have to be combined and recombined in a series of stuffs of increasing complexity until the complex living matter itself is formed. These combinations are due to certain subtle agents known as ferments or enzymes (see later) in the protoplasm. This power it is which makes growth possible—i.e. the actual increase in amount of protoplasm. The growth of a crystal out of its solution is a process of simpler nature and may seemingly be endless, but growth of a cell never proceeds beyond a certain point, when the process known as Cell-division occurs. The mass of protoplasm divides into two halves, and each half goes on living as before. The necessity for cell-division arises partly from the conditions of the food-supply. Food is absorbed through the surface of the cell, but with growth the mass to be fed increases faster than surface; therefore starvation must occur at a certain stage of growth unless the cell divides. The higher animals are built up of numberless cells (see *CELL*) which have all arisen, by division, from a single cell, the ovum; but instead of becoming separated they have all kept together, joined probably by strands of protoplasm. The cells are massed into tissues and the tissues into organs, the organs having special functions. This difference in the behaviour of the cells of different parts of the body is an example of Division of Labour (q.v.). We can form some idea of its origin. Imagine a cell to divide many times, but the daughter-cells to remain loosely joined together; the outer and inner cells would live under different conditions and would assume different functions. The whole story of the evolution of life, both in the origin of individual forms and in the growth of nations, is simply the process of the division and organisation of labour. For just as an organism is a collection of cells, each having its own life, yet all bound together for mutual service, so is a nation a collection of individual men and women. And as the perfection of an animal is measured by the completeness of the division of labour among its cells, so is the civilisation of a nation measured by the harmony of organisation of its labour. Further, just as there have been many species of animals which have appeared, lived for a time, and then given place to higher species, so there have been civilisations which have flourished for a time and then died away. Any fairly complex civilisation will serve as a type of the division of labour in the body of one of the higher animals. First there are the parts concerned in the getting of food, like the limbs and mouth of an animal. Then the food is prepared for use by other labourers; such are the digestive organs of the animal. The food has to be distributed to all members of the community by merchants and carriers; the blood and the blood-vessels perform this function. The whole community has to be warned of dangers, directed and governed, and made to act harmoniously by the statesmen of a nation; the same things are done by the sense organs, brain, and nervous system of an animal.

We have already noted that the source of energy of an animal lies in its food. The accurate

calorimetric work of Rubner in Germany and of Benedict in America has shown that the law of conservation of energy is true in animal life, that is, that the potential energy of the food is exactly equal to that dissipated as heat, kinetic energy, &c., during life; the results of the earlier work of Lavoisier and others, which indicated discrepancies between intake and output, were due to the imperfection of their instruments. The food is either (1) burned in the tissues as fuel for the protoplasmic machinery, or (2) used to keep that machinery in repair. This twofold aspect of the use of food was clearly recognised by Liebig, who spoke of the fats and carbohydrates (sugar and starch) as heat-forming foods and of the nitrogenous materials or proteins as flesh-forming. This distinction between the heat or energy-forming materials and those essential for growth and repair is not quite so closely limited to the non-nitrogenous and nitrogenous components respectively as Liebig asserted, but is nevertheless in the main correct.

In all cases, however, the food-stuffs have to be prepared (digestion) before utilisation. This renders them soluble and diffusible, the heavy molecules of such substances as starch and protein being broken up into smaller molecules of the sugar called glucose and amino-acids respectively. These products are absorbed into the blood-stream. The third class of food-stuff (the fats) after a preliminary cleavage into glycerine and fatty acids pass in large measure into another set of absorbent vessels, the lymphatics or lacteals, the latter name being given because during absorption they are filled with an emulsion of finely divided fat (chyle), which has a milky appearance. These effects are produced by the various digestive juices (saliva, gastric, pancreatic, intestinal juice, &c.).

The blood so charged with absorbed food-substances passes to the liver, a large organ, which is concerned with carbohydrate and protein metabolism; the sugar is stored as glycogen or animal starch, and given out again as sugar as the other tissues require it. The muscular tissue is the great consumer of sugar, and it is to the cells what coal is to the steam-engine. The liver also forms one of the digestive juices called Bile (q.v.); the importance of the liver in the katabolism of the proteins will be indicated in a later paragraph.

There is, however, a most important food-stuff which requires no digestion. This is oxygen, which is needed by the protoplasm for its life, and for the burning of fuel within the living machinery to get heat and energy of motion. The oxygen is held in the Blood (q.v.) by means of a special iron-containing substance called hæmoglobin, which absorbs it from the air in the lungs, and yet gives it up readily to the protoplasm of the tissues. The blood, as is well known, circulates round and round the body, pumped by the heart. By this stream each cell of the tissues is fed. For each cell is close to a capillary, which is a very thin-walled blood-vessel, through which the fluid of the blood oozes, and thus bathes the tissues. The matter which has thus passed out of the blood-vessels is collected into another system of vessels, the lymphatics, and eventually emptied into one of the great veins. The lymph stream is also the drain into which is thrown by each cell the waste products of its activity. The carbonic acid that is formed in the tissues is carried away by the blood, and escapes out of the system from the lungs, or, in aquatic animals, by the gills, which play the same part. The waste materials are chiefly products of oxidation, and of these carbonic acid is the most abundant; but hydrogen, sulphur, phosphorus, and other elements are also oxidised, forming water, sulphates, phosphates, &c., respec-

tively, and these are excreted mainly by the kidneys, although the sweat-glands of the skin participate in their excretion. Some of the water is also exhaled in the expired air by the lungs. This leaves us to deal with the nitrogenous waste; and here, as already indicated, the liver has important work to do. We take our nitrogen not in the simple form abundantly present in the atmosphere, but in the shape of the most complicated compounds known to chemists, which they call proteins; after undergoing cleavage into simpler materials, the products of cleavage pass to the tissues where they are utilised for growth and repair, but by far the greater bulk is worked up into the special material called urea by the liver, whence it is taken to the kidney by the blood, and cast out of the body by the kidneys; urea forms the chief solid substance dissolved in the urine. Other waste nitrogenous matter in the shape of uric acid and other katabolites have a somewhat similar history.

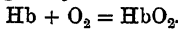
Enzymes.—Allusion has already been made to the activity of these ferment-like agents in our account of protoplasm. The digestive juices are enabled to act in virtue of such catalytic agents, some acting on one, others on other varieties of food-stuff. The majority of the chemical changes in the metabolic cycle in the tissues are also brought about by similar subtle materials, which by their presence accelerate changes, though they themselves do not participate in the final products formed.

An illustration may help in the understanding of the word catalyst. If starch and water are mixed together it is conceivable that in time the two will unite, and the starch molecule split into its constituent molecules of sugar. Such a cleavage, due to the entrance of water, is called hydrolysis (splitting by water), but in these circumstances the process would occupy such a long time (perhaps years) that for practical purposes it does not occur at all. If the starch and water are reinforced by a few drops of mineral acid, and the temperature raised to boiling-point, the transformation into sugar is accelerated, and occupies but a few minutes and the acidity remains unaltered. If instead of the acid a few drops of saliva are used, the transformation occurs with even greater rapidity, and, what is more important to the well-being of the animal, the temperature need not be raised to boiling-point, but the body-temperature is the optimum. The hydrolytic agent in the saliva which has this power, and is not used up by its activity, is called an enzyme; it is able to act on a fresh supply of starch, and so *ad infinitum* ('a little leaven leaveneth the whole lump'). It, however, differs from the inorganic catalysts by being destroyed at higher temperatures, and has the properties of a colloid. The greater number of enzyme reactions are hydrolytic, but in other cases enzymes act for the carriage of other substances—for example, in the process of oxidation the enzyme may be an oxygen-carrier, not a water-carrier.

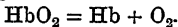
Reversible Reactions.—An important character enzymes possess is that the changes they produce are reversible. The analytic change of which an example has been given may be reversed, and become synthetic; the direction of the change is determined by the relative amount of the substances present. For instance, cane-sugar can be split into its two constituent sugars, named dextrose and lævulose, by a special enzyme, but, as the splitting proceeds, the synthetic process begins, and, when the dextrose and lævulose are present in excess, once more they are built into the original cane-sugar. The same is generally true for other enzymes; and this is especially im-

portant in metabolic processes, for the same enzyme can both untie the bond as in katabolism, and unite the same materials together again in the anabolic phase of metabolism. For example, we have seen that the liver-cells possess the power of linking sugar molecules together for storage as glycogen, and the same enzyme which performs this action is able once more to split up the glycogen into sugar molecules when they are wanted for energy supply elsewhere.

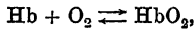
Another instance of reversibility, although here there is no enzyme at work, occurs in the hæmoglobin of the blood. This may be selected not only because it is such a fundamental reaction in the body, but is also one which can be explained without recourse to elaborate chemical formulæ. Representing hæmoglobin by the symbol Hb, and molecular oxygen by its usual symbol O_2 , what occurs in the lungs may be written as an equation:



The reverse change occurs in the tissues; there the compound oxyhæmoglobin breaks up to supply the tissue with oxygen, so there the equation runs:



The combined equation is usually written:



the sign of equality being replaced by a double arrow. There are many different definitions or descriptions of 'life,' but that which says, 'Life is a series of reversible reactions,' is not the least instructive.

The foregoing sketch of the labours of the inferior members of the cell-community may be completed by a final reference to the more skilled workmen which comprise the nervous system. Their function is to inform the community of what is going on in the outside world by the senses, and to keep in harmony the diverse labours of the various organs. Sir Michael Foster, in summing up the questions physiology has to grapple with, concludes: 'Lastly, we have to attack the abstruse problems of how the nervous vibrations, often mysteriously attended with changes of consciousness, as well as the less subtle vibrations of the contracting muscles, are wrought out of the explosive chemical decompositions of the nervous and muscular substances—i.e. how the energy of chemical action is transmuted into and serves as the supply of that vital energy which appears as movement, feeling, thought.' A discussion of the theories held would lead us far into philosophical fields. The relation of the material and mental worlds is the domain of the psychologists.

It may not be inappropriate to conclude an article which deals with life by a few words on Death (see also LONGEVITY). In a simple organism such as the amœba there is not only no differentiation of sex, but there is also no differentiation between the reproductive element (Weismann's germ-plasm) and the remainder of the body (Weismann's somatoplasm). When the amœba propagates itself by dividing into two new amœbæ, the whole animal is concerned in the act of reproduction, and barring accidents the new amœbæ may behave in this way indefinitely, and so may be spoken of as immortal. In this sense the only part of the body of higher animals which is immortal (in the material as opposed to the theological sense of the word) is the germ-plasm, which lives beyond us to repeat the process an infinite number of times in our descendants. The common lot of all is to die, and life in the individual is then extinct; but each individual is only a link in a long chain of lives; each link is composed of somatoplasm, the temporary harbouring-place of the germ-plasm, and from this point of view life is not something which

begins and ends like a straight line. It is rather to be compared to a circle in which a series of events is repeated over and over again.

As the prime of life is past, signs of old age begin to appear: the eyes become feeble, the hair becomes gray, the cartilages calcify, the muscles (heart included) get weaker, digestion more difficult, and metabolism in every way more and more imperfect. If this continues the machinery gradually runs down, and life is ultimately terminated by natural death. But such death from old age is comparatively rare; the common cause of death is accident, in which term disease may be included. In the activity of youth many a disease is vanquished, but as the power of resistance diminishes with increasing years, some ailment, usually upsetting more particularly some important organ, will finally find the body unable to repel its attack.

The History of Physiology.—This may be divided as Preyer did into five periods: (1) the speculative period; (2) that associated with the name of Aristotle; (3) headed by Galen, (4) by Harvey and Haller, and (5) by Müller. The first period opens with the beginning of medical science in India, China, and Egypt. The Jews were acquainted with many laws of practical hygiene and dietetics. Then came the philosophers of Greece. Matter was supposed to consist of four elements, fire, air, earth, and water. The essence of life was referred first to one and then to another of these elements by various philosophers: by Thales to water, by Anaximenes to the air, by Xenophon to the earth, by Pythagoras to fire or heat. Hippocrates, the father of medicine, about 450 B.C., was the first to proceed in a purely rational spirit. Observing carefully the facts of disease, he strove to found the art of medicine upon the results of experience. He attributed diseases to natural causes, and not to special visitations of the gods; and as already noted, he postulated a spiritual essence universally diffused; this he called Nature, Physis, and to this he ascribed the maintenance of things in their normal state, and their restoration if disturbed. The second period is headed by Aristotle, the father of natural history, about 350 B.C. He dissected many animals, and attempted to discover the uses of the various parts. It is difficult to estimate correctly the exact value of Aristotle's work in physiology; it must be measured more by the methods of research which he initiated than by the actual results achieved. Thus, to give an example of his ideas on the subject, the heart he imagined as the seat of the 'rational soul'; the nerves he supposed to arise in the heart; of their function he was ignorant. What is perhaps more surprising is that he described the brain as an inert viscus, cold and bloodless, whose only function was to cool the heart, and not comparable in importance to the other organs of the body. Erasistratus, the grandson of Aristotle, about 300 B.C., was perhaps the first to dissect carefully the human brain. He traced the connection of nerves with it, and even noticed that the complexity of the convolutions of the gray matter was greatest in man, and that they were to some extent a measure of the intelligence. The next 400 years were barren of any useful advance; the practice of medicine reached perhaps its lowest point. The literature is occupied with discussions as to the 'animal and vital spirits,' terms used before Aristotle to express the powers of living things. The animal spirits were those that ruled over those actions of living things that were supposed to be quite different from anything that takes place in things not living, while the vital spirits were those that were concerned in those processes going on in the body which were the result of purely chemical and physical laws. We no longer

discuss whether the vital spirits live in the heart and the animal in the brain, but we have not yet settled the exact relationship between the processes of the living world and those of inorganic matter.

About 150 A.D. Galen, a Roman, revived the sounder method of experimental inquiry; he is the leader of the third period. He perceived that mere dissection of dead animals give no infallible information as to the functions of the living, and accordingly performed many experiments upon living animals. He proved that during life the arteries contain blood and not air, as was thought to be the case up to that time, by simply opening a vessel of a living animal. He also directed much of his study to the brain and nervous system. He was the first to state definitely that the brain, spinal cord, and nerves are the organs of sensation, intelligence, and the originators and guides of properly ordered voluntary movements; and he finally refuted the doctrine of Aristotle by showing that the brain was hot and not cold, and by arguing also that if it were a mere cooler of the blood it need not be elaborately organised. He pointed out that the brain was of the same substance as the nerves, but softer, 'as it should necessarily be, inasmuch as it receives all the sensations, perceives all the imaginations, and then has to comprehend all the objects of the understanding, for what is soft is more easily changed than what is hard.' He discovered also that the nerves of sensation and of motion are distinct, but this was not placed on a firm basis until Magendie's work on the spinal nerve-roots in 1822. For centuries Galen exercised an undisputed sway over the practitioners of medicine and the students of allied philosophy. Even his mistakes were religiously believed in; for example, he taught that the right and left chambers of the heart were connected by apertures.

Some centuries afterwards the so-called Arabian physiology arose. Avicenna, about the year 1000, was its chief exponent. Once more, however, the discussions were about the nature and residence of the animal and vital spirits. Albertus Magnus, in the 13th century, and Paracelsus, in the 16th century, are representatives of mediæval mysticism. About the same time, during the revival of learning, the mathematicians and chemists were busy seeking to explain bodily functions in terms of mechanical, chemical, and physical laws. In the 16th century Villærovanus described correctly the action of the lungs as purifiers of the venous blood. The study of human anatomy was revived by Vesalius in Italy, and continued by Fabricius; and in the beginning of the 17th century Harvey, who had studied in Italy, made perhaps the most important of all physiological discoveries, that of the circulation of the blood.

This discovery inaugurates the fourth period of the history of physiological research; by it a sound foundation for the whole science was laid, and the development of surgery and medicine made possible. Then, after the invention of the microscope, came many active investigators; among them may be mentioned Malpighi and Leeuwenhoek; and thus the foundations of Histology (q.v.) were laid. Haller, near the end of the 18th century, gave to physiology the form that it now possesses. He attempted to discard from the science all statements of a vague and mystical character, he added many minor discoveries to the store of facts, and ranged the whole in a logical sequence.

The great leader of the fifth period, Johannes Müller, during the first half of the 19th century, gave to the science a greater width. He connected as one philosophy the truths of chemical physics, comparative anatomy and physiology, and embryology. Embryology was founded as a science by

Von Baer. Cuvier developed comparative anatomy, and thus gave a foundation to the study of comparative physiology. Lamarck enunciated a certain view on evolution. Berzelius, Liebig, and Mulder placed animal chemistry upon a sound basis. The discovery of the mechanical equivalent of heat by Joule, the enunciation of cell-theory by Schleiden and Schwann, and the discovery of protoplasm as the essential constituent of the cells by Von Mohl and Du Jardin, are the great steps which have placed us in our present position. The discovery of reflex action by Marshall Hall, of inhibitory nerve action by the brothers Weber, and of the glycogenic function of the liver, and of vasomotor nerves by Claude Bernard, mark important advances. At about this time the study of protoplasm, as we now know it, begins. The conception of evolution has been rendered acceptable by Darwin's work, and the foundation of the new science of bacteriology marks a more recent milestone on the road of physiological discovery, especially on its medical side. The reader interested in history is recommended to read the late Sir Michael Foster's *History of Physiology* (1901, revised 1924).

Even to early inquirers it was obvious that the life-processes of animals are the result of the action of a set of machines which were supposed to be kept in action by the 'vital spirits.' These machines were called organs, and the work performed was spoken of as their functions. The whole body was conceived of as made up of various organs, and the labours of physiologists were directed towards discovering their functions, a work which to this day is incomplete. This may be called the first phase of physiological philosophy; it lasted until the promulgation of the cell-theory and the rapidly following discovery of protoplasm. The idea of protoplasm is to natural science of as much importance as the doctrine of the conservation of matter and energy are in chemistry and physics. The chief labours of physiologists for a very long time will be directed towards attaining exact conceptions of the nature of this protoplasm in terms of chemistry and physics. We are not able to say whether there is any abrupt distinction between ordinary matter and that which is called living matter, and which forms 'the physical basis of life.' Is it merely that living matter is more complex and unstable than ordinary matter, and therefore far more sensitive to external impulses in the form of ethereal and molecular vibrations; or is there some special vital force at work? If we accept the first theory we shall believe that there is no such vital force. At any rate the surest path to its discovery lies in determining how far the *objective* phenomena of life are explicable in terms of ordinary chemical and physical laws. When we find any activity of living matter which we can be certain cannot be so explained, then, and not till then, may we postulate a vital force. Supposing such a discovery ever to be made, it is necessary to observe that it will merely widen our chemistry and physics. In fairly recent years there has been a revival of the idea of 'vitalism' as an idea of specific energy, but even the 'neo-vitalists,' as they are called in their rebellion against the 'materialistic' spirit of the time, have not the superstitious ideas of the dark ages. The majority of modern physiologists use the word 'vital' in an apologetic way, not to explain phenomena they cannot understand, but as a convenient cloak for their ignorance of what at present cannot be brought into line with known chemical and physical laws. The use of such a word is especially frequent in the consideration of the processes of the mind, which, as already indicated, is the greatest of the problems of the future.

See, besides the articles named above, those on ANATOMY, ANIMAL, ANIMAL CHEMISTRY, ANIMAL HEAT, DIET, FOOD, DEATH, LIFE, &c. Some important books are mentioned in the text. The beginner should start with an elementary text-book (Huxley's is the best). There are also text-books more complete by Stewart, Starling, and Halliburton (17th ed. 1924). The fullest are those by Foster and Sharpey-Schafer.

Physiology (VEGETABLE). Vegetable physiology deals with how plants grow, and is thus concerned with the function or work of plants. It is frequently forgotten that plants, like animals, are living organisms, and consequently similar processes must go on in each. In the broad aspect, vegetable physiology is the study of the origin of life, since plants arrived before animals. Many of the processes are obscure, but the resultant is apparent in the recurrence of seed-time and harvest, in the orderly appearance of first the blade, then the ear, after that the full corn in the ear. At times the return is a hundred-fold, at others thirty-fold. A physico-chemical explanation has been sought to explain life-processes, but fails in the interpretation of phenomena apparently purely chemical. Behind all the processes there is life working in the Protoplasm (q.v.), co-ordinating all the processes and resulting in plant development as a manifestation of life. Paul plants, Apollos waters, but God alone gives the increase.

Many of the experiments referred to below can be carried out with simple apparatus, and their performance will help to elucidate the problems.

The problems involved may best be set forth starting from the planting of a seed in good ground. On completion of the period of rest, which varies in length in different plants, the dry seed will germinate when supplied with suitable conditions. Seeds may be stored in the majority of species in a dry condition for considerable periods, but sooner or later they lose their vitality. Elm seeds must be sown when they fall to the ground; turnip seed germinates better the second year after harvest. The story of mummy wheat serves best to illustrate the ingenuity of the Egyptian in satisfying the tourists' wish. It is impossible to tell if a seed is alive or dead, except by a germination test. The changes which take place during germination arrange themselves under physical, chemical, and vital changes. Water is first taken up by imbibition to the seed-coat, and then by imbibition and osmosis by the structures inside the seed-coat. The result is a physical swelling of the seed. Before growth starts, a supply of available food is necessary. The reserves in the seed are stored mainly in a solid and non-assimilable form. Water and appropriate enzymes are necessary to bring the reserves into a form which the embryo can use. These changes are known in chemistry as hydrolysis. The third series of changes follow on this, and only take place in the living seed. The embryo starts to develop and grow, and this is manifested by the splitting of the seed-coat.

Respiration starts concurrently with growth, supplying the energy necessary for vital activity. Dry peas, suspended in a muslin bag in a closed test-tube over lime-water, can be compared with soaked seeds similarly placed. In the latter only is sufficient carbon dioxide evolved in respiration to turn the lime-water milky. The energy derived from respiration may cause a rise of temperature, which can be felt as in the case of malting barley.

When supplied with suitable conditions of moisture, temperature, and aeration, the seed germinates. It has been found that soaking seeds, prior to sowing, for definite periods, varying with the kind of seed, gives quicker germination than direct sowing in the ground. The suitable temperature also varies with the kind of seed. Shepherd's

Purse will germinate in frozen ground, while tropical seeds require higher temperatures. The best all-round temperature is 22° C. At higher temperatures, varying with the species of the seed, the success in germination becomes less, until a point is reached—particular to each plant—above which the moist seed is killed. It may be noted here that in physiological processes occur three points in the intensity of external conditions, which are of supreme importance. There is a minimum below which the process is inhibited altogether, a maximum above which inhibition again occurs, and, lying between these extremes, an optimum at which the process proceeds with greatest activity. On either side of the optimum there is a lessening in activity in the process.

Absorption.—Plants living in water are able to absorb over their whole surface. Experiments show that in land-plants the root is the special absorbing organ, and the fine root-hairs, just behind the root-apex, are the special structures concerned in this. The contact between the root-hairs and the soil particles is very intimate. Soil-particles adhering to root-hairs cannot be washed off, and in transplanting a seedling many of the root-hairs are torn away. These root-hairs are outgrowths from the limiting layer of the root, and consist of a cellulose wall containing protoplasm and a nucleus. The centre is occupied by cell-sap. Experiments demonstrate that the cell-sap is osmotically a stronger solution than the soil solution, and thus there is established a living cell acting as a dialyser. With the entry of water into the cell-sap the solution becomes weaker, and the cells internal to the limiting layer absorb water from them, and thus, in a linked chain, water is passed inward to the xylem.

Substances in solution alone can penetrate into plant-cells, as can be shown by placing seedlings in a solution of red ink in water and in water coloured with carmine in suspension respectively. Along with the water absorbed by the root-hairs any substance in solution in the soil-water will pass into the cells, provided there is less of the substance in the cell-sap than outside, and provided the cell is permeable to the substance. Strong solutions in the soil, such as occur near the sea-coast and in peat-bogs, retard water-absorption of all plants, and in those localities the physiological drought of the plants accounts for the characteristic vegetation in such areas. It must be borne in mind that the process of absorption is controlled quantitatively by the protoplasm, which determines the amount of any substance taken in. Further, the permeability of the protoplasm is constantly changing, thus at one time allowing a substance to pass in, again refusing entry to that substance. Absorption is intimately connected with other processes in the plant, and is also influenced by external factors in the soil, of which the chief are aeration, water-content, chemical composition, temperature, &c.

The quantity of water absorbed sets up pressure in the plant, and at some periods of the year the pressure of absorbed water is considerable, as can be shown by attaching a glass tube to a decapitated vine or fuchsia. Watering the plant with warm water generally secures a satisfactory result. This root-pressure is the explanation of bleeding from pruned trees, such as vines, birches, and maples. The water may be forced out through special pores in saxifrages, fuchsias, balsams, or as dew in the early mornings on grasses and the edge of the leaf of lady's mantle. Exudation, as this process is termed, occurs only when conditions are unfavourable to transpiration, and may be looked upon as a safety arrangement to protect the intercellular spaces from flooding. The fluid found

in nectaries and in pitcher plants is secreted by osmosis.

Experiments made by growing plants or by placing twigs in coloured water demonstrate that absorbed substances pass from root to leaf. If the stem of a plant so treated be cut across, the wood (xylem) alone is stained. Removal of a ring of bark does not interfere with the ascent of the solution. Trees hollowed by decay still carry fresh leaves, showing that, generally, it is the youngest wood in which the sap ascends. On reaching the leaves the water is given off as water-vapour. This unseen loss of water accounts for the wilting of cut flowers and branches. If a freshly-cut branch is fitted to a glass tube filled with water, whose end dips under mercury, the loss of water from the leaves will draw up the mercury, thus measuring the force of the transpiration pull. In herbaceous plants, root-pressure acting from below and the transpiration pull from above account for the movement of sap. Much has been written concerning the ascent of sap in tall trees. Let it be remembered that every tree began as a seedling, and reached its height by growth. In the seedling water was raised by root-pressure and the transpiration pull. Further, water adheres to the sides of the conducting elements through which it passes, and there is also the cohesion of water in a column. Such a column of water transmits a pull like a solid rod, and even in the tallest tree root-pressure and the transpiration pull are the forces at work.

Transpiration.—A simple experiment of enclosing a leaf in a bottle serves to show that water-vapour is given off from a leaf. The process is called transpiration. The actual amount of water lost as vapour can be measured accurately by weighing, but is by no means constant even in the same leaf. It varies with the age of the leaf and with external conditions. Leaves in ordinary plants transpire more than stems, and more transpiration takes place through the under side of a leaf, because there are more stomata present. Transpiration resembles evaporation in that both are influenced by temperature, humidity of the air, and wind; but light increases transpiration, and has little effect on evaporation. Light increases the permeability of the protoplasm, with a consequent increase in transpiration.

Transpiration is not essential to plant growth, as water plants do not transpire. It is an unavoidable accompaniment of a land existence. Within limits transpiration is regulated by the stomata. When transpiration exceeds absorption the leaves wilt, as the turgor of the cells due to the pressure of the cell-sap no longer distends the cell-walls. Thus, a plant in a dry pot wilts because it obtains no water from the dry soil. Watering a greenhouse plant with cold water will cause wilting, as the lower temperature retards absorption from the root. In winter our trees are leafless, not because there is no water in the soil, but because the soil temperature is too low to admit of absorption keeping pace with transpiration. If an ordinary plant is watered with sea-water, wilting results because the salt retards absorption. These two cases illustrate the phenomenon of physiological drought—water is present in quantity, but is not attainable in sufficient quantity for the plant. The leaves of trees in a strong wind on a bright day often flag, and in dry bright weather even herbs may wilt towards the close of a windy day. During the night the plants recover, and the leaves resume their normal position. This is because in darkness transpiration is reduced, and the roots are able to absorb enough water to make the cells again turgid.

In Ecology (q.v.) an attempt is made to classify plants in relation to factors of their environment. One of the most important factors in the environ-

ment is water. Plants which are adapted to conserving their water-supply are called xerophytes. The limitation in loss of water from xerophytes is accomplished by reduction in the size of the leaf, as in the heather and yew; in extreme cases by the replacement of the leaf by spines, as in the whin; by the lowly habit of the plant, as in the house-leek; by the position of the leaves with relation to each other and with regard to the sun's rays, as in the Eucalyptus, where the leaves are set edgeway to the sun's rays at midday; and by the rolling and curling of the leaf, as in many grasses.

The surface of the leaf may be covered with cuticle, giving the leaf a varnished appearance, as in holly and laurel; or the leaf may have a coating of wax on the outside, such as is seen in the cabbage; or there may be a covering of hairs, as in the edelweiss. The cuticle and wax prevent the escape of water from inside, while the hairs entangle the water-vapour as it is given off, forming an artificially moist atmosphere on the surface, just as a thick tweed collects the moisture in a fog. The stomata may be sunk in pits, as in the Scots pine; or the stomata may be in grooves, as in the grasses. In many xerophytes there is water storage, giving fleshy leaves as in the aloe and stonecrop.

Other plants always have abundance of water, and are known as hygrophytes. Their leaves are large and thin, and there are devices for draining water from the surface, as in the arums. Plants which at one season show xerophytic adaptations and at another hygrophytic adaptations are called tropophytes. This class includes the deciduous trees in this country, the bulbous plants, and the herbaceous perennials.

In water plants (hygrophytes) the adaptations are concerned in the maintenance of the air supply, and an account of their peculiarities is given under *Respiration*.

Composition of Plants.—All the elements found in plants are obtained from the soil except oxygen and carbon, which are obtained from air. All dissolved diffusible substances in the soil are not used by the plant, and they cease to enter when the concentration in the cell-sap equals that of the outside solution. Useful substances are assimilated—that is, built up into other forms in the plant—and are constantly absorbed. Some plants use more of one element than of another, and a soil eventually becomes exhausted if the same crop be continuously grown on it. There is need, therefore, for rotation of crops and the use of manures to maintain fertility of the soil.

Plants may be grown in pure sand or in water, provided the essential elements are supplied in suitable form. Various combinations of the necessary salts are to be found in books. A useful water culture may be made up from calcium nitrate (1 gramme), ferric phosphate (.5 gr.), potassium nitrate (.25 gr.), magnesium sulphate (.25 gr.), water (1000 c.c.), and on it such plants as buckwheat or maize can be successfully grown. By leaving out one or other of the essential elements, comparisons can be made between growth in the normal culture and in a culture lacking any particular element. The fact that hyacinth bulbs grow to flower in water, and that seeds germinate in moisture, merely shows that there are reserves stored away which are available for growth.

The more important elements in the plant, determined by analysis of the gases evolved and the plant ash, are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, calcium, potassium, magnesium, iron, chlorine, and sodium. This analysis of the dead plant yields no evidence of how the elements are combined during life in the protoplasm any more than the analysis of a gold watch into

gold, iron, copper, silicon gives information of the structure of the watch.

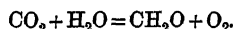
Metabolism.—The substances taken in by the root-hairs in solution, and the gases taken in mainly by the leaf, undergo profound changes. Carbon is absorbed by the stomata as carbon dioxide. Through the action of light the chlorophyll, working in conjunction with the protoplasm of the cells, breaks down the carbon dioxide into carbon, which is assimilated, and oxygen, which is returned to the atmosphere. Chlorophyll only develops in light; seedlings or plants grown in the dark are yellow, owing to the absence of chlorophyll, and are said to be etiolated. Iron is also necessary for the development of chlorophyll, and plants grown without sufficient iron suffer from chlorosis.

The spectrum of chlorophyll shows absorption-bands in the red and violet with less marked ones in the yellow. This light energy is used in carbon fixation, the first visible product of which is the appearance of starch in the leaf. That light is essential for the process can be shown by placing a tinfoil stencil on the leaf, when only the portions of the leaf exposed to light will give a starch reaction. The necessity of chlorophyll for starch formation can be demonstrated by testing a variegated leaf for starch.

Carbon fixation is conditioned both by external and internal factors. Temperature, light, carbon dioxide, and water are the chief external factors, while the amount of chlorophyll and certain unknown factors are internal. In connection with the external factors F. F. Blackman established the law of limiting factors: 'When a process is conditioned as to its rapidity by a number of separate factors, the rate of the process is limited by the pace of the slowest factor.' For example, temperature, light, and carbon dioxide supply are so closely related that increasing any one without increasing the others in due proportion will only lead to a quickening of the rate of the process over a short range, and then further increase in the factor gives no further increase in rapidity, because the others are limiting.

Blackman was also instrumental in establishing the effect of a time factor. Thus he found that, provided light intensity and the carbon dioxide supply were adequate, the rate of carbon fixation rose with increasing temperature, but at higher temperatures the initial rate was not maintained indefinitely, but slowed down regularly at a rate depending on the temperature. Further, the higher the temperature the more rapid the fall, but the falling-off at any given temperature is fastest at the beginning and becomes less rapid.

The exact nature of the process has been much discussed, as also the nature of the first-formed product. Probably formaldehyde is first formed, and this is condensed into a sugar from which starch is formed when the sugar concentration reaches a certain point. Be this as it may, the whole produce of agriculture, horticulture, and forestry is manufactured by the green plant from the carbon dioxide of the atmosphere. The balance of life on this sphere depends on this process, because through it the concentration of carbon dioxide in the air is maintained, its place being taken by oxygen. The volume of oxygen returned to the atmosphere is equal to the volume of carbon dioxide taken in, and this favours the supposition that formaldehyde is first formed. The reaction may be represented—



If little is really known concerning the process of carbon fixation, still less is known regarding the building-up of the more complex compounds, particularly protein formation. For the ordinary

green plant the nitrogen supply is the nitrates in the soil. Potassium salts are essential. Light is essential only in that the radiant energy of light is made use of in forming carbohydrates, which is a requisite in the formation of proteins.

The food elaborated in the green leaf is conveyed to the growing points and to storage organs. Much of the food cannot be translocated as it is found in the leaf, but must be changed to soluble and more diffusible compounds so as to pass from cell to cell. This change preparatory to translocation is effected by enzymes, which are produced by the protoplasm. Starch, a solid, is acted upon by diastase and transported as a soluble sugar—maltose—though the maltose is generally changed by another enzyme into glucose. The manufactured food is conveyed over long distances by the phloem, as ringing experiments show. In addition, much passes from cell to cell by diffusion.

Respiration, or breathing, consists in the taking in of oxygen and the evolution of carbon dioxide with the liberation of energy. It is the reverse process of carbon fixation in that it is a destructive process, and takes place at all times to a greater or less extent in all living cells. In dry seeds the process is so slow that air from them does not turn lime-water milky. Seeds which have been soaked for twenty-four hours respire freely and turn lime-water milky. Every living cell throughout the plant must be supplied with air, and the air, after it has been deprived of its oxygen, must be renewed. Air diffuses through the stomata of a land plant which are in communication with the respiratory cavity. From this the air diffuses out into the intercellular spaces, which are all in communication with each other. It is possible to blow through the stalk of certain leaves and see the air issuing from the stomata, thus reversing the natural passage. Better results can be obtained by inserting the leaf stalk into a bottle filled with water to cover the end of the stalk. Air is then sucked from the bottle, and a steam of air bubbles can be seen issuing from the cut end. Water plants (hydrophytes) have to contend with the scarcity of air in their environment. Extensive air canals are frequently developed, giving the spongy feeling to the leaves and stems of the Mare's Tail or the Water Lily. The activity of respiration can be estimated by measuring the amount of carbon dioxide evolved by the indicator method, or by passing the gas through baryta water and determining the amount of barium carbonate precipitated. The volume of oxygen taken in is equal to the volume of carbon dioxide liberated in ordinary plants. In succulent plants more oxygen is taken in than carbon dioxide liberated, as there is an accumulation of organic acids in these plants with a fixation of oxygen. Seeds with oily reserve give a respiratory quotient less than unity as oxygen is used in changing the reserves into carbohydrates.

The intensity of respiration varies with both internal factors in the plant and external factors. It is generally more active in young plants—e.g. seedlings and young tissues (buds) respire more actively than the older parts of the plant. Temperature, the nature of the food supply, water and light, exert an influence on respiration.

It is generally accepted that sugar, probably glucose, is the material chiefly used in respiration. Proteins are also consumed, and at times much of the food manufactured by the plants is consumed in respiration to obtain the energy necessary for its activities.

There is thus in the plant a continual process of construction and destruction going on, in which proteins are involved. The contrast between constructive metabolism or anabolism, and destructive

metabolism or katabolism, may be shown as in the figure. It is difficult to determine whether a compound is a synthetic or analytic product, and especially so when one remembers the profound changes brought about by killing protoplasm. Enzymes are bound up in most of the processes, and there has been a tendency to explain life-processes in terms of enzyme activity. Protoplasm cannot, however, be considered merely as a complex of various enzymes. Enzymes are workers in the service of protoplasm, formed by it when required, used in its work, and destroyed when no longer necessary.

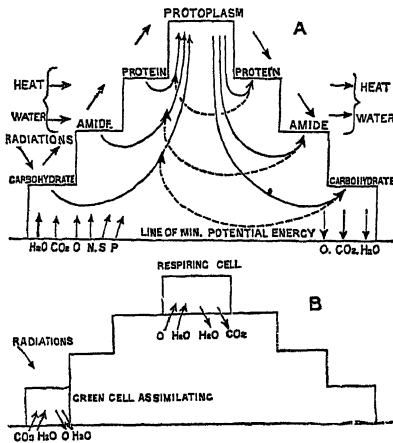


Fig. 1.

Most plants do not immediately die when deprived of oxygen, but growth, movement, irritability, and activity in general ceases. Soaked pea seeds, inserted into a test-tube filled with mercury inverted over a saucer of mercury, evolve considerable amounts of carbon dioxide. If the primary roots be measured before insertion no elongation will be found on the conclusion of the experiment. The carbon dioxide here has no relation to atmospheric oxygen, but is the result of the breaking-down of the organic substances in the seed. Closely related with this anaerobic respiration is the phenomenon of fermentation. The fermentation of sugar by yeast results in the splitting up of sugar into alcohol and carbon dioxide, with the liberation of energy. It is, however, a wasteful method of obtaining energy, since over thirty times as much sugar must be consumed to yield the same amount of energy as by direct oxidation. Lactic acid fermentation seen in the souring of milk, and acetic fermentation seen in souring of beer and claret, are fermentations due to the activity of bacteria.

Growth is the outward expression of the metabolism of the plant. Metabolism has two sides, a building-up and a breaking-down. When the building-up processes are more intense than the breaking-down processes, growth results. The most accurate method of measuring growth is by the increase in dry weight. Mere increase in size does not necessarily indicate growth, as seeds grown in the dark, though they have long spindly stems, actually in dry weight are less than the dry weight of the seeds, because the reserves have been used up in respiration and there has been no new matter formed. The root of the seedling pursues a spiral course amongst the soil particles. It is irritable to gravity, and grows downwards; to contact, and moves away from obstructions; to variations in the amount of water and air in the soil, hence the roots are found at the sides of a flower-pot. Branching takes place, increasing the absorptive

area and securing better anchorage. The root not only increases in length but generally increases in thickness.

The shoot generally emerges from the soil with arched shoulders and bent head, thus gaining a greater leverage for forcing its way through the soil and protecting the delicate growing point at the tip in its passage through the soil. Free from the soil, the shoot, by greater growth on the under side, becomes straight, and like the root elongates in a spiral course. The shoot is irritable to gravity, light, and other stimuli, which are discussed under PLANTS (MOVEMENTS OF). Growth in thickness takes place in the shoot. The rate of elongation varies greatly in different plants. Bamboos may lengthen a foot in twenty-four hours. Cereal crops in this country attain their full height in three months, while trees go on growing for hundreds of years. Further, the rate of elongation is not constant in any one plant, as growth is more active in spring, and the rate of growth decreases towards autumn in this country where there is a reasonable periodicity in the growth rate. There is also a diurnal periodicity, as elongation is greater at night than by day. Further, the rate of growth varies from time to time without any change in the external conditions.

Elongation does not take place uniformly throughout the length of root and stem, as the greatest growth in length takes place just behind the apex. Fig. 2 represents the lengthening of equal divisions of a bean root after twenty-four hours' growth. Each internode of the shoot shows a similar distribution of growth, and the terminal region of elongation embraces several internodes. In certain cases—e.g. grasses—the elongation takes place at the base of the internode, and the growth is called basipetal. Leaf enlargement is mainly from the base, the enlarging region being near the stem. Growth may result in a shortening, and is sometimes pronounced, as in the pull-roots of crocus, where the thick roots developed after flowering drag the corm downwards to the correct depth in the soil.

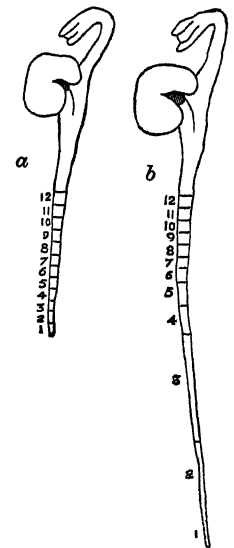


Fig. 2.

a, bean root divided into equal divisions; b, same root 24 hours later.

It is necessary to remember that all these changes manifested in growth in the living organisms, plant or animal, take place in the living cell. They are controlled by the protoplasm, and each cell contributes its share so long as it is alive. Even dead cells still serve the plant by giving strength and rigidity to the whole. Each cell starts from the division of a previous cell. A newly-formed cell consists normally of a cellulose cell-wall, dense protoplasm, and a relatively large nucleus. As the protoplasm works, it increases in amount for a time, then vacuoles appear, until in the adult cell the protoplasm forms a membrane lining the cell-wall and surrounding a large sap vacuole. The nucleus lies along one of the side walls, and appears relatively small, as its increase in size has not kept pace with that of the cell. The whole increase has taken place by the food formed through the agency of the chlorophyll apparatus. Much of this

food has been destroyed, however, in order to obtain energy. Meantime the cell-wall has increased in bulk through the activity of the protoplasm. This increase is owing to the distension (turgor) of the cell, brought about by the solution in the sap vacuole. When the wall is stretched, new material can most readily be added. The new material may be deposited between the original particles of the cell-wall, giving what is called growth by intussusception, or the new material may be laid down against the inside of the wall, when growth by apposition is said to occur. Generally both processes are at work. The new material may be cellulose, or it may be wood (lignin), or cork (suberin), or gum (mucilage), and in this way the chemical nature and the physical properties of the cell-wall are changed by the activity of the protoplasm. In appearance the cell-wall has now assumed its final shape and markings. Each cell passes through one grand phase of growth, and only one, unless it is stimulated in a suitable way—e.g. in fertilisation and in response to certain wound stimuli. The plant propagator makes use of this fact in raising plants by cuttings, layers, &c. Certain cells at the growing-points remain for long periods in the embryonic condition, but these are exceptions.

Every plant is composed of cells, and, as is indicated above, the cell starts by division, enlarges, and then reaches a permanent stage. Enlargement of plants and their component organs does not take place at a uniform rate throughout their development. Growth starts slowly, the rate gradually increases until a maximum is reached, after which the rate progressively decreases until enlargement ceases. Sachs introduced the term 'grand period of growth' to define this march of the rate of growth; other workers have analysed the progress of the growth-rate more fully, and find each grand period curve made up of a series of S-shaped curves. Blackman has introduced the idea of the law of compound interest governing the rate of growth, and other workers the law of autocatalytic reaction. The plant is, however, a living organism attuned to its surroundings, and influenced by them not only in the present but also by those of the past. This principle of predetermination is important, and helps to elucidate certain aspects in physiology whose explanation has been lacking.

Growth is conditioned by temperature, and an increase of temperature to a limit increases growth. Beyond this limit growth is retarded. The action of light is both direct and indirect. Both the quantity of light, its quality, and its duration have profound influence on growth. The elongation of the stem is retarded in light; leaves may remain dwarf in darkness, as in the pea, or may grow as much as in light, as in wheat, the difference apparently being connected with the amount of carbohydrate present. Water is another conditioning factor, as a cell to grow must be turgid. Both the humidity of the air and the moisture must be taken into account. Further, the vegetative and the reproductive phases in the plant are antagonistic. Thus dryness favours flowering: witness the early flowering of plants growing on walls. Nutrition is another factor, both in respect of the supply of food and the supply of raw material. In increasing the supply of the latter, experiment has shown the necessity of maintaining a balance and the incidence of limiting factors. Internally there is the possibility of growth being controlled by growth-promoting substances or auximones. The nature of the growth may be determined by hormones, though the presence of hormones has not been demonstrated in the plant. Vitamins, so necessary in the animal diet, are produced only in the plant world.

Irritability is a fundamental property of protoplasm, by which organisms are able to respond to a stimulus by a release of energy according to their inherent character and according to the means at their disposal. The manifestation of irritability depends on the tonic conditions, existent and previous, and on the stage of development. A perceptible response is only produced when the stimulus reaches a certain minimal intensity, and, between the application of the stimulus and the response, a latent period or interval of non-responsiveness always intervenes. In plants, as in animals, there is no exact relation between the intensity of the stimulus and the amount of response, and beyond a certain intensity of stimulus the response may alter. After-effects also occur, as exhibited in the continuance of response after the stimulus has ceased to act.

The change of intensity of physiological processes, with variations in the tonic conditions, is a manifestation of irritability. This may be observed in the rate of circulation of protoplasm within the cell of *Elodea*, *Tradescantia*, *Vallisneria*, *Urtica*, *Chara*, *Nitella*, &c. In *Elodea* the whole protoplasm is in rotation, and the chloroplasts can be observed gliding round the cell walls. In the staminal hairs of *Tradescantia*, the denser particles in the protoplasm can be seen moving along the protoplasmic threads. The rate of movement depends on the temperature. The breath of the observer is sufficient to raise the temperature of the slide under inspection with a quickening of the movement. Free movement of the Myxomycetes, which creep about like an *Amœba*, and of zoospores and gametes controlled by special organs (cilia), is, in its direction, a manifestation of irritability. Even in plants fixed to their substratum movements of growth and movements of variation, in response to external stimuli, occur, and are discussed under movements of plants. Reproduction is a manifestation of irritability depending on cell division. The products may be specially prepared, and then normally the stimulus of fusion is necessary prior to further development. This is sexual reproduction, resulting in numerical increase with the possibility of qualitative differences between the offspring. In vegetative reproduction, which gives numerical increase only, there is no special preparation of the products of division, and consequently no need for fusion. The fundamental difference underlying the two methods of reproduction will be found under other articles.

See Pfeffer, *Physiology of Plants* (trans. Ewart, 1905); Jort, *Plant Physiology* (trans. Gibson, 1907); Haberlandt, *Physiological Plant Anatomy* (trans. Drummond, 1914); Darwin and Acton, *Practical Physiology of Plants* (1915); Palladin, *Plant Physiology* (trans. Livingston, 1917); Bayliss, *Principles of General Physiology* (1920); Haas and Hill, *Chemistry of Plant Products*, vol. ii. (1922); Skene, *Biology of Flowering Plants* (1924).

Physostigma. See CALABAR BEAN, the alkaloid of which, a valuable drug, is called Eserin or Physostigmine.

Physostomi. See BONY FISHES.

Phytelephas. See IVORY (VEGETABLE).

Phytolaccaceæ, a family of centrosperms plants related to *Chenopodiaceæ*, comprising over 100 species, mostly North, Central, South American, the rest distributed over Australia, Africa, China, and Hawaii. Most are herbs, but there are some trees too included, the best known being *Phytolacca dioica*, a native of South America, and there called Ombú, but cultivated as a shade tree in Spain under the names of *Bella sombra* and *Sapote*. *Phytolacca americana* has berries that served to colour wine

and liquors, and for this purpose it was introduced into all wine-growing European countries, where it has spread to such an extent that nobody would suspect its foreign origin. Many species are used medicinally in their own homes, and scientific examination of these plants may yet enrich the pharmacopoeia of other countries.

Piacenza, a city of Northern Italy, on the right bank of the Po, a little below its confluence with the Trebbia, by rail 43 miles SE. of Milan and 35 NW. of Parma. Situated where the prolongation N. of the Via Emilia to Milan crossed the Po at the last convenient crossing-place (eastwards) of that river, and at the intersection of the Via Postumia from Cremona to Dertona (Tortona) and Genoa, it has always been an important city, both strategically and commercially, since its foundation (as *Piacentia*) by the Romans in 218 B.C. It is defended with bastioned walls and an outer ring of forts. Its streets are broad and regular, their arrangement being a survival from the Roman plan. The cathedral, in the Lombard-Romanesque style (1122-1233), has an immense crypt, a campanile 223 feet high, and paintings by L. Carracci, Guercino, and others. The church of Sant' Antonio, the original cathedral, was perhaps founded in 324, but has been several times rebuilt. S. Savino is a fine Romanesque church of 903 (well restored in 1903). The church of Santa Maria della Campagna is adorned with fine frescoes by Pordenone; and it was for San Sisto that Raphael painted the celebrated Sistine Madonna, sold in 1754 by the monks to Frederick Augustus of Saxony. Among the other buildings are the Palazzo Farnese (1558), once a sumptuous edifice, but since 1800 in use as barracks; the communal palace, one of the finest in Italy (1281), its lower story built of marble and the upper of brick; the palace of justice, and others. A couple of miles to the east of the city is the theological seminary founded by Cardinal Alberoni. The municipal library contains 120,000 volumes. The principal square is adorned with colossal bronze equestrian statues of Alessandro and Ranuccio Farnese. Manufactures of automobiles, silks, cottons, pottery, hats, &c., are carried on. The more notable facts in the history of Piacenza have been its capture by the Gauls in 200 and by Totila in 546, the meeting here of two church councils in 1095 and 1132, its active zeal as a member of the Lombard League in the 12th century, the sacking of it by Francesco Sforza in 1447, and its union with Parma (q.v.). Pop. (1921) 43,717. The province has an area of 950 square miles and a pop. of 281,256.

Pia Mater. See BRAIN.

Piana dei Greci, a town of Sicily, 10 miles SW. of Palermo. It was the chief Albanian colony in Sicily in the 15th century. Pop. 10,000.

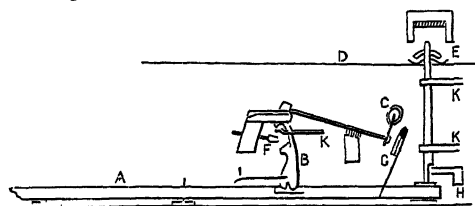
Pianoforte (Ital. *piano*, 'soft,' and *forte*, 'loud'), a stringed musical instrument, played by keys, developed out of the Clavichord (q.v.) and Harpsichord (q.v.), from which the pianoforte differs principally in the introduction, to put the strings in vibration, of hammers connected with the keys by a mechanism that enables the player to modify at will the intensity of the sounds; whence the name of the instrument. The invention of the pianoforte must be accredited to the Italian Bartolommeo Cristofori (q.v.), who produced the instrument early in the 18th century. Other claimants are a German organist of the name of Schröter, and Marius, a French harpsichord maker. The first pianoforte seen in England was made at Rome by Father Wood, an English monk there. In Germany the invention met with more rapid encouragement and development than in Italy. The Silbermanns in Strasburg and Stein of Augs-

burg improved the discoveries of their countryman Schröter, and many maintain that the pianoforte is an independent invention indigenous to Germany. In England the manufacture of the instrument was at first chiefly by foreigners, principally Italians. Italian pianoforte-makers opened many shops, but the English makers ultimately rivalled and surpassed them. The English pianoforte has been brought to its present perfection by Broadwood, Collard, Brinsmead, and others. Erard and Pleyel made many improvements in France; Germany has long been famous for its pianos, including those of Bechstein and of Blüthner, while the Bösendorfer is of Austrian make; and the American pianos of Steinway are well known.

The compass of the early pianoforte was, like that of the harpsichord, four to five octaves, and has gradually increased to seven octaves, or occasionally more. The most natural of the various forms which the instrument assumes is that of the grand pianoforte, derived from the harpsichord, with the strings placed horizontally, and parallel to the keys. The strings are stretched across a compound frame of wood and metal, composed of bars, rods, and strengtheners of various kinds—appliances necessary to resist the enormous tension. This framework includes a wooden sound-board. The mechanism by which hammers are connected with the keys is called the *action* of the instrument. In the earliest pianofortes the hammer was raised from below by a button attached to an upright wire fixed on the back-end of the key. The impulse given to the hammer caused it to strike the string, after which it immediately fell back on the button, leaving the string free to vibrate. This was called the *single action*. As the hammer, when resting on the button with the key pressed down, was thus necessarily at a little distance from the string, the effectual working of this action required that a certain impetus should be communicated to the hammer to enable it to touch the string. Hence it was impossible to play very piano, and it was found that, if the hammer was adjusted so as to be too close to the string when resting on the button, it was apt not to leave the string till after the blow had been given, thereby deadening the sound. This defect was remedied by a jointed upright piece called the *hopper*, attached to the back-end of the key, in place of the wire and button. When the key was pressed down the hopper, engaging in a notch in the lower side of the hammer, lifted it so close to the hammer that the lightest possible pressure caused it to strike; and at this moment, when the key was still pressed down, the jointed part of the hopper, coming in contact with a fixed button as it rose, escaped from the notch, and let the hammer fall clear away from the string. To prevent the hammer from rebounding on the string a projection called the *check* was fixed on the end of the key, which caught the edge of the hammer as it fell, and held it firmly enough to prevent it from rising. A necessary part of the action is the *damper*, which limits the duration of each particular note, so as to cause it to cease to sound as soon as the pressure is removed from the key. It consists of a piece of leather resting on the top of the string and connected with the back-part of the key by a vertical wire. When any key is pressed down its damper is raised off the string, so as to allow the sound produced to be clear and open; but immediately on the finger being lifted off the key the damper-wire falls, and the damper again presses on the string, muffling and stopping the vibration. The pianoforte possesses two pedals, the loud and the soft. By the former the dampers are raised, the result of which is to prolong the sound of the notes and cause them to run into one another. The soft

pedal, on the contrary, diminishes the sound by removing a string from the impact of each of the hammers, or in some way weakening the stroke of the hammers. Some modern pianos have a third pedal, which sustains any notes held down when the pedal is applied, but does not sustain any struck subsequently. One further frequent and important addition to the action may be alluded to. In the mechanism above described the key must rise to its position of rest before the hopper will again engage in the notch of the hammer for another stroke; hence a note cannot be repeated until time has been allowed for the full rise of the key. The *repetition action* is a contrivance, varying in different instruments, for getting rid of this defect by holding up the hammer at a certain height while the key is returning.

Great difference of detail exists in the actions of different makers. Some are more complicated than others; but in all are to be found the same essential parts, only modified in shape and arrangement. The subjoined figure represents one of the simplest grand pianoforte actions. A is the



key ; B, the lever which raises the hammer ; C, the hammer ; D, the string ; and E, the damper : F is the button which catches the lever after it has struck the hammer ; G, the check ; H, the damper pedal-lifter ; I, the spring ; and K, K, K are rails and sockets. Formerly the strings of the pianoforte were all of thin wire ; now the bass-strings are very thick, and coated with a fine coil of copper-wire ; and the thickness, strength, and tension of the strings all diminish from the lower to the upper notes. A grand pianoforte has three strings to each of the upper and middle notes, and now, generally, only two to the lower notes, and one to the lowest octave. In most modern pianos a system of overstringing has been adopted, whereby the lower strings are arranged to cross part of the others obliquely, to distribute the tension more equally.

Besides the full or concert grand, there is the semi-grand or square piano with curtailed keyboard, and there is the cottage piano, of which the upright grand is merely a larger form. In the cottage piano the strings run vertically from top to bottom of the instrument; and the difference in form necessitates alterations in the details of the action, but the general principle is the same. The pianette is a small form of the cottage. The pianoforte in its various forms has attained a widespread popularity, owing chiefly to the fact that it can render harmony; though the violin is a serious rival to it in domestic circles.

The improvement of the keyboard of the piano-forte has from time to time been attempted. Thus in 1882 the Hungarian, Paul von Jankó (1856-1919), patented his piano with six keyboards, rising in tiers above one another in the manner of an organ, so arranged that tenths and twelfths could be easily spanned by reaching a finger to a keyboard above or below that on which the hand was travelling; and, with a sweep of the wrist, an arpeggio could be executed through the whole compass of the instrument. But experience proved the invention to be impracticable. In 1921 Emanuel Moor, an Englishman of Hungarian descent, brought

forward a two-manual octave-coupler pianoforte, the upper keyboard giving tones an octave above those of the lower and capable of being coupled or uncoupled with it, the whole arrangement making possible the playing with facility of octaves, *arppeggios*, and widely extended chords. In an 'African piano' there are seventeen notes for a complex of tones corresponding to our octave. A pianoforte has been made with the scale proceeding in quarter-tones in place of the usual semitones.

The *Sostenente* or *Sostinente* pianoforte produces a sustained sound. But by acquiring this power it loses its distinctive character, and is a pianoforte only in name. The hurdy-gurdy is the germ of sostenente keyed instruments. Subsequently the principle was applied to the harpsichord and then to the pianoforte.

Music for the pianoforte is written in two staves, though some modern composers employ three or even four, and with the treble and bass clefs. Many of the most eminent musicians have devoted themselves to composing for the pianoforte, and some, of whom the most conspicuous is Chopin, have almost entirely confined themselves to that instrument. Amongst the greatest modern pianists have been Madame Schumann, Liszt, Rubinstein, Busoni, Cortot, and Paderewski.

Mechanical methods have been employed in the playing of the pianoforte. Different devices have been used, but the general principle of all is the same—a music roll as drawn over a wind-chest sets in motion, by means of perforations representing the duration and pitch of each note to be reproduced, a series of hammers which serve in playing as substitutes for the human fingers. The mechanism was formerly worked by foot-pedals, but now generally by motor attachment. The earliest devices known as Piano-players were independent machines that could be moved up to the pianoforte keyboard, but these have generally given place to Player-pianos in which the player action is contained within the pianoforte itself. Now practically every standard pianoforte can be had in combination with a player. Contrivances of the sort are only semi-automatic in character, their action as it proceeds allowing of modification in speed and force by means of various controls, and it has been claimed that a performer can put an individual interpretation into music for which his manual technique would be quite insufficient. At the same time great pianists make records for mechanically-operated pianofortes, and by later 'editing' of their interpretations are enabled finally to produce in permanent form the best work of which they are capable; in this way, despite early scepticism, mechanical pianofortes must be held to have achieved an artistic and not merely a commercial success.

See Rimbault, *History of the Pianoforte* (1860); Spillman, *History of the American Pianoforte* (1890); Hopkins, *The Pianoforte* (1896); Oscar Bie, *The History of the Pianoforte and Pianoforte Players* (trans. 1899); Krehbiel, *The Pianoforte and its Music* (1923); Westerber, *The History of Pianoforte Music* (1923); Grove's *Dictionary of Music and Musicians* (new ed. 1904 et seq.); works on the great pianists by Lahee (1901), and Ehrlich (1920); the histories of musical instruments; and works on mechanically-operated piano-fortes by Newman (1920), Drake (1922), Wilson (1923).

Piano-player. See PIANOFORTE.

Piarists, or 'Fathers of Pious Schools,' a religious congregation for the education of children, especially poor boys, founded at Rome by a Spanish priest, Joseph of Calasanza, in 1597, confirmed by Gregory XVI., and active in Italy, central Europe, Poland, Spain, and elsewhere.

Piassaba, Piassava. See FIBROUS SUBSTANCES. PALM.

Piastre (Gr. and Lat. *emplastron*, 'a plaster'; in the Romance languages, 'anything spread out or flat,' 'a plate,' 'a coin'), an old Spanish silver coin worth about 4s. Divided into eight silver reals, it was termed a *piece of eight*, the name familiar from stories of the Spanish Main; from this it the symbol for the dollar was probably derived (see DOLLAR). The Italian piastre, or *scudo*, was nearly equal to it in value. The Turkish piastre is a nickel coin worth about 2d. The Turkish lira (£T) contains 100 piastres. Pieces of 2, 5, 10, and 20 piastres are struck in silver.

Piatigorsk, a town in Northern Caucasia, at the southern foot of Mount Beshtau (4587 feet), facing Mount Elburz and the Caucasus Mountains, and 124 miles by rail NW. of Vladikavkaz, is celebrated for its sulphur-springs. Ranging from 83.7° to 117.5° F. in temperature, they are useful for abdominal and rheumatic affections. Pop. 40,000.

Piatra, a town of Moldavia, 60 miles W. by S. of Jassy, romantically situated on the Bistritza, at the (eastern) foot of the Carpathians, has a trade in timber and a pop. of 20,000.

Piauhy, a north-eastern state of Brazil, east of the river Parnahyba, consists mostly of plain. The climate is hot with long droughts. Horses, cattle, and mules, cotton, timber, fibres, are the chief products. Gold and lead are mined, and there is some industry (cotton-spinning, meat-canning). Area, 95,000 sq. m.; pop. 600,000. The capital is Therezina, the chief commercial town Parnahyba, the port Amarração.

Piazza (more fully *Piazza Armerina*), an episcopal town of Sicily, with a 15th-century cathedral with a fine campanile, 16 miles SE. of Caltanissetta; pop. 44,000.

Piazzi, GIUSEPPE, Italian astronomer, was born at Ponte in the Valtellina, 16th July 1746, and entered the order of the Theatins at Milan in 1764. After holding professorial chairs of Philosophy, Mathematics, and Theology at Genoa, Malta, Ravenna, and Rome, he was appointed in 1780 to the chair of Mathematics in Palermo; and there, with the aid of government, he established an observatory in 1789. The first task he set himself to was to make a catalogue of the stars, published in 1803, and again extended in 1814. On the night of the 1st January 1801 he discovered a new planet, the first of the group of planetoids between Mars and Jupiter, and named it Ceres. He died, 22d July 1826, at Naples.

Pibroch (Gaelic, *piobaireachd*, from English *pipe*), a form of bagpipe music, generally of a warlike character, including marches, dirges, &c. The rhythm is very irregular and difficult for a stranger to follow, but when played by a good piper it has a very powerful effect. The earliest mention of the military music of the bagpipe is in 1594 at the battle of Glenlivet, but the various pibrochs belonging to the different clans are mostly of modern composition.

Picardy (*Picardie*), an ancient province in the north of France, was bounded on the W. by the English Channel, and on the E. by Champagne. The capital was Amiens. It now forms the département of Somme, and portions of Aisne and Pas-de-Calais.

Picaresque. See NOVELS.

Picasso, PABLO, or, properly, PABLO RUIZ, Spanish artist, born in 1881 at Málaga, received his art education at Barcelona, where his father was a professor. He early displayed ability, and by his inventiveness and versatility rose high in the ranks of the Post-Impressionists. Drawing

inspiration from El Greco and from Cézanne, he arrived at the formulation of cubism, though his fellow-artist Braque became perhaps the visible head of the school. Picasso, indeed, even abandoned cubism.

Picayune, a name derived from the Carib language, and used in Louisiana for a small coin worth 6½ cents, current in the United States before 1857, and known in different states by various names (fourpence, fippence, fip, sixpence, &c.).

Piccadilly. See LONDON.

Piccolo. FLUTE.

Piccolomini, an old and distinguished family of Italy, settled at Siena, who subsequently obtained possession of the duchy of Amalfi. It produced numerous celebrated *littérateurs* and warriors, one pope (Pius II.), and several cardinals. One of the most illustrious members of this family was OTTAVIO, Duke of Amalfi, born in 1599. He entered the Spanish military service, and, being sent to aid the Emperor Ferdinand II., fought against the Bohemians at the battle of the Weisse-Berg (1620), then in the Netherlands, and after that in Wallenstein's army at Lützen (1632). He was one of the chief agents in effecting the fall of the all-powerful general, by betraying his secrets to the emperor. Then he greatly distinguished himself in the battle of Nördlingen (1634). In the following season he was sent to aid the Spaniards in the Netherlands, and speedily drove out the French, but had not much success against the Dutch. He was withdrawn by the emperor in 1640 to stay the Swedes, who, under Banér, were threatening the hereditary possessions of Austria. This purpose he accomplished; but, though he was successful against these northern invaders in the Palatinate, he was worsted in Silesia by Torstenson. Returning to the Spanish service in 1643, he was sent again to the Netherlands to take the command of the Spanish troops. But his success was not nearly so decisive as before, the prestige of the Spanish infantry having been destroyed by Condé at Rocroi (1643). After the signing of the peace of Westphalia (1648) Piccolomini was created a field-marshal by the emperor, and was sent as plenipotentiary to the Congress of Nuremberg (1649). He died at Vienna, 10th August 1656, leaving no children; his son Max, who figures in Schiller's *Wallenstein*, is only a poetical fiction.

Pic du Midi, a summit of the Pyrenees, 9466 feet high, in the south-east corner of the French département of Basses-Pyrénées.

Pichegru, CHARLES, French general, was born a labourer's son at Arbois in Jura, 16th February 1761, and was educated by the Minorite friars at Arbois and at the college of Brienne. He enlisted into an artillery regiment in 1783, and showed such capacity and courage on the Rhine in the fiery service of the young republic that by 1793 he was a general of division. In October of that year he was given supreme command on the Rhine, and in conjunction with Hoche and his army of the Moselle he drove back the Austrians, relieved Landau, and overran the Palatinate. Next year he continued his career of triumph in the Netherlands, and showed in three campaigns within one year consummate generalship and a fortunate audacity worthy of the great Napoleon. After by swift movements defeating the Austrians in detail, he broke their forces at Fleurus, June 27, 1794, and, continuing the struggle into the winter, crossed the Meuse and the Waal on the ice, entered Amsterdam, January 20, 1795, and soon occupied the whole of Holland. During this campaign occurred the famous capture by the French hussars of the Dutch ships frozen in the Helder. Recalled to

Paris by the Thermidorians, the 'Sauveur de la Patrie' crushed an insurrection of the *faubourgs* at Paris, 1st April 1795, next proceeded to the Rhine, and took Mannheim. But at the height of his fame he turned traitor, and sold himself for vast promises to the Bourbons. With deliberate treachery he remained inactive before the enemy, and allowed Jourdan to be defeated. The Directory becoming suspicious superseded him by Moreau, and Pichegru retired to Arbois. In 1797 he took his place, first as member, next as president, of the council of Five Hundred, and continued his Bourbon intrigues, but on the 18th Fructidor (4th September) was arrested and deported to Cayenne. Escaping in the June of next year, he made his way to London, was attached to the Austro-Russian army in 1799, and thereafter lived in Germany and England until the formation of the Bourbon conspiracy of Georges Cadoudal (q.v.) for the assassination of the First Consul. The pair reached Paris secretly, but found it impossible to gain over Moreau. They were soon betrayed to the police, and Pichegru was seized in bed and carried to the Temple, 28th February 1804. Here, on the morning of the 6th April, it was found that he had anticipated justice, and ended his dishonoured life with his own hands. There is no justification for the royalist slander that he was made away with by Napoleon.

See the Lives by Gassier (1814), Pierret (1826), Vouziers (Dôle, 1870); the *Mémoires* by Montgaillard (1804); and works by Daudet (exculpatory, 1901), Caudillier (1908), Sir John Hall (1915).

Pichiciago. See CHLAMYDOPHORUS.

Pichincha ('boiling mountain'), the most populous province (210,000 in 1922) of Ecuador, embraces the Quito plateau and its slopes. Area, 8300 sq. m. The soil is fertile in the west. The province takes its name from the active volcano of Pichincha, 8 miles NW. of Quito, the chief town. It has five peaks, two of which (15,918 feet) Edward Whymper ascended in 1880. The enormous crater, nearly a mile across at the top and perhaps 1500 feet in diameter at the bottom (which is 2500 feet below), is said to be the deepest in the world.

Pichler, KAROLINE, novelist, was born 7th September 1769 at Vienna, her maiden name being Greiner; and between 1800 and her death, 9th July 1843, published novels and dramas sufficient to fill a collected edition of 60 volumes, of which the most notable are *Agathokles* (1808), *Frauenwürde* (1808), *Die Belagerung Wiens* (1824). Her autobiographical *Denkwürdigkeiten* (1844) fill 4 vols.

Pickerel. See PIKE.

Pickering, a market-town in the North Riding of Yorkshire, 27 miles NNE. of York. It has a fine ruined castle, which was Richard II.'s first prison and was dismantled by the Roundheads, and an interesting parish church. Pop. 3500.

Pico. See AZORES.

Pico della Mirandola, GIOVANNI, one of the most curious figures in the history of the Renaissance, was born in 1463, the son of Francesco Pico, Count of Mirandola and Concordia in the Modenese. He was a wonderfully precocious boy, and in his youth he made a round of the chief universities of Italy and France. In 1486 he challenged all comers to public discussion at Rome, but the debate was forbidden by the pope on the score of the heretical tendency of certain of the nine hundred theses which Pico offered to maintain. His *Apologia* exposed him to considerable persecution until Alexander VI. in 1493 absolved him of the charge of heresy. He spent much of his life in travelling, and became known as a generous bene-

factor of the poor. He was an intimate friend of Politian and Lorenzo de' Medici. He died of fever in 1494, and Savonarola, who had been anxious to enrol him among the Friars Preachers, vested him after death in the habit of the order. Mirandola was the last of the schoolmen. He endeavoured to reconcile the Catholic theology with mediæval philosophy, and his works are a bewildering compound of mysticism, scholasticism, and recondite knowledge. He interpreted the Mosaic text by the Neoplatonic doctrine of the microcosm and the macrocosm, and maintained that in natural magic lay the strongest testimony to the truth of the Gospels. He appealed to the authority of the Cabbalists and Pythagoreans as well as to the Apostles; he exhibited, along with a childlike credulity, an argumentative ingenuity worthy of the subtlest schoolman. He was a humanist as well as a theologian, and was the author of various Latin epistles and elegies and of a series of florid Italian sonnets. His writings are of little value, but the magic of his personality survives. A theologian and an erotic poet, a philanthropist, a scholar, and a traveller, an adherent at once of Duns Scotus and of Politian, he was one of the most chivalrous, generous, and versatile of men; his character is as engaging as it is curious and complex.

See *G. P. della Mirandola*, his life by his nephew (1496; trans. by Sir Thomas More, 1510; ed. J. M. Rigg, 1890), and Patér's *Studies in the Renaissance*.

Picotée. See CARNATION.

Picquet. See PIQUET.

Picric Acid (Trinitrophenol), $C_6H_2(NO_2)_3OH$. This substance appears in the form of pale yellow crystalline scales. It is obtained by the action of nitric acid on phenolsulphonic acid. Equal parts of phenol and concentrated sulphuric acid are mixed together, and placed in a suitable vessel, which is heated till the mixture reaches 212° F. (100° C.). Nitric acid of the specific gravity 1.3 is then added. On cooling, a crystalline mass is produced which is filtered and drained, washed, and purified by recrystallising. Picric acid is easily soluble in hot but only slightly in cold water. It is also soluble in alcohol and ether. Its taste is intensely bitter, and its power as a yellow dye-stuff is very great. It has been much used for dyeing silk, wool, and leather. As it does not adhere by itself to vegetable fibre, it serves for a test to distinguish cotton from wool or silk. The presence of cotton in a mixed fabric can therefore be detected by steeping it in a hot solution of the acid and afterwards washing it. It was formerly called Carbazotic Acid. The salts of picric acid form powerful explosives; and, since 1885, on Dr Sprengel's discovery that the acid itself is a very powerful explosive when detonated, the acid alone, or modified by the addition of oxidising material to combine with the slight excess of carbon which is the result of its detonation, has been used as the basis of bursting-charges for shells, for which it is peculiarly well suited owing to its comparative insensitiveness to shock. It is the basis of lyddite, melinite, shimose, and other explosives of this class. The objection to it is the readiness with which its salts (picrates) are formed, some of them being exceedingly sensitive explosives. This is notably the case with lead, the picrate of which approaches fulminate of mercury in sensitiveness. In the manufacture, therefore, of picric acid for warlike purposes, extraordinary care has to be taken that the ingredients of which the acid is made should be pure, and that subsequently it shall be kept from contamination. Picric acid was added to the British Pharmacopœia in 1914. For references see under DYNAMITE.

Picrite, an ultrabasic phanocrystalline igneous rock, differing from Peridotite in containing a small amount of feldspar (usually labradorite). The dominating ferromagnesian minerals are augite and olivine. Biotite, iron ores, and apatite are common accessories. The rock is often more or less altered into serpentine.

Pictet, ADOLPHE (1799-1875), a native of Geneva, and a writer on the Celts and the primitive Aryans. To the same Genevese family belong Marcus Auguste Pictet (1752-1825), physicist; François Jules Pictet (1809-72), zoologist and palæontologist; and Raoul Pictet (b. 1842), chemist and physicist, known in connection with the liquefaction of oxygen.

Picton, SIR THOMAS, British general, was born in August 1758 at Poyston in Pembrokeshire, entered the army as ensign in the 12th Foot in 1772, and two years later joined his regiment at Gibraltar. In 1794 he went out to the West Indies, and was given a command under Sir John Vaughan. He took part in the conquest of several islands of the West Indies, including Trinidad, and was appointed (1797) governor of the last named, being shortly afterwards raised to the rank of general. In 1803 he was superseded, but immediately after appointed governor of Tobago. He found it necessary, however, to return to England, to take his trial on a charge of having permitted, under the old Spanish laws, a female prisoner to be tortured. He was found guilty of sanctioning unlawful torture; but on appeal he was in a new trial acquitted. He saw active service again in the Walcheren expedition (1809), and was made governor of Flushing after its capture by the English. Early in the following year he was summoned to Spain, and put in command of the 'Fighting Division,' and with it rendered brilliant service at Busaco, during the subsequent expulsion of the French from Portugal, at Fuentes d'Oñoro, at the sieges of Ciudad Rodrigo and Badajoz, at Vittoria, and in the battles of the Pyrenees, at Orthez and before Toulouse. Napoleon's escape from Elba once more called Picton into the field; he fought at Quatre Bras and was wounded, but kept the fact hidden that he might not miss the great day he saw coming, and he fell leading his men to the charge at Waterloo, 18th June 1815. See *Memoirs of Sir T. Picton*, by H. B. Robinson (2 vols. 1835).

Picton, a port of entry on the north coast of Nova Scotia, on a splendid harbour, 85 miles NNE. of Halifax. There are iron, lumber, leather, flour, and other industries, but coal, mined in the vicinity and largely exported, is the leading interest. Pop. 3000.

Picts. This is the name by which, for five and a half centuries (296-844 A.D.), the people that inhabited eastern Scotland from the Forth to the Pentland Firth were known. In the Irish chronicles they are generally styled Picti, Pictones, Pictores, or Picardaig—all forms of the same root; but sometimes the native Gaelic name of Cruithnig is applied to them, and their country is called Cruithen-tuath, the equivalent of Latin Pictavia and Old Norse Petland, which still survives in the name of the Pentland Firth. There were Cruithni or Cruithnig also in Ireland—never, however, called Picti. They formed the petty kingdom of Dál-araide (County Down and part of Antrim) and bordered on the Irish Dalriada; and, as the kinglets of both these provinces were contemporary with the whole extent of Pictish rule, much confusion is thereby caused as to what refers to Scots and what to Irish Cruithnig in the annals. Other Irish Cruithnig appear sporadically, not to say enigmatically, in Meath and Roscommon. There does not seem to have been any difference in language

and customs between these Irish Cruithnig and the rest of the people of Ireland, at least in historic times. They were probably early invaders from Britain belonging to the Pictish race.

The Picts are first mentioned in connection with the campaigns of Constantius Chlorus in Britain in 296 and 306. Eumenius, his panegyrist, speaks of 'Caledonum aliorumque Pictorum silvas et paludes' (the Caledonians and other Picts), which implies the inclusion of the former in the latter people. Caledonia is the name given by Tacitus to Scotland north of the Firths of Forth and Clyde, and he describes the Caledonians as a noble race of barbarians, who fight in chariots as well as on foot, with long swords and short shields, and whose fair red hair and large limbs argued a German origin. Ptolemy (120) places fourteen tribes in Tacitus's Caledonia, inclusive of the Caledonians themselves, and the more easterly ten of these may be claimed as Picts. So troublesome were these northern tribes to the Roman province that in 208 the Emperor Severus came to Britain and vainly attempted their subjugation. The contemporary historians mention only two tribes north of the Forth and Clyde wall—the Maeatae and the Caledonii—and Tacitus's noble barbarians appear in their pages but squalid savages, having no cities, knowing no agriculture, possessing wives in common, and tattooing their bodies with pictures of all kinds, to show which 'they wear no clothing,' says Herodian. Yet they have chariots and weapons as described by Tacitus, with dagger and peculiarly knobbed spear. One hundred years later the Caledonians and other Picts, as already said, are encountered by Constantius, and still fifty years later they are harassing the Roman province (360) now in company with the Scots, who are first mentioned at this date, and who appear as great sea-wanderers, starting from Ireland and Scotland both, it would seem, and attacking the whole seaboard of the province, especially Wales. The Picts and Scots are helped in this 'continual vexing' of the Britons by the Saxons and Atecoti. The Picts are represented at this time as divided into two nations called Dicalidonæ and Vecturiones, or rather Verturiones, to accept Sir John Rhys's happy emendation of Ammianus's text, for this latter form may be identified with the historic Fortrenn (Strathearn and Menteith). Theodosius the elder in 369 subdued these northern foes and restored the district between the walls to Roman Britain, and the usurper Maximus signalled his assumption of power in 383 by an energetic campaign against the Picts and Scots. During the next quarter of a century the Romans were losing their hold on Britain, and their northern foes pressed on the province with great persistence. First the northern wall was rebuilt, then abandoned; and lastly the southern wall was repaired by the last legion sent. In vain did the brave Stilicho gaze on the 'figures fading on the dying Pict,' as Claudian says, for they burst on the Romanised Britons with more fury than ever, and the calling in of the Saxons against the Picts and Scots made the last state of the Britons worse than their first.

At this point the light of Roman history is withdrawn from us, and we have to depend on vague references in native writers—on Gildas of Wales (6th century), on Adamnan (704), on Bede (731), on Nennius (9th century), and on the Irish and other annalists of the middle ages, the best of whom is Tigernach (1088). There is a Pictish Chronicle, perhaps composed in the 10th century, but preserved only in a MS. four hundred years later in date. Gildas describes the Picts and Scots as 'differing somewhat in manners,' and 'shrouding their villainous faces in bushy hair rather than

clothing' their lower limbs. Bede points out that the Picts are divided into a southern and a northern division by the Grampians. The southern Picts were converted to Christianity by St Ninian (*circa* 400), and the northern Picts over a century and a half later by St Columba. Bede also notes and mythically explains the system of succession among the Picts, whereby the reigning monarch was succeeded not by his son but by either his brother or his sister's son, descent being counted through the females. This curious rule is amply confirmed by the Pictish list of kings. Scotland in Bede's time, and for more than a century previously, was divided among four nations: the Saxons and Britons were south of the Firths, and north of them were the Picts east of Drumalban, and the Scots to the west with Dalriada or Argyllshire as their head centre. The annals say little of the Isles and north-west coast, whether they were held by Scots or Picts, though subsequent history makes it clear that the Scots had long colonised them, for the sons of Erc in 501 were but the last of many Scottish invaders and colonisers. That the four nations of Bede's day spoke four different languages is clear from his oft-repeated statement to that effect, and his handing down a word in this Pictish tongue (*peanfahel*). Columba, according to Adamnan, had to employ an interpreter twice in dealing with the Picts, while Cormac of Cashel mentions a word (*cartit*) belonging to the *berla cruithnech* or Pictish language.

In the ninth year of the reign of Brude MacMailchon, the year 563, Columba landed in Scotland to convert the Picts. Brude had his royal residence near Inverness, and was 'a most powerful king,' Bede says, for he represents him as granting Iona to Columba, though Tigernach says that Conall of Dalriada made the gift. But the Picts were carrying on war among the Isles at the time, as the life of St Comgall shows, and Brude had hostages from the king of the Orkneys. Brude's successor, Gartnait, seems to have fixed his capital at Abernethy, the church of which he founded. The Picts were subjugated by Oswald, king of Northumbria, and made tributary by his brother Oswiu after 654. They remained under the Anglian yoke for thirty years; but Brude, son of Bile, asserted his rule among the northern Picts, and meeting the Anglian king Ecgrid at Dunnichen in 685 defeated and slew him, and thus ended the Anglian rule over the Picts. About 710 Naiton or Nectan, son of Derile, was king of the Picts, and, as Bede tells us, he conformed under Anglie influence to the Roman Church in regard to the celebration of Easter, going indeed so far as to expel recalcitrant Columban clerics across Drumalban. Following a custom not unfrequent at the time, Nectan resigned his throne and became a cleric. A fierce struggle ensued for the throne, during which Nectan emerged from his monastery, but eventually Angus, son of Fergus, petty king of Fortrenn, crushed all his rivals and reigned for thirty years, when this 'sanguinary tyrant' died in 761. His brother Brude died king of Fortrenn in 763, for evidently Angus's monarchy had collapsed and the provincial kings again came to the front. Unfortunately the next eighty years of Pictish and Scottish history are exceedingly difficult to unravel, for lists of kings and a reference or two in the Annals of Ulster are all the material which is to hand. Ciniad was king after Brude, but his rights were disputed by Aed of Dalriada; and after his death in 774 there is much confusion in the Chronicles, as there must have been in the facts. Dalriadic princes struggle with Pictish princes and with one another for the throne, till Constantine of Dalriada established himself about 815 as king over both. His and his brother's reign ended in

834, and a time of confusion followed, native Pictish princes striving against Eoganan of Dalriada, and he ultimately succeeding. The year 839, which ended his reign, saw a great defeat and slaughter of the Picts by the Danes, with confusion once again, from which emerged in 844 Kenneth MacAlpin, the Scot, as king over both nations, henceforward not to be disunited. Many things contributed to the overthrow of the Pictish kingdom, such as it was, and of the Pictish language: the disunion, physical and otherwise, between northern and southern Picts; the rule of female succession which allowed Anglie, Briton, and Scottish princes to rule in right of their mothers, with the consequent degradation of marriage which matriarchy implies; and the superior culture of the Scots, Christian and literary. Nor must it be forgotten that we really do not know much about the Isles and west coast north of Argyll, nor indeed of the counties north of Inverness, from the time of Brude MacMailchon till the Norsemen came. It is quite certain that the Scots colonised these very early, and had, indeed, established themselves in Perthshire. Aidan, the son of Gubhran, makes expeditions to Orkney, and fights the Picts and defeats them on the Forth, or even farther eastward, in Mearns. This aggressive energy, combined with the other facts of the situation above enumerated, would easily enable the Scots to supersede the Picts in power and language.

The real 'Pictish question,' however, is what the language was which they spoke. This question must not be confused with another if allied one, What race did the Picts belong to? The Picts may have spoken a Celtic language though racially possessed of little Celtic blood, and may have retained non-Celtic customs as survivals of a lower culture, as indeed they did in the case of female succession. Four hypotheses have been formed in regard to the language and origin of the Picts. The first, started by Pinkerton and put by Sir Walter Scott into the mouth of the 'Antiquary,' is that they were Teutons, speaking a Gothic dialect; the second, maintained by Dr Skene, is that they were Gaelic-speaking Celts, and that they and not the Scots finally conquered in the 9th century; the third, due to Sir John Rhys, is that the Picts were not Indo-Germanic, but that their language was overlaid by loans from Welsh and Irish; and the fourth, which was held by two of the most eminent of Celtic scholars, Professor Windisch and Dr Whitley Stokes, is that they were Celts, but more nearly allied to the Cymry than to the Gael.

The materials for deciding the linguistic relations of the Picts, though fairly abundant, consist almost entirely of names—those in the classical writers, in the king lists, and in the Book of Deer, and the still or lately existent place-names of ancient Pictavia. The main agreement between the Gallo-Cymric and Gaelic languages is their dropping of Indo-Germanic initial *p*; their main difference is their developing the labialised guttural *qu*—Gallo-Cymric (like Oscan) into *p*, and Gaelic (like Latin) into *q* or *c*. This fact led Sir John Rhys to call them respectively P Celts and Q Celts. No native initial *p* exists in old Gaelic language. The name Picti, which was usually regarded as the Latin for 'painted men,' is now considered inseparable from Pictones or Pictavi of Gaul, now Poitou, and is therefore Celtic of the P group. An old Gaelic equivalent is supposed to exist in *cicht* ('engraver'), which leaves the old idea of 'painted or pictured men' intact. Further, the Gaelic name *cruithni* is derived from *cruith* ('form, figure'), Welsh *pryd*; and the Welsh name for Pict is actually Prydyn. The form Prettania, undoubtedly used by the best Greek writers for

the Latin *Britannia*, makes it possible that the Cruthnig gave their name to Britain. The meaning of Bede's Pictish word *peanfahel* is practically explained by himself as Wall's Head, where *pean*, with its *p*, answers to Welsh *pen* ('head') and not to Gaelic *cenn*. Similarly *Fern* and *pant* in the king lists belong to the *P* group; but more striking still is the *pett* of the Book of Deer, which signifies 'a portion of land,' corresponding to Welsh *peth*, and etymologically to Gaelic *cuid* ('portion'). *Pet* or *pit* is a prefix in place-names in Pictland from Sutherlandshire to the Forth at the present day, some two hundred being easily counted, though the Gaelic *Bal* has considerably extruded it in western Pictland. Minor points in the phonetics of the Pictish names are the preservation of *st* and *nt* as in Cymric; *ch*, as in Ochl, Welsh Uchel, but Gaelic Uasal; *it*, in Naiton, for Gaelic Nectan, being Cymric; Elphin for Alpin or Albin; Bridei for Brude, where *u*, as in Welsh, changes to *i*; the Cymric forms of the prefix *ur* or *wr* for Gaelic *for* or *fer*; and others. Names like Talorg and Morcunn remind us of Gaulish Argio-talus, 'silver-brow,' and of Welsh Morgan. Modern place-names like Dee ('goddess'), Don for Divona ('goddess'), Tay, Eden, Nith or Nethy, and Ythan can hardly be paralleled outside Gallo-Cymric ground. The *sp* of Spey and Spean is evidence of non-Gaelic origin. Dr Whitley Stokes, who collected all the extant Pictish words from Tacitus down to the mediæval annalists in 'On the Linguistic Value of the Irish Annals' (*Transactions of the Philological Society*, iii. 1889-90), sums up the philological arguments with sufficient temperateness thus: 'The foregoing list of names and other words contains much that is still obscure; but on the whole it shows that Pictish, so far as regards its vocabulary, is an Indo-European and especially Celtic speech. Its phonetics, so far as we can ascertain them, resemble those of Welsh rather than of Irish.' The conclusion to which we come is that the Picts, whatever traces they show of an alien racial element, with its consequent survival of lower ideas of marriage-laws, spoke a Celtic language belonging to a branch of Celtic allied to Cymric, but dialectically different from the Welsh of Bede's time; and that this dialect of the Gallo-Cymric stock was a wave of Celtic speech from the Continent previous to the Gaulish which held England when Cæsar entered Britain.

See Skene's *Chronicles of the Picts and Scots* (1867), and his *Celtic Scotland*, vol. i. (1886); Rhys's *Celtic Britain* (1884, and later editions), his Rhind Lectures for 1889 in the *Scottish Review*, and, with Brynmor-Jones, his *The Welsh People* (1900); Stokes's study above mentioned; Windisch's article, 'Keltische Sprachen,' in Ersch and Gruber's *Encyclopædie*; Macbain's *Etymological Dictionary of the Gaelic Language* (1896; 2d ed. 1911); Nicholson's *Celtic Researches* (1904); Scott's *The Pictish Nation* (1918); Adamnan's *Columba*; Hennessy's *Annals of Ulster* (1887); Bede's *Ecclesiastical History* and the other documents in the *Monumenta Historica Britannica*; Innes's *Critical Essay* (1729; new ed. 1879); and Pinkerton's *Inquiry into the History of Scotland*.

Picts' Houses, the name popularly given in many parts of Scotland to the rude underground buildings, more commonly and accurately called Earth-houses (q.v.). The Brochs (q.v.) are also sometimes called Pictish Towers.

Picts' Work. See CATRAIL.

Picture-restoring. See RESTORATION.

Picture-writing. See HIEROGLYPHICS, ALPHABET.

Pidal, LUIS MENÉNDEZ, Spanish painter, born at Oviedo in 1860.

Piddock. See PHOLAS.

Pidgin-English. See CHINA.

Pie. See MAGPIE.

Piece of Eight. See PIASTRE.

Piedmont (Ital. *Piemonte*; Fr. *pied*, 'foot,' *mont*, 'mountain'), a former Italian principality, which now forms the north-west part of the kingdom of Italy, is by the Alps separated from Switzerland on the N. and from France on the W.; on the E. lies Lombardy, and on the S. Liguria and Genoa. It included the duchy of Monferrat and part of the old duchy of Milan, and now embraces the provinces of Alessandria, Cuneo, Novara, and Turin, and covers 11,330 square miles, with a population of 3,384,000. For an account of its geographical features, see ITALY. From the end of the 12th century the name Piedmont was used as a collective title for the territories ruled over by the House of Savoy on the east side of the Graian and Cottian Alps; the history of the region will be found under ITALY, SARDINIA, SAVOY, and WALDENSES. See, too, S. Butler's *Alps and Sanctuaries of Piedmont*.

Piepowder Court, in England, an ancient court held in fairs and markets to administer justice in a rough and ready way to all comers, called also the Court of Dusty Foot (Old Fr. *pied poudré*). Its jurisdiction seems to have been confined mostly to petty vagabonds, pedlars, and other wanderers. The court has long been obsolete, its jurisdiction merged in the court of Petty Sessions.

Pierce, FRANKLIN, fourteenth president of the United States, was born at Hillsborough, New Hampshire, November 23, 1804. His father, Benjamin Pierce, a farmer who had risen in the war of independence to the rank of major, in 1827 and 1829 became governor of New Hampshire. Franklin Pierce was educated at Bowdoin College, and was an officer in a college military company, in which his biographer, Nathaniel Hawthorne, was a private. He graduated in 1824, studied law, and was admitted to the bar in 1827. From 1829 to 1833 he was a member of the state legislature, and for two years was its speaker; he was then elected to congress, a Democrat of the school of Jackson. In 1837 he was elected to the United States senate, of which he was the youngest member. In 1842 he resigned his seat, and returned to the practice of law. He refused the Democratic nomination for governor, as well as an appointment to fill a vacancy in the senate; and he declined the office of attorney-general offered him by President Polk. He remained, however, among the leaders of his party, zealously advocated the annexation of Texas, with or without slavery, and, after his opponents, the Whigs and Free-soilers, had been victorious at the polls in 1846, volunteered as a private for the Mexican war. The president made him a brigadier-general, and in August 1847 he joined General Scott, and led his brigade in the battles of Contreras and Churubusco. In 1852, in consequence of the conflicting claims of the leaders of the Democratic party at the Baltimore Convention, he was nominated as a compromise candidate for the presidency, against General Scott, the Whig nominee, and received the votes of all but four states. President Pierce in his inaugural address defended, on constitutional grounds, slavery and the Fugitive Slave Law; and his cabinet, which was an eminently able one, included Jefferson Davis as secretary of war. Pierce's view as to slavery was that it was the price paid for the Union by the framers of the federal constitution, and that, therefore, in honesty it must be maintained. The principal events of his administration—in importance far before the treaty for reciprocity of trade with the British American colonies and the treaty with

Japan, or the filibustering expeditions of Walker (q.v.) to Nicaragua and of others to Cuba, with the resultant abortive Ostend (q.v.) Manifesto—were the repeal of the Missouri Compromise (see MISSOURI) and the passing of the Kansas-Nebraska Act (see KANSAS), which kindled a flame of civil war in the new territory that ultimately set the whole Union in a blaze. Pierce, with his rigid regard for constitutional obligations, was intensely hostile to the free-state settlers and to abolitionists in general. At the close of his term of office in 1857 he spent three years in Europe; and afterwards, having no sympathy with the party which subsequently came into power, he took no part in politics. He died at Concord, 8th October 1869. As a lawyer Pierce was an eminent and eloquent pleader; as a statesman his administration would have passed for skilful and successful had it not been for the slavery storm which rose and wrecked it; while as a man he was amiable and generous, and of spotless integrity. There are *Lives* by Hawthorne (1852) and D. W. Bartlett (1852), and Irelan's more critical *Life, Administration, and Times of Franklin Pierce* (vol. xiv. of his *Republic*, 1887, &c.).

Pieria, a coast district of ancient Macedon, at the base of Olympus, and between the Peneus and Haliacmon. It was the fabled birthplace of the Muses and of Orpheus.

Pierre, the capital of South Dakota, is a small town in the centre of the state, on the Missouri River, at the mouth of Bad River, 781 miles by rail WNW. of Chicago; pop. 3000.

Pierson, HENRY HUGO, composer, was born (Henry Hugh Pearson) at Oxford in 1815, in 1844-45 filled the chair of Music in Edinburgh, and from 1846 lived in Germany, dying at Leipzig, 28th January 1873. Among his works were the music for the second part of Goethe's *Faust*, the operas *Leila* and *Contarini*, and the oratorios *Jerusalem* and *Hezekiah*.

Piers the Plowman. See LANGLAND.—*Pierce the Ploughman's Crede* is a poem of similar character by another hand, dated about 1394 by Skeat, who edited it (1867 and 1906); and there were other imitations.

Pietà (an Italian word signifying *piety*, in the sense in which that term indicates or includes affection for relatives), the name given in art to representations of the Virgin Mary embracing the dead body of her son. It is a counterpart to the *Madonna* with the infant Jesus in her arms.

Pietermaritzburg, or MARITZBURG, capital of Natal (q.v.), occupies a fine situation near the Umsundusi River, 50 miles NW. of Durban, and 2218 feet above sea-level. The town is well laid out, and has some good buildings. It is built, in Dutch fashion, on the plain, though there are hills close by, among which the Town Hill is notable. Fort Napier overlooks the city from a hill on the south-west. Pietermaritzburg has a university college, library and museum, asylums, a park, botanical gardens, &c. It takes its name from its founders (1839), the Boer leaders, Pieter Retief and Gert Maritz. There is railway connection with Durban, with the Orange Free State, and with Johannesburg and Pretoria in the Transvaal, &c. The place has steadily increased in importance with the development of Natal, especially since the establishment of the railways. Pop. (1887) 15,767; (1921) 36,023—17,998 whites, the rest Kaffirs and Indian coolies.

Pietists, a designation given at the end of the 17th century to a religious party in Germany, which, without forming a separate sect, was distinguished rather by fervour and zeal than by peculiarities of religious opinion. See CHURCH

HISTORY, the articles on SPENER and FRANCKE, and the *Histories of Pietism* by Heppe (1879) and Ritschl (1880-86).

Pietra-dura, a name given to the finest kinds of Florentine mosaic-work, in which the inlaid materials are hard stones, such as jasper, carnelian, amethyst, agate.

Piezometer (Gr. *piezō*, 'I press,' *metron*, 'a measure'), an instrument for measuring the compressibility of fluids, by observing the extent to which an air-bubble which marks the upper level of liquid in the capillary neck of a flask is depressed by the application of an external pressure acting through liquid surrounding the flask.

Pig, or HOG (*Sus*), a genus of artiodactyl ungulate mammals, of the family Suina (see BOAR, where the characteristics of the wild species are discussed, with an illustration). The term Swine is commonly applied to the genus in Britain. The body is covered more or less with bristles and hairs; the skin is very thick; the limbs short and stout; the neck, which is carried straight forward from the trunk, is very thick and strong; the face moderately prolonged and truncated, always terminating in a movable cartilaginous disc, furnished, as in the mole, with a special small bone, and employed with wonderful expedition in turning up the soil in search of roots and other food. In most of the improved varieties the face is much shorter than in the wild boar or ancient pig. There are six incisors, two canine teeth, and fourteen molars in each jaw, the lower incisors projecting forwards; the canine teeth long and strong, projecting and curved, becoming formidable tusks in wild boars, and large and powerful even in the females in a wild state. The feet have each four toes, the lateral ones small, and scarcely touching the ground, all separately hoofed. The tail is short. The stomach shows mere traces of division. The food is chiefly vegetable, but perhaps no animals may more properly be called omnivorous; and although, even in a wild state, pigs are not to be reckoned among beasts of prey, they not unfrequently, even in domestication, kill and eat small animals that come in their way, as many a housewife has had occasion to observe in respect to chickens. The Common Pig (*S. scrofa*) appears to be a native in the wild form (see BOAR) of most parts of Europe and Asia; the domestic European breeds are apparently descended from the European wild boar, crossed with domesticated Asiatic breeds. Like the hippopotamus, to which it is allied, the pig delights in humid and shadowy places. The pig usually grows until five years old. Its natural life ranges from fifteen to thirty years. Although the use of its flesh was prohibited to the Jews, and the prohibition has been adopted in the Mohammedan law, the pig has been a domesticated animal from a very early period, and its flesh constitutes a large part of the food of many nations. The fecundity of the pig is great; with proper treatment it will produce two litters annually, generally of six to eight pigs each, although sometimes there are as many as sixteen or more in a litter. Vast quantities of the flesh are consumed in various forms, as pork fresh or salted, bacon, ham, &c. Brawn (q.v.) is an esteemed luxury. The fat of the pig, which is produced in a thick layer under the skin, is an important article of commerce, and of various use under the name of Lard (q.v.). The skin of the pig is made into leather, which is particularly esteemed for saddles. The bristles, especially of the wild boar, are much used for brush-making. Indeed, there is no food-producing animal which is of greater benefit to mankind than the pig.

There are numerous varieties of the domestic pig. Some have erect and some pendant ears, and those are most esteemed which exhibit the



Improved Yorkshire Pigs.

greatest departure from the wild type, notably in shorter and less powerful limbs, less muscular and more rounded forms, wider ribs and greater wealth of flesh. The *Chinese* breed and the *Neapolitan* have been of great use in the crossing and improving of the breeds commonly reared in Britain, giving rise to the improved white and black breeds respectively. The *Chinese* breed was renowned for its fertility, as well as for the rapidity with which, without materially increasing in offal or bone, it laid on flesh. Its head was short and thick, ears erect, legs very short, chine high and broad, and jowl wide, belly hanging very near to the ground. As a rule it carried a small quantity of hair. The skin was usually dark, but the flesh was delicate and white. These valuable characteristics distinguish the improved Yorkshire pigs which are now so much esteemed all over the British Isles as well as in several foreign countries. The *Neapolitan* breed was entirely black, with little hair, moderately short in the face, ears small and erect, short in the leg, moderately long and thick in the body, remarkably easy to fatten, but scarcely so robust in constitution or so prolific as the *Chinese* pig.

There are now twelve distinct improved breeds of swine reared in the British Isles. The *Large White* or *Large Yorkshire* is a hardy, prolific and useful white breed, which is the most widely distributed and the most numerously represented. It is of medium length of face, and the nose is not upturned as in the next breed mentioned. It is a good general-purpose type for British conditions, though somewhat late in reaching maturity. The *Middle White* breed, of smaller size, is more easily fattened at an early age, though somewhat less prolific. The *Lincoln Curly-Coated White* breed is another large variety, with drooping ears and curly hair. The *Large Black* breed, of a sooty black colour throughout, and also with lop ears, is of the same general type. The *Berkshire* is a smaller, less prolific type, black with white 'points,' which is excellent for the production of young porkers, but liable to get too fat when kept to greater age. The *Tamworth*, a chestnut-coloured animal, is of large size, rather stronger in bone than the other sorts, and is noted for its high proportion of lean meat and the excellent quality of its bacon. It is a prolific but slow maturing type. The *Gloucester Old Spot*, the *Essex*, the *Wessex*, the *Ulster*, the *Cumberland*, and the *Long White Lop-Eared* are breeds of considerable local but of less general importance. In the United States the *Berkshire* and three breeds that have originated in that country, viz., the *Poland China*, *Duroc Jersey*, and *Chester White*, are the common

varieties. When allowed to run wild, pigs multiply rapidly under favourable conditions, as has happened, for example, in the *Polynesian Islands* and in *New Zealand*.

Pigs are profitably kept wherever there is much vegetable refuse on which to feed them, as by cottagers having gardens, farmers, millers, brewers, &c. They are often allowed to roam over fallow ground, which they grub up for roots, and over stubble-fields, which they glean very thoroughly. It was an ancient practice to allow pigs to feed in woods, where they consumed acorns, beechmast, and the like. When they are fed, as is sometimes the case, chiefly on animal garbage, their flesh is less palatable and less wholesome. The pig has a reputation, which it does not deserve, of peculiar filthiness of habits. It is true that it wallows in the mire, to cool itself and to provide itself with a protection against insects, and it searches for food in any puddle; but its sleeping-place is, if possible, kept scrupulously clean. The too common filthiness of pigsties is rather the fault of their owners than of their occupants; and a clean and dry sleeping-place is of great importance to the profitable keeping of pigs.

Hog Cholera or *Swine Fever*, due to the presence of a bacterium, caused terrible havoc in the United States in 1870-80, though hardly known twenty years before. As in the splenic fever of sheep, due also to bacteria, attempts have been made to ward off the more violent form of the disease by inoculating animals with a milder type.

The pig is not inferior to other quadrupeds generally in intelligence, but it excels most of them in obstinacy. It can be easily rendered very tame and familiar. Its acuteness of scent has been turned to account in making it search for truffles; and a tale is told of a pig having been successfully used as a pointer. The pig has sometimes served as a beast of draught.

The *Bosch Vark*, or *Bush Hog* of South Africa (*Phacochoerus*), is about 2 feet 6 inches high, covered with long bristles; it has projecting tusks, a large callous protuberance on each cheek, and long, sharp, tufted ears. It is gregarious, subsists chiefly on vegetable food, and makes destructive inroads on cultivated fields. Other wild pigs are *Sus vittatus* (East and Southern Asia), *Sus veru-cosus*, and the *Babiroussa* (Celebes and Buru). The *Peccaries* (q.v.) are closely allied.

See *Pigs*, by Sanders Spencer (Vinton & Co.), also works by Long and Day.

Pigeon (Ital. *pigione*, *piccione*, or *pipione*, from *pipiare*, Lat. *pipere*, 'to peep or cheep'), a name sometimes applied, like dove, to all the species of *Columbidae*, and sometimes almost restricted to those still included by ornithologists in the genus *Columba*; having a bill of moderate length, hard, and a little arched at the point, the base of the upper mandible covered with a soft thick skin, in which the nostrils are pierced; the feet with toes divided to the base, and formed both for walking and perching; the wings rather large and pointed; the tail of moderate length, and generally square at the end. The species of this group are very numerous, there being nearly 150 different kinds, and they are found in all parts of the world. Some of them build their nests in trees, and others in rocks. They invariably lay only two eggs at a time, but breed several times in the year, both the male and the female taking part in the process of incubation, as also in that of feeding the young birds. The origin of all the domesticated varieties of the pigeon is the *Blue Rock-pigeon* (*C. livia*), the *Biset* of the French, a bird of extensive geographical range, being found as far north as the *Faeroe Islands*, and in nearly all parts

of the eastern hemisphere. It is found in large numbers on the British coast, particularly on the Orkney Islands and the Hebrides, and also in the Mediterranean. Its food consists partly of molluscs and other small animals, and partly of grain and seeds; and it often pays unwelcome visits to the cornfields within its radius. In a wild state the blue rock-pigeon exhibits great uniformity both of size and plumage; it is not quite 12 inches in length from the tip of the bill to the end of the tail; the prevailing colour is bluish gray, in some parts with green and purple reflections, and having two broad and distinct black bars across the closed wings; the lower part of the back is whitish; the tail is a deep gray with a black bar at the end; the bill is dark brown; the legs and feet reddish orange. There are also the Stock-dove or Smaller Wood-pigeon (*C. cenas*), found all over southern and mid Europe, a species found in woods; and the Ring-dove, Wood-pigeon, or Cushat (*C. palumbus*), very common in all parts of Europe and Asia and in northern Africa, and the largest of the British species. These are all the British species of pigeon; in addition we may mention the Ring-tail Pigeon (*C. caribbea*), a West Indian species; the Bald-pate or White-headed Pigeon (*C. leucocephala*), also found in the West Indies and Florida; the Double-crested Pigeon (*C. dislopha*),



a, Rock-dove (*Columba livia*); b, Stock-dove (*C. cenas*);
c, Ring-dove (*C. palumbus*).

found in the northern parts of Australia, and having, as its name indicates, a double crest, one half on the back part of the head, and the other springing from the forehead. There are other species, too numerous to mention.

As already stated, only the blue rock-pigeon has been domesticated, but this species lends itself very readily to the restrictions of civilised life. The changes brought about in it are very varied and remarkable; and the description of his experiments upon the pigeon by Darwin is of the deepest interest. For many centuries and in all lands pigeon-breeding has been a favourite pursuit with all classes of society. In India several of the native rulers have very extensive establishments for the breeding of pigeons. In Persia and in Asia Minor the pigeon is very largely and carefully bred; and in the latter country

especially many of our most beautiful varieties have been produced. From North Africa we have also received at least one fine breed. Throughout Europe this pursuit is followed with a great amount of enthusiasm, more especially in Italy, Germany, France, and Belgium, as well as the United Kingdom. In Belgium the sport of pigeon-flying or racing is the national sport engaged in by all sections of the community; and to that country we owe the variety known as the Homing Pigeon (see CARRIER PIGEON). In the United Kingdom, as in America, there are enormous numbers of breeders who devote themselves to what are known as 'fancy pigeons,' by which term are known those bred for their special points or characteristics. Of these there is a great and ever-increasing variety, which it is impossible to describe in detail, as there are in all some two hundred breeds, many of which have several distinct colours. The following are some of the most prominent: *Carrier* (q.v.).—This is not, as is commonly supposed, a member of the homing family, though undoubtedly it was at one time used to carry messages. It is much longer in feather than the blue rock, and is specially characterised by having an abnormal development of the beak and eye wattles, the former of which is like a round fleshy ball pierced by the beak. *Dragon*.—Of a similar type, rather lighter in body, and with less heavy wattles. *Barb*.—A heavy-wattled pigeon; but in this case the eye-wattle is the chief point, and it is bred so that the head has the appearance of a bobbin or reel. These three varieties make up the *Wattled Pigeons*; and they are all very valuable when bred to perfection. *Pouters*.—The Pouting Pigeon is equally high class, the name arising from the great development of the crop, which has a globular form, and stands out from the neck. Of these the best known is the English Pouter; and there is also the Norwich Cropper; the former a large bird, and the latter a smaller one. The smallest of this family is the diminutive Pigmy Pigeon. In these the head, which is at the back of the crop, is often almost buried by it. *Jacobin*.—A breed in which the head and neck feathers are largely developed, the former in the shape of a hood, so that the head is often buried within it, and the latter falling on to the shoulders, leaving a round space between, known as the rose. *Fantail*.—In this the characteristic which gives the variety its name is that the tail-feathers spread themselves out transversely to the body in the shape of a fan, and in good specimens evenly so. The head is thrown back, often touching the tail, with a nervous motion, the body poised on short legs, and the bird looking as if it were falling backwards. *Tumblers*.—In these the name is derived from the tumbling or turning motion when flying in the air, and good well-trained birds have been known to remain on the wing for many hours without cessation. They are divided into two sections—viz. Flying Tumblers—i.e. those which are bred for this quality, and Fancy Tumblers, in which the propensity is lost or suspended through disuse. A very valuable breed is the Short and Long Faced Tumbler, of which there are several varieties, notably the Almond, so called from its rich coloured plumage. The Nun and the Magpie are supposed to be descended from the same family. Allied to the flying tumblers are the Rollers and the Tipplers. *Frisled Pigeons*.—These include a very large variety, the greater portion of which originated in the Orient. They are thus called because the throat or chest is decorated with a frill of curled feathers, more or less perfect. Some have in addition a crest on the head, and there is an almost endless variety of colour and of markings, the richest—those known as Oriental Frills—

being of much later introduction than the Owls and Turbits. One, the White African Owl, is the smallest of all domestic pigeons, and comes from Tunis. *Antwerps*.—A very massive-built bird in which there is a considerable admixture of homer blood. Of the other prominent varieties the homer has already been referred to; the Russian Trumpeter has a large crest and very profuse leg-feathering; the Runt is the largest of all pigeons, and on the continent of Europe is extensively bred for the table.

For the keeping of pigeons different forms of houses may be adopted. When they are permitted to fly about they may have either small cotes for, say, four pairs, mounted on tall poles—and these can be made very attractive—or they may be accommodated in larger houses. Fancy pigeons are usually restrained by what are called flights or aviaries, which consist of a large space attached to the house, the sides and top made of wire-netting, so that the birds cannot get away. It would be too great a risk to permit valuable birds to fly. Whether in confinement or at liberty each pair of pigeons must be supplied with a nest of their own, which is better if double, as often they are sitting on eggs and feeding young pigeons at the same time. In the nest-boxes pans are placed of the usual construction for this purpose. Pigeons are prolific breeders, and will lay several times during the year, each time a couple of eggs. The male and female, if permitted to do so, continue faithful to each other from year to year, a circumstance noted by Pliny and others of the ancients.

Pigeon-flying. See CARRIER PIGEON.

Pigeon-shooting is a form of shooting in which live pigeons are shot at as released from traps. The traps, usually five, are placed 5 yards apart on an arc of a circle which has the shooter, not more than 31 yards off, as its centre. The traps are boxes falling flat open at the release of a spring, so ordered that it is impossible for anyone to know beforehand which bird will be freed; emptied traps are immediately refilled, and at the next word from the shooter the same or any other trap may be released. To count, birds must fall and be retrieved within a boundary from 65 to 20 yards off. As quickest on the wing the blue rock is the pigeon generally used. The sport, as will be seen, is artificial. It is also essentially competitive, and matches are usually for money, sometimes large sums; handicapping is effected by shortening the shooter's distance from the traps. Betting is usual. The merits of pigeon-shooting as a test of marksmanship are undoubted, but the organised nature of the killing, the unfair chance of escape, the incidental cruelties, as of maiming, &c., have tended to bring it, where it has not been suppressed, into disrepute. Pigeon-shooting in England can be traced onwards from 1793. In the days of the Red House, at Battersea, betting was frequently heavy. When the Red House Club was closed in 1850 pigeon-shooting was for some years out of fashion, but later, under Frank Heathcote, many successful meetings were held at the Old Hornsey Wood House. In 1867 the Hurlingham Club at Fulham was opened, and there pigeon-shooting was a favourite sport; it was, however, stopped on a resolution of the club in 1905. Thereafter meetings took place under the National Gun Club, but in 1921 the sport was prohibited in Britain by act of parliament. Monte Carlo, where pigeon-shooting was instituted in 1872, is the great centre of competitions; prizes are rich, and competitors are attracted from many countries; in 1921 it was promised that live birds would not be used, but in the same year the practice was resumed—only a short distance across the frontier

in French territory. After Monte Carlo, Aix-les-Bains is next in importance.

The substitution of artificial for live birds has given rise to what is known as clay-bird shooting. The 'birds,' of saucer shape, were originally of clay, now more generally of a composition of pitch. They are thrown from traps (usually fifteen) at different and unknown angles. The ordinary distance of an unhandicapped shooter is 18 yards. The sport originated in the United States, and spread to Canada, Britain, France, Belgium, Holland, and elsewhere. In 1893 the Inanimate Bird Shooting Association, restyled in 1903 the Clay Bird Shooting Association, was formed in England, and under it annual championship meetings were initiated. Throughout Britain there are many clubs.

Pigments used in artistic work vary much in permanence; not a few of the pictures painted by distinguished artists during the 18th and the first half of the 19th century are already more or less faded by the action of light or otherwise injured by impurities in the atmosphere of rooms. It is imprudent to expose any kind of artistic work in colours to direct sunlight or even, it would seem, to the light of electric arc lamps. The following refers to the durability of pigments employed in oil-painting, when continuously exposed to fairly strong daylight. Among blue colours, ultramarine, both real and artificial, is permanent; while Prussian blue is liable to some change, and indigo is fugitive. Among red colours, vermilion and the red ochres are perfectly durable; while the madder reds and purples can hardly be so thoroughly relied upon, and the carmine and crimson lakes, from cochineal, quickly give way. Among the yellows, raw sienna, yellow ochre, as well as the cadmium and Naples yellows, are quite stable; while Indian, chrome, and lemon yellows, and also aureolin, although less so, are yet fairly durable, but gamboge and yellow lake are not. Among greens, oxide of chromium undergoes no change, terre verte is practically permanent, and so also is emerald green, but it is blackened by contact with cadmium yellow. Among browns, burnt sienna, raw and burnt umber, cappagh brown, and Caledonian brown do not at all fade; but hardly as much can be said of madder brown, Cologne earth, and Vandyke brown, although these are fairly durable. Asphaltum or bitumen has a tendency to move on the canvas unless very carefully prepared, and its rich brown colour is not altogether permanent. Lampblack, ivory black, and charcoal black are quite durable, so also are flake white, zinc white, and baryta white. It is generally the case that a colour produced by a mixture of permanent pigments is also permanent, and it may be added here that flake white (white lead), so much used to mix with other colours for light tints, is liable to discolour when exposed to sulphuretted hydrogen (an occasional impurity in coal-gas), and this colour has also a tendency to tarnish when kept in the dark.

The above remarks on colours made up with oil apply equally to water-colour pigments, with a few exceptions. These are vermilion, especially if artificial, Naples yellow, chrome yellow, and madder brown, the permanency of which cannot be relied upon in Water-colours, under which head some further remarks on this subject will be found.

Fuller information about the pigments named above, as well as others, will be found under the heads ASPHALT, BLACK, BLUE, GREEN PIGMENTS, LAKES, OCHRES, &c. The oils and varnishes used as media for pigments, as well as the nature of the prepared canvas or paper used for painting upon, have all a bearing on the preservation of the colours of a picture. See works by A. P. Laurie. The

history of the introduction of the principal pigments is given at PAINTING.

Pigments of Animals. The colour of an animal or part of an animal may be due to the physical structure of the surface from which the light is reflected, as in the case of the mother-of-pearl in the interior of a shell. Or it may be due to the presence of a substance whose molecules absorb or reflect only certain parts of the visible spectrum. Such substances are called pigments, and they vary greatly in their chemical nature. The reddish pigment of the blood, the blackish pigment of dark fur, and the yellowish pigment of yolk of egg may serve as examples. Thirdly, the finest colouration among animals is due to a combination of physical and pigmentary colour, as in the blue feathers of some parrots, the metallic-green wing-cases of some beetles, the beautiful blue scales of some butterflies, and the iridescent setæ of Aphrodite, the sea-mouse. When physical structure is a factor the colour of the surface changes as it is moved about, as is familiar in peacocks' feathers; when physical structure enhances the effect of a pigment, it may result in a colour—notably blue or green—which is quite different from the colour of the pigment.

Chemistry of Animal Pigments.—It is convenient to begin with chlorophyll, the green colouring matter of plants, for it is the most important pigment in the world, being connected with the utilising of red and orange light rays in photosynthesis. In the green freshwater sponge, the green hydra, the green sea-anemones, in the green worm called *Convoluta*, and in many other cases, the green colour of the animal is due to partner or symbiotic Algae (*Zoochlorella* and others), but there are also a few green animals, which have chlorophyll of their own. These may be illustrated by the green Bell-Animalcule (*Vorticella viridis*) and various green Flagellates, such as *Euglena* and *Volvox*. The molecule of chlorophyll is still very imperfectly understood, but it is readily split into two parts by the action of alkali, one of the parts being a complex, colourless alcohol called phytol. The other part has for its foundation the pyrrol ring, in which four carbon atoms form a ring with one atom of nitrogen. In chlorophyll there are four of these pyrrol rings joined together, and linked to these in some way there is a single atom of magnesium. The reason for giving this detail is that a very similar structure recurs in the red pigment of the blood. As a matter of fact the chlorophyll of plants is much more complicated than used to be supposed; it is a system of four pigments, chlorophyll-*a* and chlorophyll-*b*, which absorb red and orange rays, and therefore appear green, and besides these there are two yellowish pigments, carotin and xanthophyll, which seem to be less important. When the light shines on the green leaf, there is probably a continuous cycle of change, from chlorophyll-*a* to chlorophyll-*b*, with absorption of carbon dioxide, and back again from chlorophyll-*b* to chlorophyll-*a*, with liberation of oxygen. This is very interesting, because in the blood of vertebrates the red pigment shows the same general alternation between oxy-hæmoglobin and hæmoglobin. (See RESPIRATION.)

The molecule of hæmoglobin, the red pigment of the blood, may be split into two parts, the colourless portion being a protein called globin. The coloured portion, now called hæm, consists (like that of chlorophyll) of four pyrrol rings linked together with an atom of iron. Hæmoglobin varies from species to species, but the differences concern the attached protein, not the essential nucleus. In the lungs the pigment in the red blood-corpuscles captures oxygen and forms oxy-hæmoglobin; in the tissues oxygen is set free to

supply the needs of the cells. There is a continual breaking down of hæmoglobin in the body, and the products, free from protein and iron, are dealt with in various ways. Thus they almost certainly give rise to the bilirubin and biliverdin of the bile of vertebrates, and some are laid down as tissue-pigments in various backboneless animals, such as leeches and molluscs. Allied to hæmoglobin, but not so effective, is hæmocyanin, a bluish copper-containing blood-pigment, common among invertebrates such as crustaceans, some insects, and most molluscs. Here also a reference must be made to the 'cytochrome' pigments discovered by Keilin in 1925. A cytochrome contains the hæm nucleus and is therefore related to hæmoglobin, but it is much more widely distributed, perhaps universally. It does not carry oxygen over a distance as hæmoglobin does, but probably serves to control oxygen within the cell.

Another series of pigments with a wide distribution is the melanin series. Melanin gives dark colour to skins, as in negroes, to the black feathers of the blackbird, to the dark choroid of the eye, to the ink of cuttlefishes, and in scores of other cases. It always occurs in little granules and it will not crystallise. Its origin may be diverse, but there is strong reason for deriving it from tyrosine, an important amino-acid, that is, one belonging to the series that build up proteins. When tyrosine is treated in air with a widely distributed ferment called tyrosinase, it becomes reddish and then black, and is practically indistinguishable from melanin. It is probable that melanins arise from tyrosine and related substances.

Another group of animal pigments includes the chromolipoids or lipochromes, the 'coloured fat-like bodies.' They are mostly reddish and yellowish pigments, such as occur in many brightly coloured birds and fishes, where melanins often accompany them. The colouring-matter of yellow fat in many animals has a chromolipoid nature, and reference has already been made to two chromolipoids, carotin and xanthophyll, that accompany chlorophyll. This is an important fact, for these two pigments occur also in many animals, e.g. carotin in butter and xanthophyll in the yolk of eggs, thus suggesting that chromolipoids in animals may be derived directly or indirectly from plants.

In higher crustaceans, such as rock-lobsters and prawns, a reddish chromolipoid (zoonerythrin), which is next door to carotin, is common. The blue colour of the common lobster is due to a compound of zoonerythrin with a protein. When the protein is destroyed by heating, the free pigment is left to give its familiar red colour to the boiled lobster.

There are many other animal pigments that cannot be included in any of the groups referred to—such as the uric acid pigments of some butterflies, the purple secretion of the dog-whelk *Purpura* and some other Gastropods (the animal counterpart of indigo), the red pigment of the cochineal insect (a distant counterpart of the alizarin of madder), but it is perhaps more important to emphasise the great classes: the blood pigments, the melanins, the chromolipoids, and the chlorophylls—the last being almost confined to plants.

Physiology of Pigments.—Little can be said with any security as to the connection between the molecular structure of a substance and the colour to which it gives rise; and our knowledge of the physiological production of pigments is also very tentative. There are glimpses of light, however, in the derivation of melanins from amino-acids and the like, since these are constituents of the proteins which are present in all living matter. Similarly it is satisfactory when an animal lipochrome can be linked back to the

carotin or xanthophyll of plants. The 'flavone' or 'flavonol' of the wings of the marbled-white butterfly (*Melanargia galathea*) is probably derived by the caterpillar from the Cocksfoot or the Timothy grasses on which it feeds. Some pigments may be unhesitatingly classified as waste-products, such as the uric acid pigments of some butterflies. The carmine that sometimes forms half of the weight of a female cochineal insect (*Coccus cacti*) is a glucoside, yielding sugar when treated with dilute acid, and may perhaps be interpreted as a reserve product. Of others, it may be said vaguely that they are by-products of the everyday chemical routine (or metabolism) of the body. Another physiological problem is to correlate the pigmentation with external conditions. Thus in some cases the amount of pigment formed is known to vary with the temperature and the illumination. Albinism, i.e. the abnormal absence of superficial pigment, is probably due to a germinal perturbation, involving the loss of some essential pigment-producing factor, but the wan whiteness of the cave newt called *Proteus* is due to the absence of the light-stimulus, as is experimentally proved by rearing the animal in a well-lighted laboratory. Melanism or darkening is probably in many cases a modification, hammered on from without by some environmental peculiarity; but there is also evidence that it may arise as a germinal variation.

Internal Uses of Pigments.—Apart from the problem of determining origin is the easier problem of discovering utility. Thus the blood-pigments are of value in capturing and transporting gases; cytochrome is probably of value in controlling the disposal of oxygen within the cell; eye-pigments, like retinal purple, may be auxiliary to vision; a superficial melanin may be protective against too intense illumination; and chlorophyll is important in connection with the absorption of orange-red rays of light.

External Utility of Colouring.—In many different ways the colouring of animals is of importance to their well-being in the struggle for existence. Thus, the green insects and reptiles which live in the grass or on trees, the sandy-coloured animals which are hardly to be detected against a background of similar colour, the white animals which are almost invisible among the snow illustrate protective colouring. This colour-resemblance between animals and their surroundings is sometimes marvellously exact, and doubtless of great advantage. Moreover not a few animals, among crustaceans, fishes, amphibians, and reptiles, have the power of changing their colour, for the pigment-cell or the pigmented protoplasm expands or contracts under stimulus, and this is in some cases a cloak of invisibility. The conspicuous colours of some unpalatable or noxious animals may be of everyday value in warning off possible molesters. It may also be that colours are sometimes useful in assisting mutual recognition between individuals, or in indicating attitudes and movements. The bright colour of the inside of the mouth of some nestlings may help the parents to transfer the food without fumbling. Sometimes the strong colour of a gaping mouth, as in a chamæleon, may have some use in repelling intruders. Finally, in many animals the sexes differ markedly in colour, the males being almost always brighter than their mates. According to some, this depends on the constitutional peculiarities of maleness and femaleness, while Darwin has emphasised that the brightness of males has been enhanced by the selective taste of the females, and Wallace has urged that natural selection has retarded female butterflies and birds from attaining a brightness which would expose

them during the weakness or preoccupation of the reproductive period to the hungry eyes of their enemies. But our recognition of the way in which variations of colouring are fostered or eliminated in the course of natural selection must not lead us to forget the primary problems of the origin of the pigments, and of the physiological conditions which determine their distribution.

See BILE, BLOOD, BUTTERFLIES, CATERPILLARS, CHLOROPHYLL, ENVIRONMENT, FLOWER, MIMICRY, SEX, SEXUAL SELECTION. C. Fr. W. Krukenberg, *Grundzüge einer vergleichenden Physiologie der Farbstoffe und der Farben* (Heidelberg, 1884); M. I. Newbigin, *Colour in Nature* (1898); Karl Semper, *Animal Life* (Inter. Sci. Series, 1881); E. B. Poulton, *Colours of Animals* (Inter. Sci. Series, 1889); F. E. Beddard, *Animal Colouration* (1892); G. Bohn, *L'Évolution du pigment* (Série Scientia, Paris, 1901).

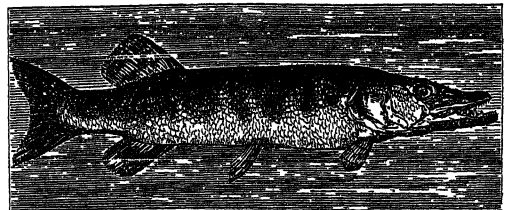
Pigmies. See DWARF, NEGritos.

Pigott, RICHARD. See PARNELL.

Pigtail, or QUEUE. See CHINA (*Social Habits*, vol. iii., p. 184).

Pika. See OCHOTONA.

Pike (*Esox lucius*), a well-known fresh-water fish abundant in the temperate parts of Europe, Asia, and America. The body is long and covered with small cycloid scales; the dorsal fin is near the tail; the mouth is large, with strong, sharp teeth; the lips have no barbels; the stomach is without the usual pyloric appendages; the open (physostomatous) air-bladder is simple; the gill-aperture is very wide. The fish is olive-gray above, silvery white on the belly, and is mottled with pale spots; in length it may measure from 2 to 4 feet; and it may attain a weight of 10 to 20 lb., or in rare



Pike (*Esox lucius*).

cases, it is said, about 60. The genus includes besides four or five other species, notably the *Muskallunge* of the North American lakes, a 'grand game fish,' often 6 feet long, in habit a dauntless marauder. Another of smaller size (*Esox reticulatus*) is the common *Pickarel* of the eastern states. All three are valuable food-fishes.

The common pike or *Jack* (Scotch *Gedd*) is said to spawn when three years old. The ova are usually laid in March, but the spawning is protracted. There is great mortality among the young, which take about a week to hatch. Growth is at first rapid, and continues more slowly for years. The longevity of the fish is great, but the records of pike which have attained to 250 years are as unsatisfactory as the evidence for longevity usually is. There is no doubt, however, that they may outlive their keepers; and it is also true that they sometimes venture ashore, and that they sometimes lie in a torpid slumber in the pools. But the most characteristic quality of pikes is voracity. Feeding for the most part on frogs and small fishes, they are often prompted by hunger to bid for higher game, such as ducks, geese, water-hens, and water-rats. Thoreau describes the pike as the 'swiftest, coarsest, and most ravenous of fishes, which Josselyn calls the river-wolf. It is a solemn, stately, ruminant fish, lurking under the shadow

of a lily-pad at noon, with still, circumspect, voracious eyes; motionless as a jewel set in water, or moving slowly along to take up its position; darting from time to time at such unlucky fish or frog or insect as comes within its range, and swallowing it at a gulp. Sometimes a striped snake, bound for greener meadows across the stream, ends its undulatory progress in the same receptacle.—The Bony Pike (*Lepidosteus*) is a Ganoid, and the name is sometimes applied to the marine Gar-fish (*Belone*) and to some American perches. See BONY PIKE, GAR-PIKE.

See the articles ANGLING and PISCICULTURE; Pennell's *Book of the Pike* (3d ed. 1884); and Bickerdyke's *Angling for Pike* (1888).

Pike, a word loosely used for almost any kind of lance or Spear (q.v.), whether larger or smaller headed, as used by infantry troops, and now superseded by the bayonet. The naval boarding-pike is a lance about the length of a man. The short pike, called *half-pike* or *spontoon*, long carried by some classes of infantry officers in most European armies, was a kind of Halbert (q.v.) with a smaller but ornamented head, and was rather an emblem of dignity than a fighting weapon. In 1804, when a French invasion was threatened, pikes were distributed by government through the country; and the secret manufacture of iron pike-heads was one of the most disquieting features of the Radical reform agitation in 1819 and during the Chartist troubles.

Pike's Peak, a peak of the Rocky Mountains, in Colorado, 65 miles S. of Denver, discovered by Captain Pike, in 1806. It rises to a height of 14,134 feet. On its summit is one of the highest meteorological stations in the world; while at the base, at Colorado Springs, there is a low-level station. There is a railway to the top, 9 miles long ($\frac{1}{4}$ miles of curves), with a maximum gradient of 1 in 4.

Pilaster, in Classical Architecture, a square pillar, sometimes standing free, but usually attached to a wall, from which it projects $\frac{1}{4}$ th, $\frac{1}{2}$ th, or other definite proportion of its breadth. Greek pilasters, or *antæ*, were of the same breadth from top to bottom, and had different capitals and bases from those of the orders with which they were associated. The Romans gave them a taper like the columns, and the same capitals and bases.



Pilaster.

Pilate, PONTIUS, the fifth Roman procurator of Judæa and Samaria, from 26 to 36 A.D. He was personally convinced of the innocence of Jesus, and tried to save him, yet sent him to be crucified to appease the raving mob of Jerusalem, washing his hands before the people to show that he took no responsibility for his death. His rapacity and cruelties caused many outbreaks, which were sternly suppressed, and at length culminated in the murder of a number of Samaritans on Mount Gerizim, which caused such loud complaints that Vitellius sent him to Rome to answer to Cæsar (36 A.D.). Eusebius tells us that Pilate made away with himself; others say that he was banished to Vienna Allobrogum (*Vienne*), or beheaded under Nero. In the Eastern Church there is a persistent tradition that he eventually embraced Christianity like his wife, and indeed in the Ethiopic Church Pilate is commemorated as a saint, his day falling on June 25. Pilate is said by Justin Martyr, Tertullian, and Eusebius to have forwarded to Tiberius for his own justification an account of the judgment of Jesus, but the so-called

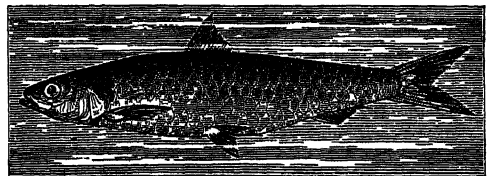
Report, and *Acts of Pilate*, as well as the two letters of Pilate to Tiberius, have no claim to authenticity.

Many legends have clustered round the sinister figure of Pontius Pilate. One relates how his body was flung into the Tiber, and caused the river to overflow, and how it was next thrown into the Rhone near Vienne, but (according to the latest form of the mediæval legend) again caused so great a storm that it was carried to Mount Pilatus near Lucerne, and there sunk securely in the deep pool on its top. But here again it made storms arise, and every year to this day on Good Friday the devil lifts him out of the pool and sets him on a judgment-seat, where he washes his hands anew.—Pilate's wife, traditionally called Procla or Claudia Procula, from her solemn warning to her husband against putting Jesus to death, has been regarded as a Christian by Origen, Chrysostom, and Hilary. In the Greek Church she is a saint, her day falling on October 27.

Pilatus, MOUNT (Lat. *Mons Pileatus*, 'the hooded peak,' from its top being frequently enveloped in cloud; the legends connecting Pilate with the place have presumably grown out of the altered name), an isolated mountain at the western end of the Lake of Lucerne, rising opposite the Rigi. The lower half is clothed with wood and meadow, where in summer many head of cattle are pastured; the upper portion is a mass of bare and jagged peaks, rising in the Tomlishorn to 6998 feet. Below the summit lies Lake Pilatus (see preceding article). On two of the peaks there are hotels; and since 1889 there has been a tooth-and-rack railway from Alpnach to the top, whence there is a splendid view of the Bernese Alps.

Pilau, or PILLAF, a dish common in Turkey, Egypt, Syria, and India, consists generally of rice, thoroughly boiled, drained, and gently stirred with butter, pepper, and finely-chopped onions. For the tables of the wealthy, fowls, lamb, mutton, shreds of ham or bacon, variously cooked, but always much boiled or roasted, are placed on the top of the rice, and served up with it.

Pilchard (*Clupea pilchardus*, or *Alosa sardina*), an important fish of the family Clupeidæ. The pilchard is nearly equal in size to the herring, but rather thicker, and the lines of the back and belly are straighter; the scales are also larger and fewer; and the dorsal fin is rather farther forward. The mouth is small, and in the adult fish destitute of teeth; the under-jaw is longer than the upper. The upper part of the body is bluish green, the sides and belly silvery white, the cheeks and gill-covers tinged with golden yellow, and marked with radiating stræ, the dorsal fin and tail dusky. The pilchard is an inhabitant of more southern seas than



Pilchard (*Clupea pilchardus*).

the herring. In British seas it is abundant off the coasts of Devon and Cornwall, and the south and south-west coasts of Ireland; towards the east end of the English Channel it becomes scarce, and off the more northern coasts of the British Isles it is only taken occasionally in small numbers. It extends in abundance throughout the Bay of Biscay, along the west coast of Portugal, and the shores of the Mediterranean; its southern limit is Madeira.

In France this fish is known as *la sardine*. It is true that the sardines in oil imported into Great Britain are smaller than the majority of English pilchards, but they are of the same species. The English pilchard is usually about 10 inches long. The French sardine is said by Moreau to be from 12 to 20 cm. in length—i.e. 5 to 8 inches—sometimes reaching 25 cm. or 10 inches. The fish used for preserving in France are certainly young and not full grown. Pilchards are now prepared in oil in the same way as French sardines, at Mevagissey in Cornwall, and have an extensive sale; so are Sprats (q.v.) at Deal.

Unlike herrings, the pilchards which are captured are not in breeding condition, but are fat, with small reproductive organs. In fact the habits of the pilchard are the direct converse of those of the herring. The pilchard is found feeding near shore in more or less abundance for nine months of the year, but in June, July, and August, when as a rule none are being caught near shore, spawning pilchards are found at some distance, 10 to 50 miles or more, from the land. At this season a few are occasionally taken in mackerel nets, in which the largest ones are meshed in consequence of their swollen condition. The ova, unlike those of the herring, are quite transparent, and buoyant like those of the cod and mackerel; they pass through their development while suspended separately in the sea-water. Like the herring, the pilchard feeds upon minute crustacea and other animals, some adult, some larval, which swarm in the sea.

In Scotland the pilchard is known as the *Gypsy Herring*, *Garvie Herring* (the sprat being *Garvie*), or *Crue Herring*. See FISHERIES.

Pilcomayo, a river of South America, which takes its rise in two branches in the Bolivian Andes, in the department of Potosí, flows in a very winding course south-east through the Gran Chaco, separating Paraguay and Argentina, and finally joins the Río Paraguay a little below Asunción. The volume of water brought down is comparatively insignificant, much being spent in lagoons on its way; at the mouth there is scarcely any perceptible current, and the breadth is not 60 yards, while within the first 200 miles it narrows more than once to less than 20 yards, and moreover divides into branches, among some of which explorers, like Captain Page, have lost their way. There have been many attempts, all fruitless, made to open the river route between Argentina and Bolivia; since 1536 numerous expeditions have been sent out, and many of the explorers have perished. There are numerous rapids, and long canals would be required. In its upper course its sands are auriferous and the banks fertile; lower down the valley is swampy. The river's water is rendered like brine by the great salt lakes of the Chaco—in which part the river is buried for hundreds of leagues in a great forest of fan-palms.

Piles are usually squared logs of wood used in engineering operations, such as dams, bridges, and roads (see COFFERDAM, &c.). They are sharpened, and, if necessary, protected with iron points. Piles are also used for permanent works, when they are driven through loose soil till they reach a firm bottom, and thus form a foundation on which buildings, roads, &c. may be placed. Cast-iron is also used for piles, which are cast hollow. Common piles are driven in by machines called *pile-drivers*. In these a heavy weight (or monkey) is raised to a considerable height between two guides, and then let fall on the head of the pile. The application of steam to these drivers has made them very powerful engines—Nasmyth's steam-hammer being a well-known instance. See also LAKE-DWELLINGS.

Piles, or HEMORRHOIDS, are small swellings

situated either within or on the verge of the anus. The first step in their development is the dilatation of one or more veins in this region. They consist of folds of skin or mucous membrane, with the subjacent tissues in an inflamed, infiltrated, or permanently thickened condition, and usually contain enlarged veins, though these sometimes become obliterated. There are several varieties of these tumours. Sometimes the pile is mainly composed of a little knot of varicose veins; in this case it is readily emptied by pressure of the fluid blood contained in it, which, however, returns when the pressure is removed. Sometimes the blood coagulates, either in a dilated vein, or, if this has given way, around it, forming a solid tumour surrounded by tissues thickened in consequence of inflammation; or the tumour may consist of a kind of erectile tissue formed by an abnormal condition of the vessels of the mucous membrane; this variety is especially liable to bleed. These tumours are divided into *bleeding* and *blind* piles, according as they are or are not accompanied by hæmorrhage; and into *internal* and *external* piles, according as they are within or without the sphincter muscle of the anus.

The following are the general symptoms of this affection. The patient, after having experienced for a varying time a feeling of heat, fullness, and dull pain about the lower part of the bowel, becomes conscious of a sensation as if there were a foreign body in the anus, and on examination after an evacuation discovers a small tumour, usually about the size of a grape, which either remains outside or is retracted, according as it originated without or within the sphincter. This tumour gradually increases, and others form around it, until a mass at length may result as large as a pigeon's egg, or larger. In its ordinary *indolent* state the swelling has little sensibility, and occasions comparatively little annoyance; but when it is *inflamed* (from strangulation by the sphincter muscle, or from any other cause) it is exquisitely tender to the touch, and is the seat of burning and stinging sensations, rendering the evacuation of the bowels (and sometimes of the bladder also) difficult and painful. In women an inflamed pile may cause pain in the back, irritation of the womb, with mucous discharge, and many other anomalous symptoms. In severe cases the patient can neither stand nor sit with comfort, and only finds relief in the horizontal position. In internal piles the most important symptom, sometimes the first to be noticed, is hæmorrhage, which may be so profuse or so often repeated as to cause serious *anæmia*.

Piles may be caused by any circumstances which cause congestion in the lower bowel, such as luxurious and sedentary habits of life, pregnancy, and such diseases of the liver as tend to check the return of blood from the veins of the rectum. Moreover, anything that causes irritation of the rectum, such as excessive use of purgatives, dysentery, inflammation of the prostate gland, &c., may cause piles. But of all causes constipation is probably the most frequent; it operates in producing them partly by the pressure of the accumulated and hardened *feces* upon the veins carrying the blood away from the rectum, and partly by the straining and irritation such *feces* occasion during their evacuation.

In the treatment of piles it is expedient to relieve the congested state of the lower bowel by one or two doses of sulphate of magnesia, and a course of vegetable diet, after which the continued use of mild laxatives should be resorted to. A teaspoonful of an electuary, consisting of an ounce of confection of senna, half an ounce of cream of tartar, and half an ounce of sulphur, if taken in the middle of the day, usually acts gently about bedtime,

which is far the best time for the bowels of patients of this kind to act, as the parts irritated by the passage of the evacuation become quieted during the night. It is most important that the piles should be carefully pressed back after every movement of the bowels. Amongst the milder forms of local treatment must be mentioned (1) the injection of the rectum with cold water both before and after the motion; (2) washing the anus with yellow soap and water after each evacuation—this should never be omitted by anyone who suffers from piles; (3) the application of gall ointment, adrenalin ointment, or of other astringents; and (4) the injection of astringent lotions, as, for instance, of sulphate of iron, in the proportion of a grain to an ounce of water. When the piles are inflamed, a suppository of morphia and cocaine relieves the pain; which is also eased by plunging the buttocks into a sitz bath or basin of very hot water; the inflammation generally subsides under the influence of rest in the horizontal position, fomentations, poultices, and low diet. In severe and prolonged cases operative interference becomes necessary. For external piles removal with scissors is usually employed. In certain forms of internal piles the application of caustics, especially injection of a few drops of pure carbolio acid into the centre of the pile, sometimes causes clotting in and disappearance of the pile. Where their removal is required it may be effected either by ligature or by cauterisation, or in severe cases by excision of a ring of mucous membrane containing the piles.

The treatment of the hæmorrhage that frequently accompanies piles requires a few words. If the bleeding is moderate in quantity, and has continued for some time without inducing weakness or any other bad symptom, it is not expedient to interfere with it. When, however, it obviously requires checking, the effect of cold water injected into the rectum, as already recommended, should be tried, and, in case of its failing, astringent injections should be had recourse to. At the same time the patient should remain in the horizontal position. Surgical interference to check the bleeding is seldom, if ever, necessary.

Pileus (Lat. 'a hat'), the upper expanded portion of many Fungi (q.v.).

Pilewort. See RANUNCULUS, CELANDINE.

Pilgrim (Ital. *pellegrino*, Lat. *peregrinus*, 'a visitor of foreign lands'). A pilgrim is one who visits, with religious intent, some place reputed to possess especial holiness. The early Christians, like the Jews and the pagan Gentiles, regarded certain places with special religious interest; above all, the Holy Land, and particularly the scenes of the Passion of Christ at Jerusalem. St Jerome refers the practice of visiting Jerusalem to the discovery of the Holy Cross by St Helena. He himself was a zealous pilgrim; and throughout the 4th, 5th, and 6th centuries pilgrims habitually undertook the long and perilous journey to the Holy Land from almost every part of the West. Other sacred places, too, were held to be fit objects of the same visits of religious veneration. The tombs of the apostles Peter and Paul, and of the martyrs in the catacombs at Rome, are so described by St Jerome. St Basil speaks in the same terms of the tomb of the Forty Martyrs; and the historian Theodoret tells of not only visiting such sanctuaries, but of hanging up therein, as offerings, gold and silver ornaments, and even models of hands, feet, eyes, &c., in commemoration of the cures of diseases supernaturally obtained as the fruit of these pious visits. The Pilgrimage, however, pre-eminently so called, was that of the Holy Land; and, even after Jerusalem had been occupied by the Saracens, the liberty of pilgrimage, on payment of

a tax, was formally secured by treaty; and it was from the necessity of protecting pilgrims from outrage that the well-known Military Orders had their origin. The Crusades may be regarded as a pilgrimage on a great scale; the direct object being to secure for the Latin Christians immunity of pilgrimage. On the other hand, the final abandonment of the Crusades led to a great extension of what may be called domestic pilgrimage, and drew into religious notice and veneration many shrines in Europe, which, after the lapse of time, became celebrated places of pious resort. The chief places of pilgrimage in the West were, in Italy—Rome, Loretto (q.v.), Assisi; in Spain—Compostela, Gnadalupe, Montserrat; in France—Fourvières at Lyons (q.v.), St Denis; in Germany—Maria Zell, Cologne, Trier; in Switzerland—Einsiedeln; in England—Walsingham, Canterbury; in Scotland—Whithorn, Whitelkirk (near North Berwick), Loretto (Musselburgh), Scone, Dundee, Paisley, and Melrose; in Ireland—Station Island (see DERG), and many places connected with the life or death of the early Irish saints. The pilgrim commonly bound himself only by a temporary vow (differing in this from the palmer), which terminated with the actual visit to the place of pilgrimage, or at least with the return home, and by which he was bound for the time to chastity and to certain other ascetic observances. Many abuses arose out of these pilgrimages, the popular notions regarding which may be gathered—although, probably, with a dash of caricature—from Chaucer's *Canterbury Tales*, and from Erasmus's account of the pilgrimage to Walsingham (*Peregrinatio religionis ergo*). Pilgrimages have gone much into disuse in France since the Revolution. In late years, however, pilgrims have resorted in large numbers, not only to the ancient sanctuaries of Fourvières, Puy, &c., but also to La Salette, Paray-le-Monial, and since 1858 to Lourdes. Knock (q.v.) became in 1880 a resort of Irish Catholics; Carfin, near Motherwell, in 1922 of Scottish. Pilgrimage is of cardinal importance to Hindus (see BENARES, HARDWAR, &c.) and to Moslems (see HAJJ, MECCA). Positivists also visit the places connected with the lives of selected great men. See Jusserand's *English Wayfaring Life in the Middle Ages* (1888, new ed. 1920), and Sidney Heath's *Pilgrim Life in the Middle Ages* (1912); and for the historic route from Winchester to Canterbury, see *The Old Road*, by Hilaire Belloc (1905) and *The Pilgrims' Way*, by Julia Cartwright (new ed. 1912).

Pilgrimage of Grace, a rising of the rural population in Lincolnshire and Yorkshire in 1536. When the commissioners charged with the suppression of the minor monasteries arrived in Lincolnshire, reports were spread abroad among the people that all the church jewels and plate were to be taken away, that most of the churches were to be pulled down, that new taxes were to be levied, and that the rights of the commons were in other ways to be vexatiously interfered with. The rising began at Louth on 1st October; 20,000 men soon gathered at Lincoln, under the leadership of Dr Mackerel, Abbot of Barlings, a shoemaker named Melton, better known as Captain Cobbler, and some of the dispossessed monks and gentry. But the approach of the Duke of Suffolk from the south, and a proclamation by the Earl of Shrewsbury, who was drawing near from the west, stating that what had been done was with the consent of parliament, and promising a free pardon to the rebels, caused them to disband and go away home (October 13). In the meantime a similar rising for precisely similar causes had taken place in Yorkshire; it began on 9th October in the East Riding, the chief leader in the movement being a lawyer named Robert Aske. The rebels, 40,000 in number, took York and Ponte-

fract, capturing in this last town Lord Darcy and the Archbishop of York (not unwilling to be captured). The king sent against them the Earl of Shrewsbury and the Duke of Norfolk, and on the reading of a similar proclamation to that in Lincolnshire they dispersed to their homes. In the following year Aske, Sir Robert Constable (who had been associated with Aske in the leadership), Lord Hussey (suspected of complicity in the Lincolnshire movement), Mackerel, and others, about twenty in all, were executed. See Gairdner's preface to *Calendar of State Papers: Henry VIII.*, vol. xi. (1888), and a book by M. H. and R. Dodds (1915).

Pilgrim Fathers, generally known in American history as THE PILGRIMS, the founders of the first English colony to be permanently settled in New England. They belonged mostly to a set of separatists (Brownists) from the Church of England. Originating in Yorkshire they had established independent churches at Scrooby in Nottinghamshire and at Gainsborough in Lincolnshire at the end of the 16th and at the beginning of the 17th century, and, in 1608, seeking escape from religious persecution, had fled to Holland, first to Amsterdam and then (1609) to Leyden where they formed a church. With little hope of returning to England, and desirous of preserving their distinctive national character and of realising what they believed to be their providential calling of founding a new church and of spreading their religion in some remote part of the earth, they turned to the New World and sailed in the *Speedwell* from Delfshaven about 22nd July 1620; in the *Speedwell* and the *Mayflower* from Southampton (here they had been joined by associates in England), 5th August, and later from Dartmouth, where the *Speedwell* had put in for repair; and in the *Mayflower* from Plymouth (a depleted company, the *Speedwell* having there been abandoned), 6th September. The company (exclusive of the crew) sailing from Plymouth numbered in all 102 persons, men, women, and children, and was bound for the banks of the Hudson within the colony of Virginia; but after a long and stormy voyage they landed, 21st December (though in the United States Forefathers' Day marking the event is celebrated on the 22d), on the bleak shores of Cape Cod at a point to which Captain John Smith in the course of an exploration in 1614 had given the name of Plymouth. Here was founded the colony of Plymouth (q.v.), which existed as a separate state from 1620 till, under a charter of 1692, it was united to the colony of Massachusetts Bay, which after 1628 had been established by Puritan emigrants from England to be distinguished from the Pilgrim Fathers (see MASSACHUSETTS). Soon the earliest Plymouth colonists were joined by others from the church at Leyden, and by 1631 almost the whole of that body had emigrated. The first years of the colony were years of much difficulty and of great privation. From the outset democratic government was established, and communism at first was practised but gradually was forsaken, and in 1626 was completely abandoned. A religious illiberality which came to be displayed is to be viewed, it has been held, only in relation to the prime necessity of maintaining civil order. Though the Virginia Company founded the first permanent English colony in America the Pilgrim Fathers formed the nucleus of the New England states, and as such are peculiarly revered in the United States as pioneers and national founders. In 1894 a General Society of Mayflower descendants was organised to preserve the memory, records, and history of the pilgrims and their stock. Among notable pilgrims were Myles Standish (q.v.), Edward Winslow (q.v.), and William Bradford (1590-1657), historian of the

colony and its governor (except for five years' interval at his own request) from April 1621 till his death. See also ROBINSON (JOHN). A barn at Jordan's Hostel, Chalfont St Giles, Buckinghamshire, is held by Dr Rendel Harris (see his *The Finding of the Mayflower*, 1920) to have been built of the veritable timbers of the *Mayflower*.

See the Massachusetts Historical Society's edition (2 vols. 1912) of Bradford's *History of Plymouth Plantation, 1620-47*, written after 1630 and first printed in 1856 from the original MS., which, lost it is supposed during the War of Independence from the New England Library, in the tower of the Old South Church, Boston, reappeared in the Fulham Library, London, but was not generally identified till 1855, and was returned to the United States in 1898, being deposited in the Massachusetts archives. See also Goodwin, *The Pilgrim Republic* (1888); John Brown, *The Pilgrim Fathers of New England* (1895, new ed. 1920); H. M. & M. Dexter, *The England and Holland of the Pilgrims* (1905); and works by Devereil (1887), Arber (1897), Usher (1919).

Pilibhit, a town in the United Provinces of India, 30 miles NE. of Bareilly; pop. 32,000

Pili-nuts. See CANARIUM.

Pillar, a detached support like a column; but its section may be of any shape, whereas the column is always round. Pillars have been used in all styles of architecture, and their forms and ornaments are usually amongst the most characteristic features of the style. The Greek and Roman pillars (or columns) are the distinguishing elements in the various orders. In Gothic architecture, also, the pillars or piers are of different forms at the various epochs of that style. In the Norman period we have plain massive pillars, square, circular, and octagonal, frequently ornamented with zigzag ornaments, spiral bands, &c. on the surface (fig. 1). As vaulting progressed, the system of breaking the plain surface of the pier, and giving

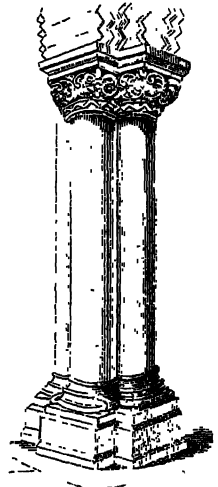


Fig. 1.

Norman Clustered Pillar.

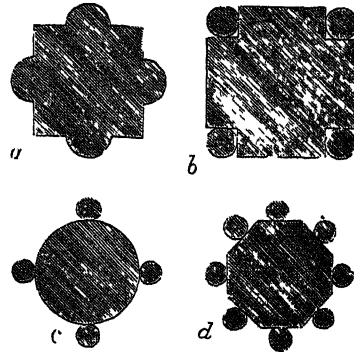


Fig. 2.

to each portion of the vaulting a separate little column or shaft to support it, was introduced. This was done either by attaching shafts to the pillars or by cutting nooks in the pillars and setting little

shafts in them, as at *a*, *b*, fig. 2. In the Early Pointed style a plain circular or octagonal pillar, with a number of small shafts attached around it, is a favourite arrangement, as at *c*, *d*, fig. 2. In this style the attached shafts are very frequently banded to the main pillar at different heights, and they are sometimes made of a finer material, such as Purbeck marble. In the Decorated style the pillar is of a lozenge form, and not so much ornamented with detached shafts as with mouldings; plain, circular, or octagonal pillars, however, are used in this, as in all the styles. The mouldings and shafts are usually filleted; and some of the mouldings run up into the arch without any cap. In Perpendicular the same idea is further carried out; the mouldings become thinner, and are more frequently run up into the arch without caps. See FLAMBOYANT.

Pillar-saints, an English rendering of the Greek *stylistai*, the name of a class of hermit-ascetics, chiefly Syrian, who crucified the flesh by living on the summit of pillars in the open air. The most noted was Simeon called Stylites (q.v.).

Pillars of Hercules. See HERCULES, PILLARS OF.

Pillau, a Prussian town and fortress on a spit of land at the entrance of the Frisches Haff, 25 miles W. of Königsberg—of which it is the outer port—by a good channel; pop. 10,000.

Pillnitz was the ordinary summer residence of the royal family of Saxony, in a beautiful situation on the Elbe, 5 miles SE. of Dresden. The palace embraces three main buildings or 'castles,' and is surrounded with beautiful parks and gardens, particularly rich in conifers. It is now a school of gardening. Here, in August 1791, the Declaration of Pillnitz was framed, in which Austria and Prussia called upon the European powers to take common action on behalf of the royal family of France against the republicans, at the same time safeguarding the liberties of the French people.

Pillory, an engine for the public punishment of criminals, disused in Britain since 1837, but previous to that time commonly employed, as it also was in France and Germany. It consisted of a stout plank fixed like a signboard on the top of a pole, the pole being supported on a wooden platform elevated above the ground. Above, and parallel to this plank, another of like dimensions was placed in a similar position with respect to the pole, and fixed to the former by a hinge, being thus capable of being moved upwards from it, or closed upon it, when necessary. A large circular hole was cut, with its centre in the line of junction of the two planks, and two corresponding holes of smaller size were formed, one on each side of it; the large hole was for receiving the neck, and the two smaller the wrists. When a criminal was to be placed in the pillory he was made to mount and stand upon the platform; the upper of the two hinged planks was raised to allow the culprit's neck and wrists to be inserted in their proper grooves, and then brought down into its place, and fastened by a padlock, or in some other way. The pillory seems to have existed in England before the Conquest, in the form of the *stretch-neck* (an instrument by which the neck only was confined), and was originally intended, according to the 'Statute of the Pillory' (51 Hen. III. chap. 6), for persons guilty of forestalling and regrating, using deceitful weights and measures, perjury, &c. Its use was exclusively confined to this class of offenders till 1637, when restrictions were put upon the press, and all who printed books without a license were put in the pillory. From this time it became the favourite mode of punishing libellers

against the government, and many eminent men were accordingly from this time pilloried, among them Leighton, Lillburn and Warton the printers, Prynne, Dr Bastwick, and Daniel Defoe. These sufferers were popular favourites, and the encouragement, applause, and sympathy of the crowd around converted the intended punishment into a triumph; but such men as Titus Oates, and the class of offenders including perjurers, swindlers, polygamists, &c., who were objects of popular hatred and disgust, were pelted with rotten eggs, garbage, mud, sometimes even with more dangerous missiles. In 1797 the preacher Thomas Evans was pilloried for singing a seditious Welsh song; so too, in May 1812, was Eaton, the publisher of Paine's *Age of Reason*; and in 1814 the celebrated naval hero Lord Cochrane, afterwards Earl of Dundonald (q.v.), was sentenced to stand an hour in the pillory, but the government did not dare to carry the sentence into effect. The punishment was abolished for all offences save perjury in 1815; totally in 1837. The perjurer Peter James Bossy was the last to stand in the London pillory, in the Old Bailey, for one hour, on 22d June 1830. In France the pillory was anciently called *pilori* (a word of uncertain origin), and in recent times *carcan*, from the iron collar by which the criminal's neck was attached to the post; and even so late as 1840 a woman who had poisoned her husband was at least sentenced to the pillory at Tulle as part of her punishment.

Defoe's occupancy of the pillory on the 29th, 30th, and 31st July 1703 was memorable in many ways, and helped to deprive the pillory of its terrors. He ingeniously took the opportunity of publishing on the first day of his appearance there his vigorous *Hymn to the Pillory*; the crowd was on his side, and instead of pelting him with unpleasantness, crowned the pillory with flowers and drank the martyr's health. 'Dauntless on high stood unabashed Defoe,' like a new Simeon Stylites, and his temper was apparently infectious.

See Douce, *Illustrations of Shakespeare*; Griffiths, *Chronicles of Newgate*; Andrews, *Punishments in the Olden Times*; and Jewitt in the *Reliquary* for April 1861. See also JOUGS, CANG, STOCKS, and STOOL OF REPENTANCE.

Pills are the most generally convenient and popular of all forms of medicine. They are formed from masses of a consistence sufficient to preserve the globular shape, and yet not so hard as to be of too difficult solution in the stomach and intestines. This form is especially suitable for drugs which operate in small doses, as aloes, colocynth, &c., while the disagreeable taste is always less than when the drug is given in solution. It is also useful where it is desired that the drug shall not dissolve in the stomach or upper intestines, but shall act only in the lower intestines. In such cases the pills may be coated with keratin, which is only soluble in the lower bowels. Many substances, such as vegetable extracts, may be at once formed into pills without any addition; but most substances require the addition of a material termed an excipient for converting it into a pill-mass. The excipients in most common use are bread-crumbs, hard soap, extract of liquorice, mucilage, syrup, treacle, honey, castor-oil, and conserve of roses. From the property of preserving pills for a long time in a properly soft state the most valuable excipient is the conserve of red roses; and, perhaps, next to it treacle is the most valuable excipient, as it does not undergo any change by time, but maintains a proper consistence, and preserves the properties of vegetable powders unimpaired for years. It is common to place pills in some fine powder to prevent them from adhering to each other, and to conceal their taste. For this purpose liquorice powder, wheat-flour, starch, and

magnesia are generally used in Britain, and lycopodium on the Continent. Pills retain their moisture and activity far longer in small bottles than in the ordinary pasteboard boxes. The ordinary weight of a pill is five grains; if it much exceeds that weight it is too bulky to swallow conveniently if consisting of vegetable matter. It is very common to meet with patients who express their inability to take this form of medicine. If, however, they practise with a small globular mass towards which they feel no repugnance, as a pellet of bread or a currant, placing it on the back of the tongue and gulping it down with water, they will soon get over the difficulty.

To many people the taste of pills is a great deterrent, and various methods of coating the pills are resorted to for their benefit. Formerly coating with gold or silver leaf and coating with a little tolu resin dissolved in chloroform were the only methods; but more recently gelatine-coated, sugar-coated, and pearl-coated pills have been prepared in vast quantities and have become very popular. There is, however, a risk of deterioration owing to the length of time which they may be kept before being sold. See also QUACK DOCTORS.

Pillwort. See WATER-FERNS.

Pilocarpine. See JABORANDI.

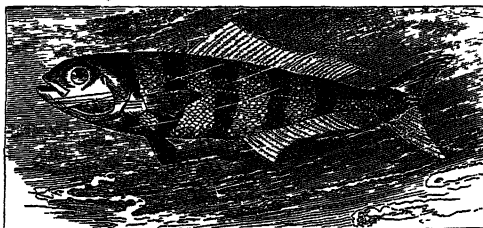
Pilot is a person specially deputed to take charge of a ship while passing through a particular sea, reach, or dangerous channel, or from or into a port. Pilots are of three classes—(1) those licensed to act in districts where the pilotage is compulsory; (2) those licensed to act where the pilotage is not compulsory; (3) unlicensed pilots. British pilots are licensed by the London Trinity House (q.v.) for London and certain other districts, and by Pilotage Commissioners elsewhere. The British law relating to pilotage has been consolidated by the Pilotage Act 1913, which repeals Part X. of the Merchant Shipping Act 1894, and certain of the other sections in the Merchant Shipping Act. The Pilotage Act substitutes for the prior legislation, which was frequently confused and inconsistent; (1) a general Pilotage Act extending to the United Kingdom and the Isle of Man, and applicable to all ships, British and foreign; (2) a Pilotage Order applicable to the particular district; (3) bye-laws of the local pilotage authority. By this Pilotage Act, a licensed pilot is always entitled to supersede an unqualified pilot, and in such a case the master must pay to the unlicensed pilot a proportionate sum for his services, and may deduct the sum so paid from the sum payable to the licensed pilot. The scale of pilotage fees paid by the ship depends upon the distance piloted and the ship's draught of water. The fees earned are sometimes retained by the pilot earning them, less deductions for collection, superannuation, sick, or widows' funds, and sometimes they are thrown into a joint stock.

A British pilot-boat must have conspicuously painted upon it its number, owner's name, and the port to which it belongs, and must show a large flag of two horizontal stripes, the upper white and the lower red. At night a pilot-vessel on its station shows a white light, and in addition shows a flare at intervals not exceeding fifteen minutes. Ship-masters or mates are often licensed to act as pilots for their own vessels.

At common law the pilot, being appointed by the owners, or their servant the master, is their agent, and they are responsible for damage done by the ship while under his charge. By the Pilotage Act 1913, the liability of the owner or master of the ship for damage caused by her, or by any fault in her navigation is made the same in a district where pilotage is compulsory as in a district where

pilotage is not compulsory; in other words the fact of the ship being under compulsory pilotage will not relieve the owner or master of any liability for loss or damage occasioned by her wrongful navigation.

Pilot-fish (*Naucrates ductor*), a well-known fish which accompanies sharks and follows ships. It usually keeps to the open sea, and is very widely distributed in tropical and temperate regions. From the Mediterranean it sometimes follows ships to



Pilot-fish (*Naucrates ductor*).

British coasts. In length it is about a foot, in shape like a mackerel, in colour variable, though generally grayish blue with five transverse dark blue bands. The first dorsal fin is represented by a few spines. Its zoological position is beside the horse-mackerels in the family Carangidae.

Many wonderful stories are told about the pilot-fish, which seems to be the *Pompilus* of the ancients. It is said to guide the shark to its prey—nay, more, to show sailors their desired course. It certainly is a very frequent companion of the shark, especially if that fish be swimming alone, but the precise nature of the association is doubtful. The pilot-fish probably follows the shark as it follows a ship for the sake of scraps of food, and perhaps eats the parasitic crustaceans, &c., with which the skin of the shark is often infested. Moreover, companionship with the shark probably protects the pilot-fish from its enemies.

Piloty, KARL VON, German painter, was born at Munich 1st October 1826, studied at its academy under Schnorr and Schorn, and abroad under the French and Belgian masters of colour. In 1856 he was appointed professor of painting at the Munich Academy, and in 1874 succeeded Kaulbach as director. He died at Munich 21st July 1886. Piloty inaugurated a new era in the school of Munich, and his great work was through it to restore the colour element to German art. All his best pictures belong to the class of historical genre, and through him the centre of German historical painting came to be Munich. Several of his historical paintings adorn the sumptuous palaces of art built by the Bavarian kings at their capital, as the Maximilianeum and the New Pinakothek. Piloty was a pronounced realist, but he tended to distort the relative importance of essentials and subordinate details, and, in spite of his skill as a portraitist, his pictures frequently have a theatrical air. His drawing was strictly objective; but he allowed his personal tastes all the more freedom in the choice of subject and in the employment of colour. Most of his pictures have melancholy subjects; amongst the best of them are 'Seni beside the Body of Wallenstein,' 'Nero amid the Ruins of Rome,' 'Wallenstein's March upon Eger,' 'Galilei in Prison,' 'Columbus,' 'Death of Cæsar,' 'Announcement of the Sentence of Death to Mary Stuart,' 'Thusnelda in the Triumph of Germanicus,' and 'Death of Alexander the Great.' Piloty was a famous teacher, and among his pupils were Makart, Defregger, Lenbach, Max, Dietz, and others. See Stieler, *Die Pilotyschule* (1881), and Rosenberg, *Die Münchener Malerschule* (1887).

Pilpay. See BIDPAL.

Pilsen (Czech, *Plzeň*), the second town of Bohemia, situated in a fertile and beautiful valley, 67 miles by rail SW. of Prague. There are numerous active industries, producing sulphuric acid, building materials, machinery, metal-work, porcelain, spirits, liqueurs, leather, &c. In the neighbourhood are mines of iron, alum, vitriol, and coal. The great Skoda armament and ordnance works, devoted after the Great War (other works in Czechoslovakia being incorporated) mainly to steel manufacture and to engineering, were established here in 1869. But the town is most widely known from giving its name to the most approved kind of Bohemian beer. The town was stormed by Ziska in the Hussite war and by Count Mansfeld in the Thirty Years' War (1618); it was Wallenstein's headquarters in 1633-34. Pop. 88,000.

Pilsudski, JÓZEF, Polish soldier and statesman, was born of Lithuanian-Polish noble stock at Żulów in the then Russian government of Vilno, 19th March 1867. Even while at school at Vilno he was a member of a circle of Polish revolutionaries, and later, when a student of medicine at Kharkov, was expelled for his socialist and nationalist activities. In 1887 at St Petersburg, although innocent, he was summarily despatched for five years to Siberia for alleged complicity in a plot against the Tsar. In 1892 he returned to Russian Poland and became one of the chief founders of the Polish Socialist Party, whose primary object, united to the general aims of labour, was the emancipation of Russian Poland from tsarist rule. He founded also, in 1894, the at first secretly issued journal *Robotnik* ('The Workman') of the party; his connection therewith, however, having at the last been discovered, he was imprisoned in 1901; but later, successfully simulating madness, made good his escape to Sweden, and in 1902 returned to Russian Poland. It was a conviction of Pilsudski's that independence for Poland was to be won from Russia only by force and not by peaceful means, and by organising a military element in the Polish Socialist Party he sought to create a secret national army; but the activities of the force ran to little more than banditism. In 1907, in consequence of the suppression of the revolution of 1905, Pilsudski was obliged to seek refuge in Austrian Poland, and by making use of athletic clubs (*sokols*) and rifle-clubs he continued the work of organising a national army, to be turned against Russia when occasion presented. The Great War furnished the moment, and, assembling his Polish legion, Pilsudski crossed into Russian Poland and seized Kielce. Thereafter, however, the force fell into the hands of Austro-Polish politicians, against Pilsudski's will was made subject to the Austrian command, and was freely exploited in the interests of the Central Powers. It was then that Pilsudski, with a view to creating a real national army to be used solely in the cause of an independent Poland, established his secret Polish military organisation. He remained, however, with the legion, but shortly was removed from his command for insubordination, and later, having refused to raise a Polish army for the assistance of the Central Powers, was imprisoned at Magdeburg. But on the outbreak in 1918 of revolution in Germany he was released, and returning on 14th November—Polish independence had been proclaimed on the 9th—was received with acclaim, invested with dictatorial powers, and became provisional president. Thereafter, on the basis of the work of the military organisation, a Polish army was established, and by it, and by display of non-party statesmanship, Pilsudski raised the new Poland from the dangers external and internal

which threatened it. Of the three wars (with the Ukrainians, with the Czechoslovaks, and with the Bolsheviks), in which in 1919-20 Pilsudski led the Polish army, the third had European bearings in so far as it checked the westward advance of Bolshevism. The election according to the constitution of the president in December 1922 brought the end of political office, and shortly thereafter, having also retired from the leadership of the army, Pilsudski withdrew into private life. In 1926, however, he effected, with some bloodshed in Warsaw, a military revolt, ejected the existing government, and was elected president, but refused acceptance of the office. Retaining the post of minister of war, which after the first success of his rising he had assumed, he remained in control of the army; and he became premier later in the year.

Piltown. See EOANTHROPUS.

Pilularia. See WATER-FERNS.

Pimento, also called ALLSPICE or JAMAICA PEPPER, the dried fruit of *Pimenta officinalis*, a small myrtaceous tree which grows to the height of 20 or 30 feet, and has oblong or oval leaves about 4 inches long, of a deep shining green, and numerous axillary and terminal trichotomous panicles of white flowers, followed by small dark purple berries. The pimento-tree is cultivated in some of the West Indian Islands. It is a very beautiful tree, with straight white trunk and much-branching head; about the month of April it is covered with an exuberance of flowers, which diffuse a rich aromatic odour. The leaves and bark partake of the aromatic property for which the fruit is valued. The fruit, when ripe, is filled with a sweet pulp, and the aromatic property has then in a great measure disappeared. The gathering of the berries, therefore, takes place as soon as they have reached their full size, which is about that of peppercorns. Their colour changes in drying from green to reddish-brown. The name *Allspice* was given from a supposed resemblance in flavour to a mixture of cinnamon, nutmeg, and cloves. Pimento is much employed in cookery, and is also used in medicine as a carminative and stimulant to prevent the griping of purgatives, and to disguise the taste of nauseous drugs. It depends for its properties chiefly on a volatile oil, *Oil of Pimento*, which is obtained by distillation with water. The leaves are used for tanning. From the oil extracted from the young shoots vanillin can be made.

Pimlico, a district of London between Westminster and Chelsea, strictly includes the fashionable Belgravia; but the name is now usually reserved for the less distinguished southern riverside portion. Within the confines are Buckingham Palace and the railway terminus of Victoria. The district was formerly one of public gardens much frequented in holidays. It takes its name from Ben Pimlico, famous in the later 16th century and after for his nut-brown ale.

Pimpernel (*Anagallis*), a genus of Primulaceae, having a wheel-shaped corolla, and the capsule opening by division round the middle. The species are elegant little annual and perennial plants, natives chiefly of temperate climates. The flowers are not large, but very beautiful. The Scarlet Pimpernel (*A. arvensis*) is a common plant in Britain, occurring as a weed in fields and gardens; it is common also in most parts of Europe and in many parts of Asia. The flowers are of a fine scarlet colour, with a purple circle at the eye. The flowers close very readily on the approach of rain; hence the name Poor Man's Weather-glass. They usually open about eight in the morning, and close about noon. The Blue Pimpernel (*A. cœrulea*) is far less common in

Britain, but very abundant in some parts of Europe. The Bog Pimpernel (*A. tenella*), frequent in bogs in England, but rare in Scotland, is an exquisitely beautiful plant. Several species are cultivated in flower-gardens. Acid properties prevail in this genus. The name Water Pimpernel is given to *Samolus Valerandi*, also called *Brookweed*, another British plant of the same family, with racemes of small white flowers, growing in watery gravelly places. It is supposed to be the *Samolus* which Pliny says the Druids gathered fasting, with the left hand, and without looking at it, ascribing to it magical virtues in the cure and prevention of diseases in cattle. It is distributed over almost all the world. See also *LYSIMACHIA*.

Pimples. See *PAPULES*, *ACNE*, *PUSTULE*.

Pin. See *PINS*.

Pina Cloth, a beautiful fabric made of the fibres of the leaves of the pine-apple plant. See *FIBROUS SUBSTANCES*, *BROMELIACEÆ*.

Pinar del Río, capital of the Pinar del Río province (area, 5206 sq. m.; pop. 274,000), Cuba, some 100 miles WSW. of Havana, with which it is connected by road and rail. It is the centre of the famous Vuelta Abajo tobacco-growing district. Pop. 50,000.

Pinchbeck, a reddish-yellow alloy of 4 parts of copper to 1 of zinc; much employed at the beginning of the 19th century in making watch-cases and other small articles in imitation of gold. It was named after its inventor, Christopher Pinchbeck (c. 1670–1732), a London clockmaker.

Pinckney, CHARLES COTESWORTH, American statesman, born at Charleston, South Carolina, 25th February 1746, was educated at Westminster and at Christ Church, Oxford, read law at the Middle Temple, and studied for a while at the military academy in Caen. He afterwards settled as a barrister at Charleston. He was Washington's aide-de-camp at the battles of Brandywine and Germantown, and afterwards, as colonel, saw much active service, until 1780, when he was taken prisoner at the surrender of Charleston. A member of the convention that framed the constitution of the United States (1787), he introduced the clause forbidding religious tests as a qualification for office. In 1796 he was sent as minister to France, but the Directory refused to receive him, and he had to quit the country. And in 1797, along with John Marshall (q.v.) and Ellbridge Gerry, he had little better success; it was while on this mission, which produced the XYZ correspondence (q.v.), that, when it was intimated that peace might be granted in return for a money payment, Pinckney is said to have made the reply, 'Millions for defence, but not a cent for tribute.' In 1804–8 he was twice an unsuccessful Federalist candidate for the presidency. He died 16th August 1825.

Pindar (Gr. *Pindaros*), the chief lyric poet of Greece, was born about 522 B.C. of Theban family at Cynoscephalæ, near Thebes, the capital of Bœotia, a district in which music and poetry were widely cultivated. His family, the *Ægeidæ*, was an old and illustrious one, often mentioned in the heroic legends. His father or his uncle was a flute-player, and Pindar inherited the musical talent of his family. He made music and poetry his profession, and was placed under the tuition of Lasus, a well-known musician and poet, at Athens. Though Thebes was the bitter foe of that city, Pindar often speaks of Athens with love and veneration. But Pindar seems, as a poet, to have been influenced far more deeply by Corinna and Myrtis, two poetesses then famous, with whom he

competed for the prize at public contests. Corinna five times gained the victory over him. She assisted the young poet with her advice, judiciously as it would seem. It is said that she urged him to introduce mythical subjects into his poems, and then, when he had composed an ode introducing almost the whole Theban mythology in the first six verses, she smiled and said: 'We ought to sow with the hand, and not with the whole sack.' He commenced his career as a composer of choral odes for special occasions at the early age of twenty with a song of victory which still remains (*Pyth. X.*, composed in 502). He soon reached the highest rank in his profession, and composed odes for persons in all parts of the Greek world. He was employed by the Sicilian rulers, Hiero of Syracuse and Thero of Agrigentum, by Arcesilaus of Cyrene and Amyntas of Macedon, as well as by the free cities of Greece. Wherever he went, he was honoured and loved for his own sake as well as for his art. States vied with one another in doing him honour; great cities like Athens created him their public guest. Though a frequenter of princely houses and king's palaces, he never lost his independence. In his poems he gives advice and reproof as well as praise to his patrons. He warns the great Hiero to avoid flatterers, and cautions Arcesilaus of Cyrene against undue severity. He resided four years at the court of Hiero. He died about the age of eighty in 443 B.C. Two conquerors—Pausanias, king of Sparta during the Peloponnesian war, and later Alexander the Great, who left no other dwelling in Thebes standing—spared the house of Pindar.

Pindar was in the prime of life when Salamis and Thermopylæ were fought, when Greek energy and enterprise were at their highest, and Greek poetry and philosophy were opening into their richest blossom. But his poetry belongs to the old rather than the new period of literature. In spite of his admiration for Athens, which he calls 'the pillar of Greece,' the spirit of Athens did not lay hold of him. Intellectually, he stands nearer to the age of Homer than to that of his contemporary *Æschylus*. Pindar's language is Epic, tinged with Doric. He wrote an immense number of poems, including hymns to the gods, pæans, dithyrambs, odes for processions (*prosodia*), mimic dancing songs (*hyporchēmata*), choral songs of maidens (*partheneia*), convivial songs (*skolia*), dirges (*threnoi*), and odes in praise of princes (*enkōmia*). Of all these poems we possess fragments only, often very beautiful, but his *Epinikia* or Triumphal Odes have come down to us entire. They are divided into four books, celebrating the victories won respectively in the Olympian, Pythian, Nemean, and Isthmian games. The special occasion for which these odes were composed explains their character. A victory won either in the chariot-race, for prowess in wrestling or other exercises, or for skill in music was held to confer honour not only on the winner and his family, but also on his city, and received a solemn celebration, partly religious, partly convivial and joyous. For the occasion an ode was composed, and was sung by a chorus. Pindar treats the victory not as a mere incident, but as connected with the victor's whole life and history. He loves to dwell on the moral side of it, not merely on the bodily prowess which gained it, but on the virtues which secured the favour of the gods who granted success. The plan of his poetry is intricate, and the connection of the different parts is often very hard to see. Pindar takes up various trains of thought, either relating to the victor, his ancestors, the history of his city, or else moral reflection; he breaks off each of these before the application is seen, and it is not till

the end of the poem that he weaves the different threads together and explains the allusions. Thus, says Müller, 'the curiosity of the reader is kept on the stretch throughout the entire ode.' The great merit of Pindar's poetry is its vividness and picturesque power, seen even in single epithets, as when he calls the mountain-mass of Etna, overtopping all heights in the island, 'the forehead of fertile Sicily.' It is this vigour and vividness which suggest Mrs Browning's picture of 'bold, electric Pindar . . . with race-dust on his cheeks,' and eyes that seem to see 'the chariot rounding its last goal.' The description of the happy lot of the good after the final judgment in the Islands of the Blessed (*Ol.* ii.), the voyage of the Argonauts (*Pyth.* iv.), and the vivid picture of the eruption of Etna in the First Pythian illustrate this power. To us his poems are specially interesting because they show as in a mirror the intense admiration of the Greeks for bodily prowess, strength, endurance, and beauty. Such gifts rouse in him a feeling of religious veneration; they come from the gods and are sacred. The groundwork of Pindar's poems consists in those legends which form the Greek religious literature. It will be seen that his life was intimately associated with the observances of Greek religion. In connection with the worship at Delphi he received unique honours. The belief in his devoutness as a worshipper of the gods shows itself in the legend, which apparently sprang up during his life, that the god Pan was seen and heard in a glade between Cithæron and Helicon singing one of Pindar's hymns. When once asked what sacrifice he intended to offer at Delphi, he answered 'a prean,' a reply not presumptuous, for his odes are full of religious feeling, not formal but real. His protest against myths dishonouring to the gods shows a truly reverent nature and an enlightened belief. Both in its strength and in its deficiencies his poetry reminds us of his claim on his own behalf: 'That man is wise who knows much by natural genius;' but the poets, his rivals, 'those who have learned, the versatile talkers, are but as crows vainly chattering against the divine bird of Zeus.' Thus the distinction between genius and talent is as old as Pindar's time. This high faith in his own poetic inspiration must not be mistaken for self-confidence; but it almost verges on a contempt for art which seems responsible for the frequent intricacy and obscurity of his poetry.

See editions by Böckh (1811-21); Dissen (1830; re-edited by Schneidewin, 1840-47—commentary excellent but incomplete); Tycho Mommsen (1864); Fennell (1879-83; new ed. 1893-99); Bury (*Neumeus Odes*, 1890; *Isthmian Odes*, 1892); O. Schröder (1908); Sir John Sandys (with Eng. prose trans. 'Loeb Classical Library,' 1915); English translations, in prose, by Paley (1869); E. Myers (2d ed. 1883); in verse by Carey (1833) *Way* (1922). The chapter in Müller and Donaldson's *History of Greek Literature* is full of sound criticism; and see works by Morice (1879) in English, by Villemain (1859) and Croiset (1880; 3d ed. 1896) in French, and by L. Schmidt (1862), Friederichs (1863), and Lübbert (1882) in German. Fragments of some of the poems, hitherto unknown, were found at Oxyrhynchus in Egypt in 1905-7.

Pindar, PETER. See WOLCOT.

Pindarics are in a general sense odes written in imitation of the Greek odes of Pindar, but by special English literary usage are rather odes of this kind where the imitation is merely fancied. In form the odes of Pindar are essentially strict and ordered, but the pindarics of English literature, based on a misunderstanding of the nature of Pindar's prosody, are characteristically loose and irregular. The form enjoyed great vogue in the late 17th and early 18th century. Abraham Cowley was its inventor, attracted mainly by the freedom of expression its structurelessness afforded. Dryden

and Pope wrote pindarics, and among numerous lesser poets Oldham, Mrs Behn, Otway, Sprat, Flatman. Following Congreve's exposure in his *Discourse on the Pindarique Ode* (1706) of the misconception upon which the pindaric was based more shape was given to the form. But even in the odes of Wordsworth, Shelley, and Coleridge, in a broken versification, traces of the 'vicious tradition' are to be seen. Of odes written in just imitation of Pindar, memorable examples are furnished by Congreve and by Gray, and Tennyson's 'Ode on the Death of the Duke of Wellington' is among the latest noteworthy odes of the kind. See ODE.

Pindaris, bands of unpaid freebooting horse-soldiers who, after the overthrow of the Mogul empire of India, grew (1804-17) to be a formidable power in the Central Provinces, their headquarters being at Malwa. Hastings, to put an end to their depredations, gathered two armies (120,000 men in all) in 1817 and crushed them. See R. G. Burton, *The Mahratta and Pindari War* (1910).

Pind Dadan Khan, a town in the Punjab, stands one mile N. of the Jhelum and 110 miles NW. of Lahore. The people (10,000) make brass and copper utensils, pottery, whips, boats, and woollens, and carry on a large trade.

Pindus. See GREECE.

Pine (*Pinus*), a genus of trees of the family Coniferae (q.v.). *Pinus* is distinguished by monocious flowers, and woody cones with numerous two-seeded scales, the scales having an angular truncated apex. The leaves are linear and very narrow, growing in clusters or in pairs, and surrounded by scarious scales at the base. To this genus belong many noble and useful trees. They mostly grow in mountainous or other exposed situations, and their narrow leaves are admirably adapted to evade the force of winds, which produce in the tops of pines a peculiar sound, much noticed by the ancient poets, more soft and continuous than in trees of richer foliage. Most of the pines are more or less social, one kind often covering a considerable tract; some of them clothing the sides and even the summits of mountains with magnificent but sombre forests; some growing in lower situations, on otherwise unproductive sandy grounds, as the *Pine Barrens* of North America. The pines growing in the most barren soils, or in the coldest climates and most exposed situations, are often very small, and, although very unlike any other shrubs or bushes, are scarcely to be called trees. Pines are widely diffused over the northern hemisphere, being found on mountains within and near the tropics, and in the colder temperate and the arctic regions descending to the level of the sea.

The Scots Pine (*P. sylvestris*), commonly but erroneously known as the Scotch Fir, is the only species indigenous to Britain. It has leaves in pairs, two to three inches long, the cones about the same length, obtuse, and with unarmed scales. On very poor soils and at great elevations it is reduced to a kind of shrub, but in favourable situations it becomes a lofty tree. A plank five feet and a half in width has been obtained from a Scottish forest. The Scots pine is of quick growth, but has been known to attain the age of 400 years. Its head is somewhat conical or rounded, and the lower branches die off as the tree grows, leaving the older trees bare of branches for the greater part of their height; but it is more apt to send off large branches than most of the Coniferae. There are still native forests of Scots pine at Braemar and elsewhere in the Highlands; and even in the south of Scotland noble trees are to be seen which, probably, were not planted by man. The Scots pine is not indigenous to

the south of England, but, having been introduced, has spread rapidly and spontaneously, along with the Pinaster, in some of the heaths and other unfertile tracts. Immense forests of it exist in some countries of Europe, in some of which it is mingled with the Spruce Fir. In the middle and north of Europe and of Asia it is found even in plains near the level of the sea, especially where the soil is somewhat sandy; in the south of Europe



Fig. 1.—Scots Pine (*Pinus sylvestris*):

a, young shoot with female flower; b, twig with male flower; c, female flower; d, ripe cone; e, the same, opened; f, pair of needles with section.

it grows only on mountains. Its timber is highly valuable, being very resinous and durable, and is the *Red Deal* or *Red Pine* used in house and ship carpentry. There is a very great difference, however, in the timber of Scots pine growing in different soils and situations, rich soils and sheltered situations being unfavourable. One of the best varieties is that which forms the northern Scottish forests, remarkable for its very horizontal branches. The Scots pine is not only valuable for its timber. Common Turpentine is obtained from it, and much Tar, Pitch, Resin, and Lampblack (see these heads). Oil of turpentine is sometimes distilled from the cones, and even from the leaves; the leaves have also been used for the manufacture of Pine-wool (see FIBROUS SUBSTANCES). The inner bark, when most soft and succulent in spring, is by the Kamchadales and Laplanders dried, ground, steeped in water to remove the resinous taste, and used for making a coarse kind of bread.

The Dwarf Pine (*P. montana*, or *P. pumilio*) is found on the Alps and Pyrenees, its trunk often lying on the ground, although sometimes it appears as a bush or low tree. The leaves are in pairs, very like those of the Scots pine, but a little longer; the cones are also similar. The resin spontaneously exuding from the tree is known as *Hungarian Balsam*. The Aleppo Pine (*P. halepensis*), a native of the south of Europe, Syria, &c., is a very graceful tree of moderate size, with leaves in pairs and slender. The Laricio (*P. Laricio*) has leaves in pairs, lax, and 4 to 8 inches long, cones 2 to 4 inches long, with the scales slightly pointed. It is often called the Corsican Pine. It grows on the shores of the Mediterranean, and is valuable for its timber and resinous products. In Corsica it frequently attains the height of 140 feet. It grows well in sandy soils, and has been made particularly useful for preventing the drifting of sand,

and turning to account the otherwise useless tracts between the mouths of the Garonne and the Adour, thus also preserving valuable lands which the sand threatened to overwhelm. Of its varieties the Austrian or Black Pine (*P. Laricio nigricans*, or *P. austriaca*), with light-gray buds, thick dark shaggy foliage, and great spread of branches, abounds in resin more than any other European tree; and *P. Laricio Pallasiana*, with bristling needles, abundant cones, and heavy branches, is a good tree for ill-drained peaty soils. The Pinaster or Cluster Pine (*P. Pinaster*) is another of the most important European species. It is a big tree, with cones in groups sometimes of 20 or more, 4 to 6 inches long, leaves in pairs, and very long. It is found on the shores of the Mediterranean, and also in the Himalayas and in China. It has been used in France to a great extent, in the same way as the Laricio, for covering waste sandy tracts. The timber is inferior. The Stone Pine (*P. Pinea*), a tree with a broad umbrella-shaped head, a form often seen also in the Scots pine, forms a characteristic feature of the scenery of the Mediterranean. It is the *Pinie* of the Germans, the *Pignon* of the French. The leaves are in pairs, 4 to 5 inches long, the cones very large, ovate, and obtuse. The seeds, which do not ripen till the fourth year, are large, abound in a fixed oil, and, when fresh, have a sweet taste resembling that of almonds. They are used like

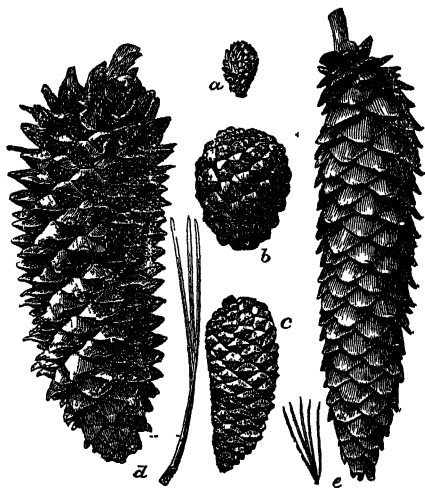


Fig. 2.

Cones of (a) *Pinus montana*; (b) *P. Pinea*; and (c) *P. Pinaster*. Cones and needles of (d) *P. Coulteri*; and (e) *P. Lambertiana*. All about $\frac{1}{2}$ natural size.

almonds and pistachio nuts, but very soon become rancid. The wood is very beautiful. The Cembra Pine, or Swiss Stone Pine (*P. Cembra*), which grows in the central parts of Europe and the south of Siberia—a stately tree, with the lower branches more persistent than they are in most pines, and rigid leaves in groups of three to six, commonly five—also produces eatable seeds (*Cembra Nuts*).

North America produces many species of pine, some of them very beautiful and very valuable. The Red Canadian Pine (*P. resinosa*) is found from Canada to the Pacific, but does not reach far south in the United States. It is the Yellow Pine of Canada and Nova Scotia. It delights in dry and sandy soils, and attains a height of 70 to 80 feet, with a diameter of 2 feet at the base, the trunk continuing of uniform diameter for two-thirds of its length. The leaves are in pairs, and

are congregated towards the extremities of the branches. Somewhat resembling this in botanical characters is the Scrub Pine, or Gray Pine (*P. Banksiana*), generally only 3 to 10 feet high, which begins to appear in the northern parts of the United States upon high mountains, and is interesting as an arctic species, extending farther north than any other. The Yellow Pine (*P. variabilis*, or *P. mitis*) abounds in the Atlantic states from New Jersey to Virginia. It is a tree 50 to 60 feet high, 15 to 18 inches in diameter at the base, with leaves 4 to 5 inches long, usually in pairs, but sometimes in threes upon the younger shoots. For timber it is one of the most valuable of American pines. The Jersey Pine, or Scrub Pine (*P. inops*), abounds in the lower parts of New Jersey, and thence to the south-west. The leaves are in pairs, 1 to 2 inches long, the cones armed with strong spines. The tree is rarely 30 or 40 feet high. *P. rigida*, a native of the northern and middle parts of the United States, shares the name of Pitch Pine with several others. The leaves are in threes, varying much in length, as the cones do in size. The Loblolly or Old Field Pine (*P. Taeda*) grows in dry and sandy soils in the lower parts of the southern states, often occupying lands exhausted by cultivation. Vast tracts never cultivated in the southern states are *Pine Barrens*, in great part covered with this species of pine. It attains a height of 80 feet and upwards, and has a wide-spreading crown. The leaves are 6 inches long, in threes, sometimes in fours on young branches; the cones 4 inches high, with strong spines. The timber is not of much value. The Pitch Pine, Long-leaved Pine, or Southern Pine (*P. palustris*, or *P. australis*), is perhaps the most important of North American forest trees. It furnishes the greater part of the tar, resin, pitch, and turpentine used in the United States. The timber is also very valuable. The tree attains a height of 60 to 70 feet, and a diameter of about 16 to 18 inches; the leaves are in threes, and about a foot long; the cones 7 to 8 inches long, and 4 inches in diameter, with small spines. The seeds are sometimes eaten. The White Pine (*P. Strobus*), called in Britain the Weymouth Pine, from its having been largely planted by Lord Weymouth, attains a height of 150 feet, and a diameter of 5 feet and upwards. It has lax sub-triangular leaves in groups of five, and pendulous cones 4 to 8 inches long, with thin smooth scales. It is frequently planted in Britain and on the continent of Europe for its beauty. In its native country it abounds chiefly from lat. 47° to lat. 43°, and southward to the Alleghanies. The timber is not strong, but easily wrought and durable. Of the species belonging to the north-western parts of America one of the most magnificent is *P. Lambertiana*, which is found on the Rocky Mountains between lat. 40° and lat. 43°, chiefly on sandy soils. It attains a height of 150 to 200 feet, and a diameter of 7 feet and upwards, almost to 20 feet. The trunk is remarkably straight, and destitute of branches for two-thirds of its height; the leaves in fives, the cones upwards of a foot long. The timber is white, soft, and light; and the tree produces great quantities of a pure amber-coloured resin, which, when the wood is partly burned, is changed into a somewhat saccharine substance, used by the Indians as a substitute for sugar. The seeds are eaten either roasted or pounded into coarse cakes. *P. flexilis* is found on the Rocky Mountains, and occurs almost to the limit of perpetual snow. It has a dense crown formed of numerous and remarkably flexile branches. The leaves are in fives. *P. ponderosa*, another native of the Rocky Mountains, is a magnificent tree, remark-

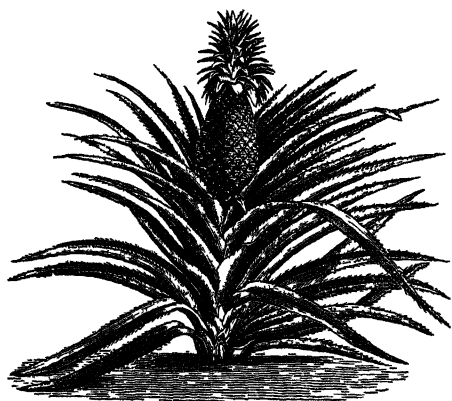
able for the heaviness of its timber, which almost sinks in water. The leaves are in threes, and 9 to 14 inches long. *P. Sabiana*, *P. Coulteri*, and *P. insignis* are also noble species from the west of North America.

The Himalayas abound in pines, some of which rival in magnificence those of North-west America. The Bhutan Pine (*P. excelsa*), much resembling the Weymouth Pine in its botanical characters, and attaining a height of 90 to 120 feet, abounds in Bhutan. The Cheer Pine (*P. longifolia*) of India is a tree of remarkable and most graceful appearance, with leaves in threes, very long, very slender, and generally pendulous. It is abundant on the crests of hills in the lower Himalayas, growing at a lower elevation than the other pines. *P. Gerardiana*, a species with leaves in threes, is a large tree, a native of Nepal.

The term pine is in general use for the timber of the pine-tribe (see CONIFERÆ), and is not confined to that of the genus *Pinus*, but embraces the wood of species of *Abies*, *Larix*, *Araucaria*, *Agathis*, &c., and even of *Callitris* and *Dacrydium* of the Cypress tribe. From the Baltic ports come red wood and white wood. The former is yielded by the Scots Pine (*Pinus sylvestris*), and the latter by the Spruce Fir (*Abies excelsa*). These two, with the Larch (*Larix europæa*), yield the greatest part of the pine-timber of Europe. See TIMBER.

Pineal Gland, a small reddish body at the end of an upgrowth from the optic thalami in the vertebrate brain. It is about the size of a pea in man, and rests on the corpora quadrigemina (see BRAIN). It consists of epithelial cells, a few atrophied nerve-cells, and salt deposits ('brain sand'). Descartes regarded it as the seat of the soul. Its stalk sometimes gives rise to a 'parietal organ,' which may also arise separately from the brain-roof, and in some forms, notably in the New Zealand *Sphenodon* (q.v.), this parietal organ assumes a remarkable eye-like structure, as if it were a vestigial unpaired eye.

Pine-apple, or ANANAS, genus of Bromeliaceæ, highly esteemed, and much cultivated for its fruit. The fruit is a *sorosis*, formed by the calyces and bracts of a close spike of flowers, becoming succulent



Pine-apple (*Ananas sativus*).

and combined. This is the distinctive character of the genus *Ananas*. The pine-apple has a number of long, serrated or smooth-edged, sharp-pointed, rigid leaves, springing from the root, in the midst of which a short flower-stem is thrown up, bearing a single spike of flowers, and therefore a single fruit. From the summit of the fruit springs a crown or tuft of small leaves, capable of becoming

a new plant; the pine-apple, in cultivation, being propagated entirely by crowns and suckers, as, in a state of high cultivation, perfect seed is almost never produced. The various cultivated forms spring from two species, *A. sativus* and *A. bracteatus*. These are found wild in sandy maritime districts in the north-east of South America. The pine-apple has also been gradually diffused over tropical and subtropical countries, and not only as a cultivated plant, for it is fully naturalised in many parts both of Asia and Africa, and has even been adopted as a kind of armorial bearing by the Luwu people of Central Celebes. It delights in a moist climate, and consequently does not succeed well in the dry climate of the south of Italy, although the warmth is sufficient. The first particular account of the pine-apple was given by Oviedo in 1535. It was in Holland that it first began to be cultivated in hothouses; but it was introduced into England from that country in 1690, and first cultivated by Mr Bentinck, ancestor to the ducal family of Portland; and its cultivation rapidly became general in the gardens of the wealthy. It was only after the peace of 1815 that it received similar attention in continental Europe. Later in the century, however, with improvements in means of transportation, the pine-apple disappeared as an important British and European hothouse crop. To-day among leading sources of supply are the Azores, Canary Islands, Hawaii, Florida, Straits Settlements, Queensland. Great care is requisite in the cultivation of the pine-apple, which without it is generally fibrous and coarse, with little sweetness or flavour, and with it one of the most delicate and richly flavoured of fruits. Its size, too, very much depends on cultivation, but there is also considerable difference in the size of the fruit in different varieties, the largest not being always the most luscious and superior in flavour. The size varies from 2½ lb. to 12 lb. in weight.

A spirituous liquor (*Pine-apple Rum*) is made from the pine-apple in some warm countries. The use of the fibre of the pine-apple is noticed in the articles BROMELIACEÆ, FIBROUS SUBSTANCES. For Pine-apple Oil, see BUTYRIC ETHER.

Pine-beetle. See BARK-BEETLES.

Pine Bluff, capital of Jefferson county, Arkansas, is built on a high bluff on the south bank of the Arkansas River, at the head of low-water navigation, about 120 miles from its mouth. Cotton and lumber are the staples of trade, and among industrial undertakings are cotton-seed oil mills, cotton gins, saw-mills, stave and spoke factories; also foundries, brickworks, &c. Pop. 19,000.

Pinel, PHILIPPE (1745-1826), a Parisian physician who gained for himself undying fame by his reformation of the old barbarous methods of treating the insane.

Pinero, SIR ARTHUR WING, English playwright, was born in London, of Portuguese-Jewish ancestry on his father's side, 24th May 1855. He studied law, but in 1874 made his *debut* on the stage at Edinburgh, and, without any notable success, continued actor (in 1876-81 in Irving's Lyceum Company) till 1884, when he left the stage to devote himself to playwriting, in which he had already achieved first successes. His earliest plays of importance were *The Money Spinner*, of 1881, and *The Squire* of the same year. Both were serious plays, but later came successes in farce, as *The Magistrate* (1885), *The Schoolmistress* (1886), *Dandy Dick* (1887), and in comedy, sometimes sentimental, as *Sweet Lavender* (1888), *The Weaker Sex* (1889), sometimes satirical, as *The Hobby-Horse* (1886), *Lady Bountiful* (1891); by this work Pinero revealed himself as a master of the technique of English comedy, and by some comedy

has been held to be his most characteristic form. *The Profligate*, of 1889, however, brought a return to the serious drama, and in 1893 appeared the epoch-marking problem play, *The Second Mrs Tanqueray*; by it the English drama of the time was given a European standing, and Pinero was placed among the first rank of living dramatists. Numerous plays followed, displaying a remarkable versatility. Of the number were the serious dramas *The Notorious Mrs Ebbesmith* (1895), *Mid-Channel* (1909); the comedies *The Gay Lord Quex* (1899), *Letty* (1903), *His House in Order* (1906), *The 'Mind the Paint' Girl* (1912); also the idyll *The Freaks* (1918), the wordless play, *Momca's Blue Boy* (1918, with music by Sir Frederic Cowan), and the fable *The Enchanted Cottage* (1922). Pinero was knighted in 1909. See a work by H. Hamilton Fyfe (1902).

Pinerolo, or PIGNEROL, a town of North Italy (formerly in Savoy), 23 miles SW. of Turin. In its strong citadel, then regarded as the key of Italy, the Man with the Iron Mask, Lauzun, and Fouquet were imprisoned. This fortress was in French hands from 1536 to 1574, again from 1630 to 1696, from 1704 to 1706, and from 1801 to 1814. The town contains a cathedral and a cavalry school. Cloth, paper, leather, cotton, and silk are manufactured. Pop. 19,000.

Pine-tree Money, silver money coined at Boston, Massachusetts, in the 17th century (from 1652), and so called from the coins' bearing the rude figure of a Weymouth pine (*Pinus Strobus*) on one side. The date 1652 was retained, though there were changes in the dies.

Pine-wool. See FIBROUS SUBSTANCES.

Ping-pong, or TABLE-TENNIS, a miniature form of lawn-tennis played on a table indoors. The ball, of light celluloid and hollow, is about 1½ inch in diameter. The racket is usually of wood generally covered with vellum, cork, sand-paper, or rubber: from the sound of play with the original hollow vellum-covered racket the onomatopoeic name—a trade name—of the game was derived. While the general conception of the game corresponds to that of lawn-tennis, there are important differences in detail. The game was invented in England, or in India by Englishmen, and dates from the close of the 19th century, when the introduction of celluloid balls made it possible. At first it was known as 'gossima.' In 1900-2, as 'ping-pong,' it became a rage in Great Britain and also in the British colonies, and in France and America. But presently the craze disappeared. In 1922, however, a revival took place. Since then the ruling authority of the game has been the Table Tennis Association, the heir, because of difficulties arising out of the use of the trade name, not of the original Table Tennis Association, but of its contemporary and rival the Ping-Pong Association.

Pink (*Dianthus*), a genus of Caryophyllaceæ, of which there are some 300 species, annuals and perennials, with beautiful and often fragrant flowers, chiefly natives of Europe and temperate Asia. The calyx is tubular, 5-toothed, with two or four scales at the base; there are five petals suddenly contracted at the throat of the corolla into a linear claw. There are ten stamens, and one ovary with two styles. The capsule is cylindrical and one-celled. The exquisite beauty of the flowers has attracted admiration in all ages; and some of the species have long been much cultivated in gardens, particularly the Garden Pink and Carnation (q.v.), which are often referred to one original, the Clove Pink (*D. Caryophyllus*), a native of the south of Europe, growing wild on rocks and old walls, and naturalised in some places in the south of England; whilst some botanists refer the garden

pinks with more probability in part to the Maiden Pink (*D. deltoides*), a British species, and those called Pheasant-eye pinks to the Feather Pink (*D. plumarius*), a native of some parts of continental Europe naturalised in England. The varieties of the garden pink and the pheasant-eye pink, which are usually designated the florists' pink, are of much less antiquity than the carnation as garden ornaments. Gerard scarcely mentions them, while in Parkinson's time they appear only to have been cultivated as other hardy perennials and annuals were, without any special care. Their capabilities as choice florists' flowers were recognised about 1810, and the number of varieties has since then greatly increased. Nearly allied to them is *D. superbus*, found in moist places in some parts of Europe, and not unfrequently to be seen in flower-borders. It has very fragrant flowers. Both single and double pinks are generally propagated by *pipings*, which are short cuttings of the younger shoots. They are also sometimes propagated by layers. A rich loamy soil is the best for pinks. The Maiden Pink is a small, much-branched plant, growing in grassy places, on gravelly and sandy soils; it has rose-coloured flowers spotted with white, and a white eye encircled by a deep purple ring. The very rare Cheddar Pink (*D. cæsius*) grows on the limestone cliffs of Cheddar. The Deptford Pink (*D. Armeria*) and the Clustered Pink, or Childing Pink (now placed in another genus, as *Tunica prolifera*), also natives of England, differ from these in being annuals, and in having clustered flowers. The Bearded Pink, or Sweet William (*D. barbatus*), with bearded petals, has long been a favourite garden-flower. The choice Mule Pink, or Fielding's Pink, is supposed to be a hybrid between Sweet William and Picotee. The Indian Pink, or China Pink (*D. chinensis*), is now common in flower-gardens. Although perennial, pinks are sown annually by florists to secure fine flowers.—*Sea-pink* is a common name of Thrift (q.v.).

Pinkerton, ALLAN (1819–84), born in Glasgow, became a Chartist, but in 1842 emigrated to Chicago, where he organised a famous detective agency, which developed into a kind of private mercenary army (armed with rifles, revolvers, and shot-proof shelters), suppressed the Molly Maguires (q.v.), and was conspicuous in labour troubles, as at Homestead in 1892. He wrote several books on his triumphs.

Pinkerton, JOHN, an acrid little book-maker, born at Edinburgh in 1758, who, after five years' irksome apprenticeship to a lawyer, in 1780 settled in London as a man of letters, in 1802 in Paris, where he died in indigent circumstances, 10th May 1826. His twenty-four works and compilations include some pseudo-archaic 'rimes,' ballads, &c.; *Essay on Medals* (1784); *Letters of Literature* (1785), marked chiefly by a novel system of inflection and orthography; *Ancient Scottish Poems from the MS. Collections of Sir Richard Maitland of Lethington* (1786); *Dissertation on the Origin and Progress of the Scythians or Goths* (1787), in which he first fell foul of the whole Celtic race; *Enquiry into the History of Scotland preceding the Reign of Malcolm III.* (1790); *Iconographia Scotica* (1795–97); *History of Scotland from the Accession of the House of Stuart to that of Mary* (1797); *Walpoliana* (1799); *Modern Geography* (1802–1807); *Voyages and Travels* (16 vols. 1808–13); *New Modern Atlas* (1809–15); and *Petralogy, or a Treatise on Rocks* (1811). See his *Literary Correspondence* (2 vols. 1830).

Pink-eye, a contagious and infectious disease of horses. The primary symptoms are loss of appetite, dullness, perhaps rigors, with fever (tem-

perature varying from about 104° to 107°, or, in very severe cases 108° F.). In slight cases the pulse may be 65, in very severe ones over 100 beats a minute. These symptoms are succeeded—but not always—by swelling of the eyelids and redness of the eye—hence the term pink-eye—pain in and stiffness of the limbs, with tumefaction, particularly around the joints. The swellings are at first limited, but soon extend upwards and downwards from the joints affected, and their occurrence gives rise to the pain. The digestive organs are disturbed; there is generally constipation at first, the feces are covered with mucus, and in many instances there is some degree of colicky or intestinal pain. Some horses have a loud, hoarse cough, at first dry, but often becoming moist; but lung complications are not very common. In some instances the pulse gradually becomes very feeble, though the animal presents no other bad symptom, the pain having left the limbs, the appetite returning, the swellings diminishing, and the secretions regaining the normal condition; whilst an ordinary observer is confident of a rapid recovery, the animal suddenly dies, and a post-mortem examination reveals the presence of ante-mortem clots of blood in the cavities of the heart, and perhaps in the great pulmonary blood-vessels. To the veterinarian the apparently convalescent stage is a most critical condition, and he must endeavour, by rousing the heart's action, to prevent the formation of these coagula.

As a rule the disease runs its course favourably in from four to ten days, leaving the animal with more or less loss of condition and strength, but both are soon restored by good nursing (a comfortable roomy airy loose-box, warm clothing if necessary, great attention to diet) and gentle exercise. The treatment which has proved most successful is based on the conclusion that the disease runs a definite course, and that attempts to check it do more harm than good. It is dangerous to work a horse with this disease after he has manifested the slightest loss of appetite; many horses turned out to work after failure of appetite have been brought back a few hours after in a dying condition. The medicines made use of are those which moderate pain if excessive, keep the contents of the stomach and bowels from undergoing putrefactive fermentation, and act as very slight aperients; and, when the heart's action threatens the condition above described, cardiac stimulants, such as the carbonate of ammonia given in a ball. Alcoholic stimulants, in virtue of their irritating properties and their effect on the nervous system, are very injurious, and should not be administered in this nor in any other disease where the so-called fibrinous state of the blood is one of the conditions.—The name Pink-eye is also given to a red discoloration in salted food, especially fish, due to the use of salt contaminated by a 'red coccus' and another organism.

Pinkie, a battle fought on 10th September 1547 near Musselburgh in Midlothian between 14,000 English under the Protector Somerset and twice that number of Scots. The latter were utterly defeated, more than 10,000, it is said, being killed on the field and in the pursuit, whilst the English loss was barely 200.

Pink Root. See SPIGELIA.

Pinna, a genus of bivalves, not far removed from mussels (Mytilidæ). The shell is acutely triangular, beautifully translucent, and in some species measures two feet in length. The attaching byssus, especially of the Mediterranean species (*P. nobilis*), is very long and silky, and admits of being woven into fabrics. So the ancients occasionally used it, and, to gratify the curious, byssus-gloves,

&c., are still made at Taranto and elsewhere. The animal is sometimes eaten. It lives from low-water to sixty fathoms.

Pinnacle. See BOAT.

Pinnacle, a termination of tapering form crowning some architectural member. It did not become common till the Gothic period, when it became a highly-important decorative element. See GOTHIC ARCHITECTURE.

Pinnipedia. See SEAL.

Pinnock, WILLIAM (1782-1843), once famous as the originator of the catechisms which bear his name, was born at Alton in Hampshire. The catechisms consisted of short popular manuals on almost every conceivable subject, arranged in the form of question and answer. They were produced in association with his brother-in-law, Samuel Maunder (q. v.), and finally extended to 12 volumes, or 83 separate parts. Histories of England, Greece, and Rome ran through more than a hundred editions. Before his death in London he had lost nearly all his wealth in speculation.—His son, WILLIAM HENRY PINNOCK, LL.D. (1813-85), vicar of Pinner, studied at Cambridge, and wrote on church law and church history.

Pinos, ISLA DE, an island in the West Indies, south of Cuba, of the Havana province of which it forms part. It was discovered by Columbus in 1494, has an area of 1200 sq. m., part low and swampy, and part hilly (1500 feet), and is clothed with fine meadows and woods (it takes its name from *Pinus cubensis*), and produces fruit, and silver, quicksilver, and iron. It was once notorious as the resort of pirates.

Pins. The earliest kinds of pins were probably thorns or fish bones. Prehistoric pins of bone and bronze are common, and copper and iron pins also occur. Munro estimated that 10,000 pins had been collected at the lacustrine stations of Switzerland alone. They seem to have been chiefly used as hair-pins, though no doubt they were also employed to fasten the dress, and for other purposes. The forms of these ancient pins are extremely varied, and in the numerous cases where they have ornamented heads the patterns are often curious and beautiful. A good many both of bone and of bronze have a head formed of a loose ring in an eye. Some have bulbous heads (these occasionally being of amber). For numerous illustrations of ancient pins, see Munro's *Lake-dwellings of Europe* (1890). Among articles for the toilet found in Egypt some pins with gold heads occur, and ancient Roman bronze pins and bone hair-pins, with ornamental heads, have been found at Pompeii. About 1840 the solid-headed kind now in common use took the place of the older form of pin, which had a globular head of fine twisted wire made separately and secured to the shank by compression from a falling block and die. These old pins had the disadvantage of frequently losing their heads. They were made by manual labour in such a way that each pin passed through the hands of fourteen different persons (see DIVISION OF LABOUR). Solid-headed pins are made by an improved form of a machine which was patented in England by an American, named L. W. Wright, in 1824. Pincers draw from a reel of wire a length sufficient to make a pin, which is at the same time straightened by passing between fixed studs. The pin length is seized by lateral jaws, from which a portion of the wire is left projecting. A snap head die next advances to shape the head partially; the jaws or grippers then release it, and the pin is pushed forward again about a twentieth of an inch, when the head gets another squeeze of the die. These movements of the machine are repeated once more to finish the head, and the wire is then cut

to the length of a pin. The headed blanks drop into a receptacle and arrange themselves in the line of a slot formed by two inclined and bevel-edged bars. The opening between the bars is just wide enough to let the shank of the pin fall through. From the lower end the blanks are passed along, rotating as they move, in front of a cylindrical cutter, which files them to a point.

Ordinary pins are made of brass wire, and after cleaning are coated with tin, or 'coloured,' as it is called. For black pins iron wire is used, and these are either 'blued' by heating in a muffle or varnished. Safety-pins, with the point resting in a loop, were already made in prehistoric times.

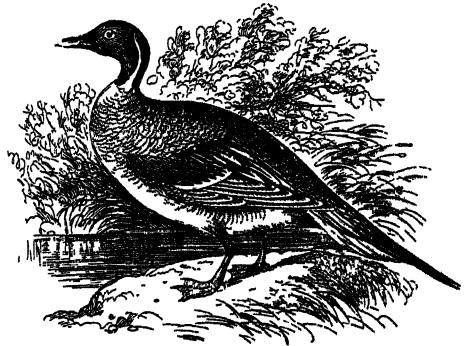
Pinsk, a town ceded by Ukraine to Poland by the treaty of Riga, 1920, stands in the midst of what were formerly vast marshes (in large part drained since 1875), on a branch of the Pripet, 98 miles by rail E. of Brest-Litovsk. It manufactures leather and has a large transit trade. Pop. 36,500, two-thirds being Jews.

Pinsuti, CIRO (1829-88), composer of over 300 songs, was born at Sinalunga in Tuscany. He studied music at Bologna (1845), and was a special pupil of Rossini. From 1848 to 1885 he taught singing in England, chiefly at London and Newcastle, from 1856 at the Royal Academy of Music.

Pint, a measure of capacity used both for liquids and dry goods, and equivalent to the eighth part of a Gallon (q. v.), or 34·65925 cubic inches. The Scots pint, superseded as a legal measure by the imperial pint, was equal to 3·0065 imperial pints.

Pintado. See GUINEA FOWL.

Pintail (*Dafla*), a genus of ducks, widely represented in northern regions. One of the species, *D. acuta*, also called the Sea Pheasant because of its elongated form, is a regular winter visitor to



Pintail Duck (*Dafla acuta*).

Great Britain, and has established itself as a breeding species in some parts of Scotland. It often crosses with the mallard. The flesh is very palatable.

Pinto, FERNÃO MENDEZ, Portuguese adventurer, born at Montemor-o-Velho, near Coimbra, about 1510. When twenty-seven years of age he made his way out to India, and remained twenty-one years in the south and south-east of Asia, leading the life of an adventurous seaman, fighting pirates at one time, trading at another, and again being employed on special missions to Japan or elsewhere, his fortune often fluctuating between great wealth and poverty. He returned home to Portugal in 1558, spent much time in writing an account of his adventures, adding to them many exaggerations and gross fictions, and died at

Almada near Lisbon, probably in 1583. His travels—*Peregrinagam*—were not published until 1614, but have since then been translated into several European languages—into English by F. Cogan in 1663 (abridged with introduction by A. Vambery, 1891).

Pinturicchio, whose proper name was BERNARDINO DI BETTI, was a painter, born at Perugia, in 1454. An assistant to Perugino, he helped him with the frescoes in the Sistine Chapel at Rome, and then spent the best part of eight years (1484–92) in painting frescoes on the walls of the chapels of Santa Maria del Popolo in Rome. After executing two pieces in the cathedral at Orvieto he decorated the walls of what is now the Vatican library with a series of six frescoes; this occupied him six years (till 1498). On the walls of S. Maria in Ara Coeli he illustrated the life of St Bernardino of Siena. Other frescoes by his brush adorned two churches in Spello, the Petrucci Palace at Siena, and the cathedral library in the same city, this last series illustrating the life of Pope Pius II. All these works are admirable examples of decorative art. Pinturicchio painted a few panel pictures of high merit, as Christ bearing the Cross, two Madonnas enthroned (at Perugia), Coronation of the Virgin (in the Vatican), and others at Siena, Florence, and Spello. He died at Siena, 11th December 1513.

See *Life* by Vermiglioli (1837), books by Schmarsow (1880–82) and E. M. Phillips (1901), but especially *Pinturicchio: his Life, Work, and Time*, by Corrado Ricci (trans. 1902).

Pinwell, GEORGE JOHN (1842–75), born in Wycombe, drew on wood, did book illustration, and after 1865 became a water-colour painter. Dying young, he left few works, but the promise of these was great. See *Life* by G. C. Williamson (1900).

Pinzon, a wealthy Andalusian family, of which three brothers who flourished in the 15th and early 16th centuries were associated with Columbus in the discovery of America. On Columbus's first voyage (1492) MARTIN ALONZO commanded the *Pinta*, but did not remain loyal to his leader; FRANCISCO was pilot of the *Pinta*; and VICENTE YAÑEZ commanded the *Nina*. On an independent voyage Vicente Yañez discovered Brazil (q.v.).

Piombi, the notorious roof-cells (*sotto i piombi*, 'under the leads') of the state-prisons of Venice (q.v.), in which Casanova and many other notable prisoners were confined.

Piombino, a former principality of Italy, lies along the coast opposite the island of Elba, the greater part of which belonged to it. Its extent was 139 sq. m.; and its population, previous to its incorporation with Italy in 1860, about 25,000. Piombino, originally a fief of the empire, came in the 14th century into the possession of the Appiani, who, after ruling it for nearly 200 years, made way for the Buoncompagni, who were expelled by Napoleon in 1801; but after the Congress of Vienna the principality was put under the suzerainty of Tuscany. The town of Piombino (pop. 24,000), at the S. end of a promontory 50 miles S. of Leghorn, has iron-rolling mills and is the port of embarkation for Elba. At the N. end of the promontory was the ancient Etruscan city of Populonium: considerable remains of its walls exist, and numerous Etruscan tombs have been found.

Piombo. See SEBASTIANO DEL PIOMBO.

Pioneer, in the British infantry, is a military artisan employed during peace in such work as painting and repairing barrack-rooms, &c., and in war marching at the head of each battalion with

tools to clear a passage for it through woods or other obstructions, improve roads, make bridges, and generally to do any minor engineering or constructive work that may be necessary.

Cavalry Pioneers are instructed at the School of Military Engineering, Chatham, in the best method of rapidly destroying railways, telegraph lines, &c., and carry gun-cotton and the tools necessary for this purpose. Abroad, and in the Indian army, there are whole battalions called pioneers, who are nothing less than lightly-equipped engineers, but who also fight like infantry.

Piotrkow (Ger. *Petrikau*), a town of Poland, 87 miles by rail SW. of Warsaw. There are various industries—leather, textiles, founding, saw and flour milling. It is one of the oldest Polish towns; here in the 15th and 16th centuries diets were held and the kings elected. Pop. 41,000.

Piozzi, MRS, more famous as MRS THRALE, and by that name to be remembered until Dr Samuel Johnson is forgotten. Her maiden name was Hester Lynch Salusbury, and she was born of a good Welsh family at Bodvel in Carnarvonshire, 27th January 1741. She early gave promise of quick parts and lively disposition, and received a good education. Early introduced into the fashionable world of London, in October 1763 she married Henry Thrale, a prosperous Southwark brewer, thirteen years her senior. She bore him one son and eleven daughters, the eldest Dr Johnson's 'Queenie.' Thrale was an honest man, an indulgent, if somewhat indifferent, husband, uncommunicative and phlegmatic in temperament. Mrs Thrale made Johnson's acquaintance through the kind offices of Arthur Murphy (q.v.) in January 1765, and one of the most interesting friendships in the history of letters at once began. The sage quickly conceived an extraordinary affection for his 'mistress,' was domesticated in her house at Streatham Place for over sixteen years, and for her sake learned to soften many of the eccentricities of his speech, dress, and behaviour. Thrale himself had esteem for Johnson, carried him with the family to Brighton, to Wales in 1774, and to France in 1775, and left him £200 as one of his four executors. Thrale died in April 1781, and three years later the brewery was sold for £135,000. Dr Johnson's health was now declining, and he soon began to feel himself slighted as the widow's affection for the Italian musician Piozzi began to occupy her heart. A few letters on the subject of the proposed marriage passed betwixt Johnson and herself, in which it must be confessed that the woman shows to more advantage than the sage. The marriage, for some time postponed owing to the objections of her daughters and her friends, took place at Bath, 25th July 1784, and the pair travelled through France, Italy, Germany, and Belgium, returning to England early in 1787. Piozzi proved an inoffensive husband and managed their finances with prudence. Mrs Piozzi returned to Streatham in 1790, but soon after built Brynbell on the banks of the Clwyd. Here Piozzi died in 1809, and here his widow remained till 1814, living thereafter at Bath, Clifton, and Penzance. When past seventy she formed a sentimental attachment for William Augustus Conway, a handsome young actor, who drowned himself crossing the Atlantic in 1828. She died at Clifton, 2d May 1821.

Mrs Thrale was vivacious, frank, witty, thoroughly feminine, and charming, if somewhat wanting in refinement. She was pretty, if hardly beautiful—her face gave Hogarth his model in 'The Lady's Last Stake,' but the best portrait is that by Sir Joshua Reynolds. Baretti, Boswell, Wolcott, Gifford, and Horace Walpole all abused her; but she lives secure of immortality in the love of Samuel

Johnson, and in the happiness she brought into nearly twenty years of a life 'radically wretched.'

Mrs Piozzi had a fatal facility in composition, but two of her books at least live through their subject, and indeed are only less interesting than Boswell himself: *Anecdotes of Dr Samuel Johnson during the last Twenty Years of his Life* (1786; ed. with introduction by S. C. Roberts, 1925), and *Letters to and from Dr Samuel Johnson* (2 vols. 1788). Her *Observations and Reflections made in a Journey through France, Italy, and Germany* (2 vols. 1789), *British Synonymy* (2 vols. 1794), and *Retrospection, or a Review of the most striking and important Events, &c.* (2 vols. 1801) are long forgotten. Of her poems the 'Three Warnings' survives—it was first printed in the *Miscellanies* of Miss Williams (1766), a volume containing a prose-tale of Johnson's, 'The Fountains,' the heroine of which, Floretta, was a study of Mrs Thrale. Her notes to Wraxall's *Historical Memoirs* were reprinted in the 1884 edition of that work, as well as in Hayward. Her *Autobiography, Letters, and Literary Remains* were edited with notes and an account of her life by Abraham Hayward, in 1861 (2 vols.); and selections from this work were edited with introduction and notes by J. H. Lobban as *Dr Johnson's Mrs Thrale* (1909). *Thraliana*, a 6-volume MS. partly in diary form and covering the years 1775-1809, was begun by Mrs Thrale at Johnson's suggestion, and records many conversations, anecdotes, &c. of Johnson and his friends; C. Hughes's *Mrs Piozzi's Thraliana* (1913) gives many extracts hitherto unpublished. See further the Rev. E. Mangin's *Piozziana* (1833), Boswell's *Life of Johnson*, Madame D'Arlay's *Diary*, L. B. Seeley's *Mrs Thrale* (1891), and Broadley's *Dr Johnson and Mrs Thrale* (1910), with introductory essay by Thomas Secombe, and Mrs Thrale's unpublished journal of the Welsh tour in 1774.

Pip is the name by which various diseases in fowls and pheasants were once known. Roup (q.v.) is now the term in use.

Pipa, a genus of Amphibia (q.v.), of which the best known is the Surinam Toad.

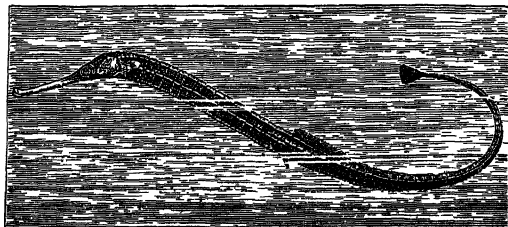
Pipal. See PEEPUL.

Pipe, a measure of quantity which has been employed in Portugal, Spain, France, England, and in some other countries, used almost exclusively for wine and oil. In England it is also called a butt, and is equal to two hogsheads. But the capacity varies with the locality as well as with the description of wine the cask contains: a pipe of port is 137 imperial gallons; of sherry, 130 imperial gallons; that of Madeira, 110 imperial gallons; while the common English pipe contains 126 wine gallons, or nearly 105 imperial gallons.

Pipeclay, a fine white plastic clay, very like kaolin, but containing a larger percentage of silica. For the manufacture of tobacco-pipes the most desirable clay contains only small traces of limonite and alkaline earths. Clays of this nature are met with in Cornwall, Devon, and Dorset, but the purer varieties of clay used for pottery-making are also employed in the manufacture. Such clays, however, have siliceous materials added to them artificially. Pipeclay is used by soldiers for whitening belts, &c.

Pipe-fish, a family of remarkable fishes in the same (Lophobranch) order as the Sea-horses. The body is elongated like a thin pipe; the jaws are prolonged in a tubular toothless snout; the muscular development is slight; the skin is covered with an armature of hard plates; the gills are in the form of tufts, and the branchial aperture is very small. The eggs are carried about and hatched by the male, usually within a capacious pouch formed from two folds of skin on the ventral surface of the tail-region. One of the commonest British species is the Great Pipe-fish (*Syngnathus acus*), which is sometimes found in deep water, and sometimes at low tide among the seaweed in rock-pools. The specimens commonly seen are from 1 foot to 18 inches in length. It may be seen slowly moving

about, with curious contortions, poking its long snout into every crevice in search of food, and sometimes assuming a vertical position with the head downwards, boring into or stirring the sand.



Pipe-fish (*Syngnathus acus*).

One of the commonest American pipe-fish is *Siphonostoma peckii*, which lives among the eel-grass of the coast.

The name Pipe-fish is sometimes given also to the fishes forming the family *Fistulariæ*, or Flute-mouths, of which one of the most remarkable is the Tobacco-pipe-fish (*Fistularia tabaccaria*). But these are large marine sticklebacks, and have only a superficial resemblance to the true pipe-fish.

Piperaceæ, a family of dicotyledons, natives almost exclusively of the hottest parts of the globe, particularly of Asia and America. About 1200 species are known, to most of which the name Pepper (q.v.) is sometimes given, although some are also known by other names, particularly those of which the fruit is not used as a spice, but of which some part is employed for some other purpose, as Betel, Cubebs, Matico, and Ava.

Piperine, an Alkaloid (q.v.) found in pepper.

Pipe-rolls. See RECORDS.

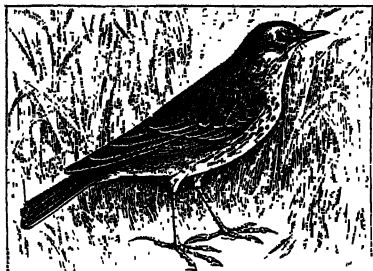
Pipes of ductile metal, such as brass, copper, and tin, are made by first casting an ingot into the shape of a lead-pencil, with a hole through its length of the same diameter as the bore of the pipe is intended to have. Into this is placed an iron rod, called the mandrel, which exactly fits, and projects slightly at the tapered end, which is then put into a funnel-shaped hole drilled through a steel post, and gripped on the other side; the machine-power is then applied, and the soft metal and its mandrel are drawn through, the former being extended equally over the surface of the latter, which is then removed, and the length of pipe is complete. Some metals require repeated drawing through smaller and smaller holes, and have to be softened or annealed at intervals, as the metal hardens under repeated drawing. In this way brass, copper, tin, and pewter pipes are made; but lead pipes are made of great lengths by squeezing the soft metal through a hole in a steel plate in which there is a fixed core or mandrel projecting, which forms and regulates the size of the bore of the pipe. Pipes are also made from copper, brass, and malleable iron by rolling out narrow strips of metal, and then passing them successively through rollers, which are deeply grooved, and which turn up the edges. A mandrel is then laid in it, and it is next passed through double-grooved rollers, which turn the edges in, and thus form a complete tube round the mandrel. The edges, however, require hard soldering—i.e. soldering with a fusible brass alloy, or welding, if of iron. All boiler-tubes used to be made in this way; but the method of drawing has been so much improved that copper and brass pipes, or tubes, as they are frequently called, are now drawn of considerable thickness and diameter. Steel tubes likewise are drawn. Iron pipes, as for water and

gas, are cast. Steel water-pipes can be made by rolling, the edges being riveted and caulked. See WATER-SUPPLY. For earthenware pipes see POTTERY, DRAINAGE, SEWERAGE. See also for various kinds of pipe, TOBACCO, FIRE.

Pipi, the name given to the ripe pods of *Cesalpinia Papai* (see CESALPINIA), which are used in tanning, and are not infrequently imported along with Dividivi (q.v.).

Piping Crow, and PIPING CROW SHRIKE, are names sometimes loosely applied in Australia to any bird of the genus *Gymnoidina* or *Bairita* (q.v.); now more commonly known as 'Magpies.'

Pipit (*Anthus*), a genus of small birds forming with the wagtails the family Motacillidae. The pipits have a strong resemblance to the larks in external appearance, and even in many of their habits, such as singing while on the wing; but they moult twice a year, while larks moult only once. With the wagtails they agree in all respects except in colour, and like them they are chiefly terrestrial in habit, running along the ground, working in and out among grass or heather in search of the insects, worms and slugs which



Meadow-pipit (*Anthus pratensis*).

form their food. The Meadow-pipit (*A. pratensis*), also known as the Titlark or Moss-cheeper, is the species most abundant in Britain. It breeds early in spring, nesting in a hollow on the ground or under a bank, and rears two broods in a season. The Tree-pipit (*A. trivialis*), though only a summer visitor, is common in many districts, and breeds freely in the south and west of Scotland. The Rock-pipit (*A. obscurus*) frequents rocky shores and feeds on molluscs and small crustaceans.

Pippi. See GIULIO ROMANO.

Pippin. See PEPIN.

Pippin, a name given to many varieties of apple, among which are some of the finest in cultivation, as the *Golden Pippin*, *Ribston Pippin*, &c.

Piprahwa, or PIPRAWA, a village of India, near the frontier of Nepal, in the Basti district of the United Provinces. Here is a ruined tope, which, following excavations by W. C. Peppé in 1896-98, proved to be one, and the first to be revealed in modern times, of the topes erected over the distributed ashes of the Buddha (see BUDDHISM). The tope itself, the underlying stone coffin holding the ashes, and various objects contained in the coffin, among them a vase bearing an inscription, are of first importance in the evidence they offer as to the state of civilisation in India about 450 B.C. See Peppé's article in the *Journal of the Royal Asiatic Society* (1898).

Piqua, a city of Ohio, on the Miami River (here crossed by two bridges) and canal, 28 miles by rail N. of Dayton. It has foundries and factories for woollens, worsteds, oil-mill machinery, flour, furniture, &c. Pop. (1890) 9090; (1920) 15,044.

Piquet, a game at cards for two players, played with thirty-two cards, the sixes, fives, fours, threes, and twos being rejected. The game was formerly played a hundred up, a *partie* being the best of five games; but about 1880 the rubicon game superseded piquet *au cent*. At the rubicon game six hands are played, each player dealing alternately. The one whose aggregate score is the higher wins the *partie*. He deducts the loser's score, and adds a hundred to the difference. If the loser fails to score a hundred in the six hands, he is *rubiconed*, and the scores are added instead of being deducted. For a description of the mode of play, handbooks should be consulted.

The earliest known mention of piquet is by Rabelais in the Gargantuan list of games (1530-45). Hence it has been concluded that piquet is of French origin. But it is more probable that a similar game, called *ronfa*, was played in Italy at an earlier date, and that this game, with modifications, travelled from Italy to Spain, where it was renamed *cientos*, and to France, where it was renamed *piquet*, a word of which the etymology continues unsettled. In England from the time of the marriage of Mary to Philip of Spain (1554) the English equivalent (*cent*) of the Spanish name of the game was in vogue, and contemporaneously with the marriage of Charles I. to the daughter of Henry IV. of France (1625) the French name *piquet* would seem to have been substituted.

In 1651 was published *The Royall and Delightfull Game of Picquet*, translated from the earliest known French book on the subject. The first important original work in English was Hony's *Short Treatise on the Game of Piquet* (1744). This included the laws which were the authority until 1873, when the Portland Club issued a code. The general adoption of the rubicon game, shortly afterwards, necessitated a fresh revision; and in 1881 the Portland and Tmf Clubs agreed to the code of laws which now governs the game. These laws were published in 1882, together with a history of and a treatise on the game, by 'Cavendish'; there have been various later editions.

Piracy (Lat. *pirata*; Gr. *peiratēs*, 'an adventurer', 'a pirate'), robbery on the high sea, was apparently very much mixed up with early maritime adventure, the sea-rover being frequently pirate as much as trader: thus, the Phœnicians often combined piracy with more legitimate seafaring enterprise. In Homeric times piracy was accounted a reputable or even dignified calling; and the Greeks, especially the Phœnicians, long displayed a natural genius for piracy. This aptitude was cherished by the constant warfare between small states, it being difficult sometimes to decide what was public and what was private war. Cilicia was long the headquarters of Mediterranean piracy, until in 67 B.C. Pompey made his memorable expedition against the pirates with great naval and military forces. From the 8th to the 11th century the Norse vikings were the terror of western coasts and waters (see NORTHMEN). The Hanseatic League (q.v.) had its origin in the desire for mutual defence against Baltic and other pirates. At a later date the Moslem rovers scourged the Mediterranean, commingling naval war on the large scale with peddling, thievery, and the abduction of slaves: Algiers was a piratical stronghold till well into the 19th century (see CORSAIRS); and in the 17th century the English Channel swarmed with Algerine pirates. The Buccaneers (q.v.) preyed mainly on the Spanish commerce with the Spanish American colonies. Lundy Island (q.v.) was long a nest of pirates, English and other. Captain Kidd (q.v.) is in the popular mind the chief representative of the picturesque type of pirates, whose career of reckless blood-

shed and rapine under their 'Jolly Roger' or black flag, alternating with luxurious debauchery, has come to be surrounded with a halo of romance, reflected in E. A. Poe's *Gold Bug* and R. L. Stevenson's *Treasure Island*. The prototype of Scott's *Pirate* was John Gow, who in January 1725 boldly anchored in Orcadian waters, and entered into friendly relations with the islanders, till, recognised as an atrocious villain, he was with his crew captured and carried to London to be tried. He and eleven of his comrades were condemned a month or two after, and the pirate captain and nine of his men were executed together. So late as 1864 five men were hanged in London for murder and piracy. National prejudices tend to obscure the distinction between privateering (see PRIVATEER) and piracy: Paul Jones (q.v.) was called a pirate in England, and the commanders of the Confederate ships *Alabama* (q.v.), *Shenandoah*, and *Florida*, which preyed on northern commerce, were in northern eyes practically pirates. Of late the pirates tried by admiralty courts are rather naval mutineers than pirates in the old sense. The African slave-trade was not considered piracy by the law of nations; but the municipal laws of the United Kingdom and of the United States by statute declared it to be so; and in or after 1841 it was declared to be so by Austria, Prussia, and Russia. The home of professional piracy, now on a small scale, is the Malay Archipelago and the China Seas; Sea-Dyaks and Malays disputing with Chinese the palm of hardihood as sea-robbers.

Piracy is recognised as an offence against the law of nations. It is a crime not against any particular state, but against all mankind, and may be punished in the competent tribunal of any country where the offender may be found, or into which he may be carried, although committed on board a foreign vessel on the high seas; but it is not permitted to put pirates to death without trial save in battle.

See H. A. Ormerod, *Piracy in the Ancient World* (1924); Philip Gosse, *The Pirates Who's Who* (1924), and his edition (2 vols. 1926-27) of Captain Charles Johnson's *A General History of the Pyrates* (1724), which treats of English pirates only. Johnson was possibly himself a pirate, and his work, the general historical accuracy of which has found support in modern research, is famous as the great inspiration of pirate stories.

Piræus (Gr. *Peiræus*), called also PORT DRACO, the harbour of both ancient and modern Athens (q.v.). Planned by Themistocles and laid out by Hippodamus of Miletus, the Piræus was built in the glorious days of Pericles; this ruler and Cimon before him built the three 'long walls' that connected Athens with its port (5 miles to the south-west), and so ensured a free and safe passage from one to the other at all times. It was both a war harbour and a commercial port, many foreigners living within its walls. Its arsenal (built 347-323 B.C.) and fortifications were destroyed by Sulla in 86 B.C., and from that time the town sank into decay. The modern Piræus, which has grown up since 1834, is a regularly laid-out but mean-looking town, with a naval and a military school, arsenal depôts, and miscellaneous manufactures, and is growing rapidly. A railway (1869), 5½ miles long, connects it with Athens, and another with Athens, the Peloponnese, and the general European system. It is the principal port of Greece. Pop. (1871) 11,000; (1879) 21,055; (1890) 36,000; (1920) 133,482.

Pirandello, LUIGI, Italian novelist and playwright, born at Girgenti in 1867, is principally known by some striking plays (written mostly during or since the Great War), *Six Characters in Search of an Author*, *Henry IV.*, *Right You Are*

(if you think so), *Naked*, &c., in which largely he discusses, with an ironic style, the question of reality, identifying it in its usual meaning, with the conventional and the illusory, whereas the real life is that of ideas, evolved from the subconscious. Pirandello gives an objective reality to his own fictitious characters, besides somewhat exaggerating them, so as to throw the substance of life into higher relief.

Piranesi, GIOVANNI BATTISTA, Italian engraver, 'the Rembrandt of architecture,' was born 4th October 1720 at Venice. He studied art there and at Rome, and worked for a time as an architect. Of his engravings, of which he left about 2000 (29 vols., Paris, 1835-37), the best are of the architectural ruins of ancient Rome. In his work he restored the missing parts of ruins and introduced statues, tombs, vases, altars, and other details. Latterly he was assisted by his family, chiefly his son Francesco, and his daughter Laura. He died at Rome or at Tivoli 9th November 1778. See A. Samuel, *Piranesi* (1910; 2d edition 1912).

Pirano, a seaport of Italy, on a promontory on the south side of the Gulf of Trieste and 12 miles SW. of the city of Trieste. It has two harbours, picturesque Venetian walls (14th century), some interesting buildings, and manufactures of soap, glass, &c., with neighbouring salt-works. It was the birthplace of the violinist Tartini. Pop. 14,000.

Pirates. See PIRACY.

Pirkheimer. See DÜRER.

Pirmasens, a town of the Bavarian Palatinate, and formerly the chief town of the county of Hanau-Lichtenberg, 34 miles by rail W. of Landau. The chief manufacture is shoes. Close by the Prussians under the Duke of Brunswick defeated the French commanded by Moreaux on 14th September 1793. Pop. (1885) 14,938; (1895) 24,548; (1925) 42,996.

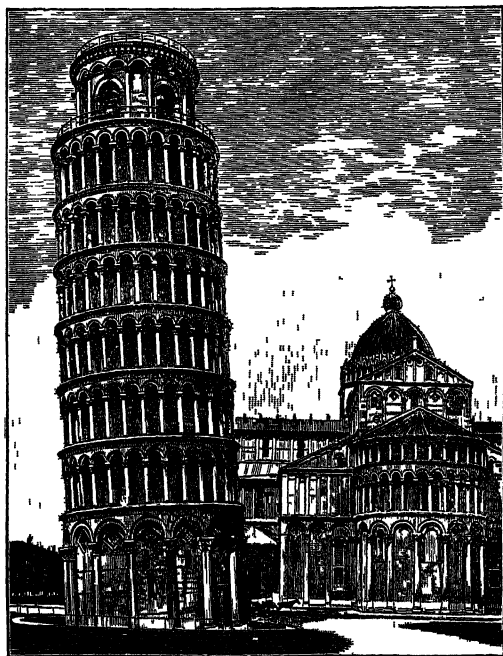
Pirna, a town of Saxony, stands on the left bank of the Elbe, 11 miles by rail SE. of Dresden. Here are a fine 16th-century church; a castle (1573), used as a lunatic asylum since 1811; and manufactures of glass, chemical, tobacco, stoves, &c. Sandstone-quarrying, once important, has declined, as the stone decays where there is coal smoke. Pop. 30,000.

Pirogue. See PERIAGUA.

Pirot, an industrial town of Serbia, on the Nishava, 30 miles ESE. of Nish, noted for its manufacture of carpets. It is of strategic importance, was occupied by Serbian troops in 1877, and taken by the Bulgarians in 1885 and in 1915. Pop. 11,000.

Pisa, a city and archiepiscopal see of Italy, once the rival of Venice and Genoa, which still has its walls standing and a citadel, is situated on the Arno, by rail 49 miles W. of Florence and 13 NE. of Leghorn. It was formerly a great port, though six miles from the sea, but owing to the silting-up of the river is now quite inaccessible to ships. Its commerce has been transferred to Leghorn. It is still a city of fine buildings, foremost amongst which is the cathedral (1063-1118), with a noble dome, fine paintings and mosaics by Cimabue, Andrea del Sarto, and others, and beautiful marble altars. Its shape is that of a Latin cross, 311 feet long by 252 wide; the nave is 109 feet high. Externally it has a magnificent façade of four superimposed rows of pilasters and arches, and fine bronze doors by Giovanni da Bologna and others. Near the cathedral stands the round marble campanile, the 'Leaning Tower of Pisa,' which is a magnificent specimen of the southern Romanesque architecture, but it is peculiar in that it (including the cornice) deviates about 14 feet

from the perpendicular. This peculiarity is not due to original design. The tower seems to have begun to heel over to one side when the third story was completed; the architects deliberately accepted the conditions, and adhered to the inclining position, but diminished the slope of the upper stories so as to keep the centre of gravity well within the walls. (There are two leaning towers also at Bologna, q.v.) The tower is 180 feet in height, consists of eight stories divided by rows of columns, the last, which contains the bells, being smaller in diameter than the others. The tower was erected in 1174 and succeeding years by the architects Bonanno of Pisa and William of Innsbruck; but the eighth story was not completed till the middle of the 14th century. The marble Baptistery, or Church of St John (1152-1278), opposite the cathedral, is circular, and supports a dome, crowned with a cupola. The interior, noted for its wonderful echo, contains the grand and elaborate pulpit of Niccolò Pisano (1260) and a large marble font. The beginning of the Campo Santo, or ancient national cemetery, was several loads of earth brought from Jerusalem towards 1200. In 1278-83 the ground was surrounded by cloisters by Giovanni Pisano, the walls of which were adorned with fresco-paintings by Orcagna, Benozzo Gozzoli, and others. The city contains



Leaning Tower and Cathedral, Pisa.

numerous other churches, some dating from the 11th century; also many fine palaces, private and official residences, including that of the archbishop. The university (1338) has a natural history museum, a botanical garden, and a library (1742). The town possesses a museum of fine arts and archives. Amongst distinguished natives of Pisa may be named the popes Eugenius III. and Nicholas V., the Visconti, Peter the Deacon, Leonardo the mathematician, Giovanni (but not Niccolò) Pisano, and Galilei. The industrial activity is now confined to cottons, silks, ribbons, and the working of coral and alabaster. Dromedaries are bred at the royal farm of S. Rossore in the neighbourhood. Pop. of commune (1881) 53,957; (1921) 67,752.

The province has an area of 1180 sq. m. and (1921) a pop. of 359,368.

History.—Ancient Pisa, originally an Etruscan city, became subject to Rome in the 2d century B.C.; but, on the decline of the western empire, it was compelled to submit in turn to the nations who successively overran Northern Italy. Early in the 11th century Pisa had developed into a powerful republic, possessing a formidable fleet and extensive territories along the Tyrrhenian Sea; it yielded little more than nominal homage to its suzerain lords, the German emperors. Throughout the 11th century Pisa was at the height of its prosperity; to this period belong most of the splendid monuments of art that still adorn the city. It had extensive commercial relations with the East; its 'customs of the sea' (1075) were the pattern upon which the sea-laws of nearly all peoples navigating the Mediterranean were modelled. During the same century the Pisans repulsed the Saracens (1011), took Sardinia from them in 1022, attacked them in Africa in 1030, and routed them utterly off Palermo in 1062. Early in the next century, in 1114-16, they wrested the Balearic Isles from the same enemies. In the second crusade too they played a prominent part, and helped the pope against the Normans, taking Amalfi in 1135 and again in 1137. But already in the 11th century the rivalry between Pisa and Genoa had broken out. Florence too, a Guelph city, grew into an enemy of the Ghibelline Pisa. Wars many and often were waged between Pisa on the one side and a coalition of cities, headed by Florence and Genoa, on the other, with varying fortune, until in 1284 the Pisan fleet was crushed at Meloria. After this Pisa was compelled to give up Corsica, part of Sardinia, and 160,000 gold pieces to Genoa. At the same time Ugolino (q.v.) della Gherardesca made himself master of the town. Various individual rulers or tyrants followed, until the Pisans finally threw themselves (1399) under the protection of Galeazzo Visconti of Milan. The son of the latter sold the Pisan territory to their greatest enemies, the Florentines, from whose tyrannical rule they were for a time relieved by Charles VIII. of France, who, in 1494, accepted the protectorate of the city. When the French left Italy the old struggle was renewed; and, after a desperate resistance, the Pisans, in 1509, were compelled by hunger to surrender to the Florentine army. The most influential families, as formerly in 1406 emigrated. From this time Pisa steadily declined, until in the middle of the 16th century it had less than 8600 inhabitants. Its history henceforth coincides with that of Tuscany (q.v.). With the rest of Tuscany it became part of the kingdom of Italy in 1860. See R. Papini, *Catalogo delle Cose d'Arte di Pisa* (1912).

THE COUNCIL OF PISA met in Pisa on 25th March 1409, and held its twenty-third and last session on 7th August. Its aim was to end the schism which had divided the Western Church for thirty years, and with this view the leading cardinals, finding that neither of the rival popes, Gregory XII. and Benedict XIII., would keep his promise to abdicate, set aside the claims of both, and themselves convoked a general council. After the rival popes failed to appear in obedience to its summons, the council formally tied the claims of both in turn, and deposed them as schismatics and heretics. The cardinals then formed themselves into conclave and elected Cardinal Philargi, who assumed the name of Alexander V. But the council, instead of getting rid of the contending popes, had only added a third, and the faithful continued to be distracted in their allegiance for eight years longer, down to the time of the Council of Constance. Bellarmine considers the

Council of Pisa as 'neither clearly approved nor clearly rejected'; Hefele says 'neither ecclesiastical authority nor the most trustworthy theologians have ever numbered it among the ecumenical councils.' See Hefele's *Conciliengeschichte*, vol. vi.

Pisan, CHRISTINE DE (1363-c. 1430), French poetess and religious and historical prose-writer, born in Venice, went to France in 1368 with her father Thomas Pisan, Charles V.'s astrologer. Widow of Etienne Castet, she supported her family by literature.

Pisanello. See PISANO (VITTORE).

Pisano, ANDREA, also known as ANDREA DA PONTEDERA (1270-1348), was born at Pontedera, near Pisa, and was first a goldsmith, but became famous as a worker in bronze and a sculptor in marble. He is doubtfully stated to have been a pupil of Giovanni Pisano. He settled in Florence, and became the founder of the Florentine school of sculpture. His best work at Florence (one of the baptistery doors and many sculptures on the Campanile) shows strong traces of Giotto's influence. His sons Nino and Tommaso were also sculptors. See Perkins, *Tuscan Sculptors* (2 vols. 1864), and works on Italian sculpture and sculptors by Leader Scott (1882), Freeman (1901), Waters (1911).

Pisano, GIOVANNI (1250-1330), Italian sculptor and architect, was born probably at Pisa, the son and worthy successor of Niccolò Pisano (q.v.). He designed the fine marble high altar and reredos in the cathedral of Arezzo and the little chapel of Sta Maria della Spina at Pisa; executed pulpits in the church of St Andrea at Pistoia and in the cathedral of Pisa; and worked with many pupils in the cathedral at Florence. The tomb of Pope Benedict XI. at Perugia, long attributed to him, possesses few of his characteristics. See works cited at PISANO (ANDREA).

Pisano, NICCOLÒ (c. 1206-78), a distinguished sculptor of Pisa, was born apparently near Lucca. His earliest work is supposed to be the 'Deposition' over one of the doors of the cathedral at Lucca, dated 1237. His reputation is supported by three important works—the pulpit of the baptistery at Pisa (1260), the 'Arca' or shrine of St Dominic for the church of that saint at Bologna (1267), and the pulpit of the cathedral at Siena (1268). He died at Pisa, and was buried in the Campo-Santo. He was also a great architect and a skilful engineer. His influence was wide, reviving the love of beauty and giving new birth to the plastic arts. His pupils Arnolfo and Lapo executed numerous works at Rome, Siena, and other cities. See works cited at PISANO (ANDREA).

Pisano, VITTORE, commonly called PISANELLO (c. 1390-c. 1450), Italian medallist and painter, was born at San Vigilio, near the Lake of Garda. He revived the neglected art of the medallist, and was the first great Veronese artist, his work being best seen in his frescoes. He enjoyed great repute in his day. His paintings excelled in the treatment of animals, but few survive. To-day he is best known by his medals. See G. F. Hill, *Pisanello* (1905).

Pisaurum. See PESARO.

Piscataqua, a river which constitutes part of the boundary between Maine and New Hampshire, and forms at its mouth the excellent harbour of Portsmouth. See NEW HAMPSHIRE.

Pisciculture. Some knowledge of the artificial propagation of fishes has been turned to practical account from the remotest periods of history, but the records are such that though it is evident the Egyptians and Hebrews in the time of the Pharaohs, and later the Greeks and Romans, practised fish-culture, we do not know to what extent. It is probable that their knowledge was

confined to certain means of protection and control, which enabled them to take advantage of the natural reproduction and growth of certain food fishes. The Chinese, too, have had, possibly for thousands of years, a knowledge of fish-culture, but here again we find that their work begins after the ova have been deposited in a natural manner.

It is to modern fish-culture we must look for a thorough and scientific development, and it must be confessed that though much has been accomplished there is room for wide research. Something more than a foundation has been laid, and results of great national and individual importance have been achieved.

It is obvious that pisciculture, as practised by ancient peoples and later by the inmates of religious institutions in this country, based on control and protection of fish rather than their propagation, was far from being all that could be done; so it is not surprising to find that in the 15th century a monk, Dom Pinchon, experimented with the artificial fertilisation of fish-eggs. But it is surprising that it is not till three centuries later we hear any more of this extended pisciculture. Between 1725 and 1765 Stephan Ludwig Jacobi, a native of Lippe-Detmold, successfully bred trout artificially. Again a century elapsed before this was turned to practical account, and it is not till 1842 that we find Rémy, a French peasant fisherman, making use of the artificial propagation of fish for commercial purposes. He, with a partner of the name of Géhin, set to work to increase the number of fish in the streams of his native district. Their efforts met with success, and from that time fish-culture has grown in importance all over Europe.

In this country Frank Buckland published his book *Fish Hatching* in 1863, and by then the value of pisciculture was so well realised that he wrote that it promised 'to be eventually the origin of increase of revenue to private individuals, a source of national wealth, and certainly a great boon to the public in general.' It may be said now that this prediction has on the whole been fulfilled, for we find rivers and lakes constantly restocked with artificially-bred trout, to replace the toll taken by anglers and fishermen: the value of fishings has increased, and this, so far as trout are concerned, is largely due to the fact that the yield and quality of fish can be controlled. Nevertheless the present state of affairs falls far short of Frank Buckland's vision, and this is due to statutory limitations which have prevented the Fishery Boards for England and Scotland, and, later, their successor the Board of Agriculture and Fisheries, from taking the active part in fishery development that the United States Fishery Commission and several Continental governments have done. So far as fish-culture is concerned, development and progress have been left almost entirely in the hands of private individuals working along commercial lines, and consequently compelled to follow rather the most profitable branches than those which would have been of national importance. This has resulted in a number of highly developed and efficient trout-farms, and an absence of salmon-hatcheries and rearing-stations on anything like an adequate scale; the reason being, of course, the limited range and complete control possible in the case of trout; and the anadromous habits and wide range of the salmon which make individual enterprise unattractive. It is not to be inferred that our Fishery Boards and Board of Agriculture and Fisheries have done no good work. This is far from being the case, but one feels that the research work and investigation into the life and habits of the salmon should be carried a step further, and

the knowledge acquired turned to practical account. In this connection it may be said that the greatest advance in knowledge in recent years is due to the discovery that the life-history of a fish is outlined and its age recorded by the ring-markings on its scales. Our knowledge of the life-histories of the migratory salmonidæ particularly has been extended by this means.

Marine fish-culture is carried on experimentally by the Board of Agriculture and Fisheries at several seaside biological stations, and enthusiastic investigators have, as in the case of the salmon, knowledge which would enable them to develop and improve our sea-fisheries, but up to the present government has only seen its way to use this for administrative purposes; and it must be admitted that international complications are at present an inseparable difficulty in any scheme of practical marine fish-culture.

Turning now to inland fisheries, we may consider in detail the branch of fish-culture which has been most successful, owing largely to private enterprise and a more or less fallacious idea that fish-culture could be made profitable to the private fish-culturist. Large sums of money have been sunk in piscicultural establishments. Sir James Maitland at Howietoun, Stirling; J. J. Armistead at the Solway Fisheries, Dumfries; Thomas Andrews at Guildford, Thomas Ford at Caistor, Colonel Custance at Norwich, may be mentioned as pioneers of what may be called commercial pisciculture, though in none of these instances has the financial return been equal to the cost of years of experiment and research.

Trout are reared at various establishments in this country almost exclusively for the restocking of private waters for angling purposes. Of late years some of the trout-farms have been producing directly for the food-market. It is not yet clear whether this can be made to pay when the fish are entirely hand-fed, though there is no doubt whatever that it would be profitable if natural feeding were supplemented by hand-feeding.

A trout-farm consists of a hatchery and a set of ponds for breeders and for rearing purposes. In some cases the output may be a hundred thousand eggs or so, and ten to twenty thousand yearlings; in others, several million eggs and several hundred thousand yearlings.

The restocking of trout waters is accomplished either by the planting of incubated eggs in specially prepared beds, the liberation of fry a few weeks old, the turning down of yearlings or two-year-olds, and, in some cases, three-year-olds.

For many years the difficulties of successful transport of live trout hindered the development of this useful branch of fish-culture, as a large volume of water, necessitating heavy tanks and incidentally heavy freight charges, was required; and in the early days it was invariably the custom to send an attendant to change the water *en route*, and look after the fish generally. Greater knowledge of how to prepare the fish for a journey, the value of low temperature and the use of ice, and latterly the use of oxygen, have overcome the earlier difficulties, so that to-day small trout undertake long journeys without serious risk in a quarter of the volume of water required for short journeys at the end of last century. In this way young trout have been distributed over Great Britain and Ireland, and many hard-fished waters depend upon an annual replenishment from some piscicultural establishment. In 1901 the writer succeeded in sending a small consignment of American trout-fry (*Salmo fontinalis*) to Natal without appreciable loss or the changing of water *en route*. Probably the most important work accomplished by fish-culturists in this country up to the present

time is the distribution of trout and salmon eggs to every part of the world where the climatic conditions made this worth while. This work was begun as early as the middle of last century, and some of the first consignments to the antipodes were by sailing-ship. Later, when steamers were made use of and the advantages of cold storage were understood, it became a comparatively easy matter to send large quantities of eggs to any part of the world. The last large consignment of salmon-eggs from this country was in 1910, when more than a million were despatched to New Zealand. These arrived in good condition, and were successfully hatched off in the New Zealand Acclimatisation Society's hatcheries, and distributed to various rivers, in some of which they became established.

In this country the varying capacity of lake and stream to support trout life was not sufficiently realised in the early days. Lightly-stocked waters, which were in reality stocked to their full capacity, were expected to maintain as many fish as waters naturally rich in the necessary food supplies. In some cases this led to disaster, and the original stock of trout were faced with partial starvation, owing to the too urgent methods of the fish-culturist, who at that time worked solely to increase the number of fish per acre without having any regard to the food supply. The many instances where increased stocks did well retarded the realisation of the need for care.

The fish-culture of the future must concern itself mainly with this important matter of food production. Hatching and rearing trout are comparatively simple matters. Needless to say, the function of the fish-farm is invaluable when it comes to replenishing stocks of trout in overfished waters that are rich in food.

The most important lesson that pisciculturists have learned since Frank Buckland's day is that success must be built on a broad and deep knowledge of aquaculture. This discovery was a costly one. It means that the useful functions of the trout-farm are limited to favourable natural conditions and the replenishing of depleted stocks. Except in rare instances pisciculture is a long way from its original ideal expressed by the analogy of making two blades of grass grow where only one grew before.

With this knowledge gained, the pisciculturist has come to realise that natural methods were not so wasteful and unreliable as he had supposed, but that they were all along producing the stock that could be carried. He knows now that as the agriculturist must prepare the land to bear the desired crops, so must he prepare the water, or be content with what nature provides.

Briefly, it may be said that pisciculture as understood in the middle of last century has been successful to a limited extent only; and the interval has been occupied in discovering its limitations, and how to extend its usefulness.

If the assertions of Frank Buckland's day are no longer heard, there is nevertheless a deep assurance that, though others may reap where the pioneers have sown, pisciculture is worth while, and will eventually take a recognised place alongside its much older sister—agriculture.

In conclusion, a short account of the methods adopted on a trout-farm may prove of interest, showing, as they do, that the artificial side of pisciculture has been developed to a pitch of high efficiency.

From a pond where breeders have been stored, the trout are taken during October, and the early spawners are retained in a smaller pond till they are ripe; the later fish are returned to their pond to await the next overhauling, which will take place

in a fortnight or three weeks. Care is taken to give the fish that are held up plenty of room, the old method of keeping them in tanks till ready has been discarded, as it was found that this lowered the vitality of the parent fish and adversely affected the vitality of the eggs. Plenty of room and plenty of running water are essentials for healthy spawners. The fish are handled as little as possible. After the first overhauling a skilled man can tell when he may expect the first eggs. He keeps an eye on the thermometer, knowing that cold weather will delay spawning operations, while mild weather and rain will hasten them.

When a number of fish are ripe, preparations are at once made for taking the eggs. The operator stands before a table on which are a number of clean basins. With a towel he carefully dries one of these, and an assistant hands up a female fish in a net. This the operator takes in such a way that it lies with its tail in his left hand and its head in his right, belly upwards. Then holding it over the basin, and with tail depressed and head raised, he gently slides the right hand over the abdomen, holding the fish to him with wrist and arm. A very gentle pressure is all that is needed. The eggs flow in an even stream from the vent into the basin, and the passing of the right hand over the abdomen three times should be enough to expel the last egg. The fish is then laid in a tank through which passes a stream of clean water. Four or five females are treated in the same way, and then a male is taken. The method of extracting the milt is much the same as in the case of the eggs, only, instead of the hand, the first finger and thumb are used to give pressure over the lower part of the abdomen. The milt is then carefully mixed with the eggs, and perhaps another male used. A cup full of clean water is added, and the eggs gently stirred, then the basin is slowly filled with water, and placed overhead in a tank with a gentle current. This clears away the cloudy milt and any urine from amongst the eggs, and they are left for half-an-hour or so while they absorb water and swell. During this time they adhere to the basin and to each other, and they must not be disturbed. When they separate they are removed to the hatchery. Here they are laid in hatching-boxes, which are simply shallow troughs of wood or slate or concrete, of such a size as may be considered convenient, this being unimportant so far as the eggs are concerned. A gentle even current is necessary, and a depth of from four to nine inches. Too shallow a tank gives either a poor current, or one which will move the eggs about; too great a depth is inconvenient. In actual practice two to three inches of water over the eggs has been found convenient, and the same depth below the trays on which they are laid. At first gravel was used in hatching-tanks, but it was found that this was not necessary, and, besides, it collected sediment, and made it difficult to find and remove dead eggs—a most important item in the care bestowed during incubation, as one dead egg, if left, is capable of causing the loss of many. Various kinds of trays were tried, and it was found that in waters free from plumbosolvent properties, perforated zinc, or fine wire mesh, could be used. The ideal hatching-tray, and one which is in use in most establishments in this country, is made of glass tubes. The eggs lie between these in rows, and are surrounded by a gentle current.

The time taken in incubation of the ova varies from fifty to a hundred and twenty days according to the temperature. In water which has an approximate mean temperature of 40° F. hatching will take place in about ninety days. A long frost will extend the period. Spring water is often

much warmer, and when this is used the development of the embryo is more rapid.

Ova that are to be despatched abroad are packed so soon as the embryo can be seen through the semi-transparent shell, and before the dark eye-spots are visible. This is usually about the end of a third of the incubation period. Before hatching, the eyes of the embryo become clearly defined as two black specks. When emerging from the shell the embryo usually shows its tail first, and it is a common sight to see one swimming about with the shell over its head for several hours before it can get rid of it. Frequently, however, the embryo emerges head first, and the writer has observed this more often with eggs from wild parents, while in the case of domesticated parents the progeny usually hatch off tail first.

For some weeks the little fish, known as an alevin, is encumbered with a yolk sac, which impedes its movement, but furnishes it with all the nourishment it requires. During this time the alevin is a very helpless creature, falling an easy prey to predatory birds, fishes, &c. Mouth and jaws are not fully developed till the yolk sac is absorbed, nor has it the full use of its fins. Under natural conditions it lies hidden in gravel till it is ready to come out and hunt for food.

It is not at all unusual successfully to bring 98 per cent. of the alevins hatched to the fry or feeding stage, and as the loss in incubation should not be more than 1 or 2 per cent., and is very often nil, it will be realised that to this stage the gain over natural methods in the rough and tumble of mountain streams, and amongst predatory creatures, must be considerable; and it was upon this fact that the pioneer fish-culturists built their hopes, only, there is no doubt, they over-estimated the loss under natural conditions.

It is at the fry stage that the pisciculturist's troubles begin. He has to find a suitable food for a great crowd of young fish which normally would be feeding on minute crustacea. For many years heavy loss occurred during the process of accustoming the digestive organs of the small trout to such food as could be provided. This usually took the form of finely-grated pig's or calf's liver. To-day more suitable foods are used, but liver is still the main stand-by. Finely-grated fish, ground boiled cockles, ground shrimps, &c., help to keep the fry healthy, so that instead of the 20 to 30 per cent. of survivors at a year old, which used to be an average achievement, 80 per cent. is common to-day, and 90 per cent. not unknown.

During the first year the young fish are subject to many parasitic and inflammatory diseases. These used to occur in epidemic form, but are now amenable to known treatment.

At an early stage the young fish have been removed to ponds where a current regulated to the right strength is provided. They have been hand-fed several times a day. The ponds have been kept free from decaying matter of any kind, whether dead fish or excrement. They have been sorted at least twice before they are twelve months old, and the large well-grown fish removed to ponds prepared for them, so that the smaller fish may not be bullied and starved, or even eaten. Constant care and watchfulness have been necessary all the time.

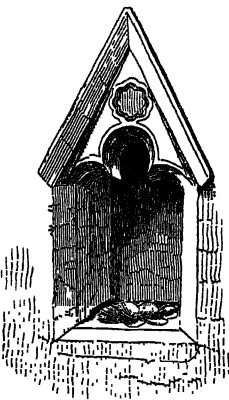
At a year old a hand-fed trout may be anything from 2½ to 10 inches in length. This extraordinary variation does not occur on one trout-farm, but represents the difference between fish reared in cold north-country water and fish reared in the warmer spring water of the chalk-stream counties. The potential growth of the two extremes under a given set of conditions is about the same; that is to say, 2½-inch fish from the north and 10-inch

fish from the south turned into, say, a Yorkshire reservoir will, at or before maturity, resemble each other in size. Both are governed by the conditions of the same environment, and these, so far as growth is concerned, are the determining factor. Normal sizes for north and south country yearlings are from 3 to 5 inches and 5 to 7 inches respectively.

Up to the beginning of this century most of the stocking in this country was done by means of yearling trout. Nowadays two-year-olds are favoured. This change is due mainly to improved methods of transport. Formerly the freight on the great cans used for the transport of two-year-olds was prohibitive.

From the very early days it was realised that our native Brown Trout (*Salmo fario*) is a very delicate fish, subject to epidemics and parasites, and that it is a capricious feeder. Therefore it is not astonishing that hardier species were imported from America, and of these the American Brook Trout (*Salmo fontinalis*), which is really a char, and the Rainbow Trout from the Pacific slope, promised great things. Compared with our own trout, they were much easier to rear, much less susceptible to various ills, and they were voracious feeders and rapid growers. Small wonder that fish-culturists were delighted. But, alas! these aliens had fatal characteristics which condemned them. Not the least disconcerting of these was their invariable disappearance from any water they were turned into if it afforded access to the sea. Where they were successfully prevented from escaping they became unsatisfactory after a short but brilliantly spectacular career. They ceased to be surface-feeders, and they developed marked cannibalistic habits; and as they were such persistent foragers, they usually grew to at least twice the size of the indigenous trout. After enjoying a short boom they became unpopular, and, though a few are still reared, most of these go to the dead fish-market, and eventually figure in restaurants under such fantastic names as Blue Trout, &c. In Germany the Rainbow Trout, by reason of its rapid growth and the higher prices obtainable for food-fish, is largely cultivated, but even there it is a failure for stocking purposes.

Piscina (named from the swimming-pond in



Piscina.

the old Roman baths), in Catholic churches a shallow stone basin with a drain usually leading directly to the earth, in which the priest washes his hands, and rinses the chalice at the end of the celebration of mass. In England it is almost invariably placed on the south side of the choir, at a convenient height.

Pisek, a walled town of Bohemia, stands on the Wottawa, an affluent of the Moldau, 54 miles S. by W. of Prague, and has iron and brass works, and manufactures of paper, boots, hats, cloth, &c. Pop. 16,000.

Pisgah, a name that seems to have applied generally to the mountain-range or district to the east of the Lower Jordan, identical with, or itself a part of, the mountains of Abarim (Deut. xxxii. 49; xxxiv. 1), one of the summits of which is Mount

Nebo (the modern *Neba*), 2644 feet above the level of the Mediterranean. From this point Moses enjoyed his glimpse of the Promised Land, in early spring. Though not the highest point, it is the nearest ridge to the Israelite camp in the plain of Shittim. The view to the east is shut in by the shelving edge of the Moabite plateau, and to the south is closed five miles off by a long ridge, but that to the west includes all the Judæan watershed, and in clear weather all Samaria and Lower Galilee, as far as Tabor and the chain of Gilboa. The Sea of Galilee and Hermon are shut out by the lofty range of Pennel (*Jebel Osha*) in Gilead, while the western watershed of Judæa and Samaria makes it impossible to see the waters of the Mediterranean; but below to the south-west the northern half of the Dead Sea is seen, bordered by the precipices of Engedi, beyond which stretches the dreary Jeshimon or desert of Judah. The burial-place of Moses is unknown, but may have been in the terrible gorge of the Zerka Ma'in, near or not far from the Callirhoë of the tyrant Herod's days.

See G. A. Smith, *Hist. Geog. of Holy Land*, pp. 562 ff.

Pishin, a subdivision of British Baluchistan, just north of Quetta, which has been governed by a political agent of the Governor-general of India since 1878. The British occupied it on account of its great strategical importance; it is the meeting-place of several roads, practicable for troops but not for wheeled carriages, leading from Sind and Punjab to Kandahar. The district—area, 3000 sq. m.; elevation 5000 feet—consists of alluvial valleys separated by ranges of hills, the whole sloping south-west, and surrounded by mountain-chains that reach in north and south 11,000 feet. The people, partly settled, partly nomad, grow wheat, barley, maize, millet, lucerne, water-melons, and musk-melons, and trade in horses to India. Pop. 50,000. A branch of the Indus valley railway traverses the principal valley.

Pisidia, one of the ancient divisions of Asia Minor, lay on the south, separated from the sea by the narrow strip of Pamphylia, and having Phrygia on the north, Isauria on the east, and Lycia on the south-west. Traversed by the main chain of the Taurus, it is a mountainous region, with an inhospitable climate. The people, a race of hardy and lawless mountaineers, were greatly given to predatory expeditions, and do not seem to have paid any regular obedience to the various oriental and other conquering races until Roman times. Under the Roman supremacy there were several prosperous cities, as Sagalassus, Antioch, Selge, Termessus. The boundaries of the province varied at different periods.

Pisistratus (Gr. *Peisistratos*), a famous 'tyrant' of Athens, was born about 600 B.C. At first he co-operated with his kinsman Solon. Early he acquired considerable military distinction. Afterwards he came forward as the leader of one of the three parties into which Attica was then divided—the *Diacrii* (party of the Highlands), chiefly a labouring population, jealous of the rich, and eager for equality of political privileges. Driving into the market-place of Athens and exhibiting certain self-inflicted wounds (so it was said), he called upon the people to protect him against his and their enemies; thereupon, notwithstanding the strenuous opposition of Solon, he was allowed a bodyguard, which he gradually increased, and in 561 B.C. seized the Acropolis, though he was soon driven out for a season; but he was able to exercise full power a year later. The heads of the rich aristocratic party fled, but returned about 556 and drove Pisistratus into exile, from which, however, he returned

some ten years later. Supported by Thebes and Argos, he sailed with a strong force, landed in Attica at Marathon, and marched on the capital. His partisans hurried to swell his ranks. At Pallene he completely defeated his opponents, but used his victory with admirable moderation. Thenceforward he lived in undisturbed possession of power, dying 527 B.C., and transmitting his supremacy to his sons, Hippias and Hipparchus, known as the *Pisistratidae*. Once he had resolutely established his authority his rule became of a kind that has won him the praise and esteem of all later ages. He adopted a strong foreign policy; he firmly, but not harshly, enforced obedience to the laws of Solon; emptied the city of its poorest citizenry, and made them agriculturists, supplying such as had no resources with cattle and seed; secured provision for old and disabled soldiers; bestowed great care on the celebration of religious festivals; encouraged literature more than any Athenian had ever done before—it is to Pisistratus, there is strong reason to believe, or to the poets, scholars, and priests about him, that we owe, for example, the first complete edition of Homer; and adorned Athens with many of its most beautiful buildings, such as the Lyceum, temples to the Pythian Apollo and the Olympian Zeus, &c. See works on Pisistratus by Flach (1885), Töpffer (1886), and Oddo (in Italian, 1903); and Newball, *Pisistratus and His Edition of Homer* (Boston, 1908); also F. E. Adcock in the *Camb. Anc. Hist.* iv. (1926).

Pisolite (Gr. 'pea-stone'), a concretionary limestone, differing from Oolite (q.v.) in having the particles as large as peas.

Pissarro, CAMILLE (1831–1903), French impressionist painter of Spanish-Jewish descent, was born at St Thomas, Virgin Islands. He came to Europe in childhood, studied with the Danish painter Melbye, was influenced successively by Corot, Millet, and Monet, and lived near Gisors. Whether depicting the country or the boulevards of Paris he is always the painter of sunshine.—His son LUCIEN, born in Paris in 1863, lived in England from 1891, and became known as an engraver and a painter of English landscape.

Pistacia, a genus of trees of the family Anacardiaceæ, having dioecious flowers without petals, and a dry drupe with a bony stone. The Pistacia or Pistachio tree (*P. vera*) is a small tree of about 20 feet high, a native of Persia and Syria, but now cultivated in all parts of the south of Europe and north of Africa, and in many places naturalised. It has pinnate leaves, with about two pair of ovate leaflets, and an odd one, flowers in racemes, fruit ovate, and about the size of an olive. The stone or nut splits into two valves when ripe; the kernel, which is of a bright green colour, is very oleaginous, of a delicate flavour, and in its properties very much resembles the sweet almond. In the south of Europe and in the East *Pistachio nuts* are much esteemed; but as they very readily become rancid they are little exported to other countries. They are sometimes called *Green Almonds*. Oil is expressed from them for culinary and other uses. In cultivation one male tree is allowed to five or six female ones. The tree produces flowers and even fruit readily enough in the south of England, but the summers are not warm enough to ripen the fruit, and the tree is apt to be destroyed by a severe frost. The Mastic-tree or Lentisk (*P. Lentiscus*), yields the gum-resin called Mastic (q.v.). It is a native of the countries around the Mediterranean. The Turpentine-tree (*P. Terebinthus*) yields the Turpentine (q.v.) known in commerce as *Cyprus Turpentine*, *Chian Turpentine*, or *Scio Turpentine*, which is of a consistency some-

what like that of honey, a greenish-yellow colour, an agreeable odour, and a mild taste, and in its properties resembles the turpentine of the Coniferae, but is free from acidity. The tree is about 30 or 35 feet in height, and has pinnate leaves, of about three pair of leaflets and an odd one, the flowers in compound racemes, the fruit nearly globular. The kernel of the fruit is oleaginous and pleasant. The Batoum Tree (*P. atlantica*), a round-headed tree about 40 feet in height, a native of the north of Africa, produces a fruit much used by the Arabs; and a gum-resin of pleasant aromatic smell and agreeable taste, which exudes from its stem and branches, is chewed to clean the teeth and impart a pleasant smell to the breath. The fragrant oil of the kernels of *P. oleosa*, a native of Cochin-China, is used there to perfume ointments.

Pistil, that part of the Flower (q.v.) which, after flowering, develops into the Fruit (q.v.).

Pistis Sophia. See GNOSTICISM.

Pistoia (anc. *Pistoria*), a town and episcopal see of Italy, stands 21 miles by rail N.W. of Florence, on a spur of the Apennines. Its streets are thoroughly Tuscan, and it is surrounded with walls, pierced by five gates, and has a citadel. The chief buildings are the cathedral of San Jacopo (12th and 13th centuries), containing a magnificent altar of silver (1286–1407) and several good sculptures; the church of St Bartholomew, with a fine white marble pulpit by Guido di Como (1250); St Andrea, with Giovanni Pisano's pulpit (1301); St Giovanni Fuorcivitas, with a font by Giovanni Pisano and terra-cottas by Luca della Robbia; the 14th-century communal palace and Palazzo Pretorio; the Ospedale del Ceppo, with terra-cottas by Giovanni della Robbia; and other palaces. The principal manufactures are iron and steel wares, agricultural implements, paper, oil, and silk. But the town has the credit of having invented and first made pistols, and of having given them its name in the form of *pistola*. Here Catiline was defeated in 62 B.C. The town was conquered by Florence and Lucca in 1306, and finally surrendered to the former in 1351. Pop. 70,000.

Pistol is the smallest description of Firearms (q.v.). See also REVOLVER.

Pistole, a gold coin formerly current in Spain and Italy, and originally equivalent to about eleven old French livres, though till about 1730 it was merely an irregular piece of gold. Its value varied somewhat at different times and in different countries, usually being between fifteen and sixteen shillings. The gold pistoles once current in the Welsh parts of Germany were in most cases merely convenient multiples of the ordinary thaler. The *louis d'or* was intended to take in France the same place as the pistole in Spain.

Pita-hemp, one of the names of the Agave fibre. See FIBROUS SUBSTANCES.

Piṭaka, 'basket,' is the title of each of the three subdivisions of the canon of the Theravādin school of Buddhism in Pāli (q.v.), the term Tripiṭaka thus standing for the whole canon. The subdivisions are *Vinaya*, 'discipline,' dealing with the rules of Buddhist monasticism; *Sutta*, dialogues in which the Buddha expounds the principles of his teaching; and *Abhidhamma*, comprising treatises of later origin, expounding a scholastic system of ethical psychology.

Pit and Gallows, a rendering of the grant of capital jurisdiction (*cum fossa et furca*) made to vassals by the crown in feudal times. Male felons were usually hanged on the gallows (*furca*); women drowned in a ditch or well (*fossa*). See BARON, DROWNING.

Pitavel, FRANÇOIS GAYOT DE (1673-1743), compiler of the famous collection of *Causées Célèbres* (see CAUSE CÉLÈBRE), served in the army, but became an advocate, and was known as an industrious and painstaking compiler. Of his great work there have been numerous abridgments, continuations, and translations; and his name has become so identified with the collecting of criminal cases that a similar work, published by various editors in Leipzig in 1843 and succeeding years, was called *Der Neue Pitaval* (2d ed. 36 vols. 1857-72; new series, 24 vols. 1866-90).

Pitcairn, ROBERT (1793-1855), editor of the invaluable collection, originally suggested by Sir Walter Scott, of *Criminal Trials in Scotland from 1488 to 1624* (3 vols. Bannatyne Club, 1833), held a post in the Register House at Edinburgh, where he was born and died.

Pitcairne, ARCHIBALD, physician and satirist, was born at Edinburgh, 25th December 1652. He graduated in arts at Edinburgh in 1671, and would seem to have been destined for the church, but subsequently read law at Edinburgh and at Paris, and finally adopted medicine as a profession, studying at Paris and becoming Doctor of Medicine of Reims in 1680 and of Aberdeen in 1699. He practised with success in Edinburgh till 1692, when the fame of his treatise on Harvey's discovery of the circulation of the blood secured him a call to Leyden as professor. There he remained only a year; his lectures being ultimately published as *Elementa Medicinæ Physico-Mathematica* (1718). He returned to Edinburgh to become one of the most famous physicians of his time; producing also *Dissertationes Medicæ* (1701), which contains his chief medical opinions. But he was even more famous, and notorious, as a Jacobite, an Episcopalian, a satirist of Presbyterian men and things, and, according to his opponents, as an atheist and scoffer at religion. *The Assembly* (1692, first printed in 1722) is a comedy in ridicule of the General Assembly of the kirk; and *Babell* (1692, first printed in 1830) is a poem with the same aim. He was a good classical scholar, and his Latin verses, some of which were republished by Ruddiman in 1727, are creditable. He died at Edinburgh, 20th October 1713. There are editions of his medical works (Venice, 1733; Leyden, 1737), and in English from the Latin original (London, 1717), Webster's sketch of his life (Edinburgh, 1781) is on the medical side.

Pitcairn Island, a solitary island in the Pacific Ocean, between Australia and South America, in 25° 5' S. lat. and 130° 14' W. long., measures 2½ miles by 1 mile. It was discovered by Carteret in 1767, a midshipman Robert Pitcairn being the first to sight it, and was at that time uninhabited, although there were unmistakable evidences that it had been inhabited at one time. In 1790 it was taken possession of by nine of the mutineers of H.M.S. *Bounty* (see BLIGH), with six Tahitian men and a dozen women, the ringleader being called Christian. The mixed settlement soon became the scene of treachery and crime, and at the end of ten years, in consequence of murders and reprisals, the Englishman Alexander Smith, who afterwards assumed the name of John Adams, was left alone, with eight or nine women and several children; and from them the present inhabitants (174 in 1921) are descended. Adams, changed by his tragic adventures, and sobered by his responsibilities, set about the education of his companions in Christian principles. The little colony was unknown to the world until 1808, when it was 'discovered' by Captain Folger of the American sealing ship *Topaz*; the first British vessel to visit it did not arrive until 1814. On the

death of Adams in 1829, George Hunn Nobbs, who in 1828 had settled in the island, became pastor and chief magistrate, and governed well. In 1831, as their numbers had rapidly increased (to 87), and drought was feared, the islanders were induced by the British government to remove to Tahiti. But, disgusted by the immorality and other undesirable customs of their Tahitian relatives, most of them came back before long to Pitcairn Island in a vessel chartered by themselves. Then appeared the adventurer, Joshua Hill, who, claiming authority from the British government, set up a tyranny on the island till removed in 1838 by a British man-of-war. The island was annexed to Britain in 1839. In 1856 the islanders (over 190) were transferred to Norfolk Island, but a number of them afterwards returned. Pitcairn Island enjoys a lovely climate; its mountainous surface reaches 1008 feet in Outlook Ridge; the soil is fertile, and produces yams, taro, maize, sweet potatoes, bananas, pumpkins, oranges, melons, pine-apples, arrowroot, sugar, coffee. Goats and poultry run wild. There is occasional trade with passing ships. The people are expert boatmen. They are degenerating mentally but not physically from intermarriage. They are lawabiding, kindly and good-natured, and passionately fond of music. By religion they are Seventh Day Adventists. As a whole the standard of morality is low. Most adults speak English fairly well, but a peculiar patois derived from Tahitian antecedents is current. In 1898 the island was brought within the jurisdiction of the High Commissioner for the Western Pacific, and in 1902 the islands of Henderson, Ducie, and Oeno were annexed, and are included in the district of Pitcairn. The affairs of the island are conducted by a governing body consisting of a president and other members, all honorary, and chosen by vote from among the islanders by all persons male and female over the age of 18.

See Sir J. Barrow, *Mutiny of the Bounty* (1831); Lady Belcher, *Mutineers of the Bounty* (1870); T. B. Murray, *Pitcairn Island* (1854; new ed. 1885); Rosa Amelia Young [a native], *The Story of Pitcairn Island* (1895); and for the physical characteristics of the natives see article by Sir Arthur Keith in *Man* (August 1917), and *Colonial Reports*, *Miscellaneous*, No. 93 (1922).

Pitch. A musical sound is produced by a series of vibrations recurring on the ear at precisely equal intervals; the greater the number of vibrations in a given time the higher is the pitch (see SOUND). The pitch of musical instruments is controlled by means of a tuning-fork, consisting of two prongs springing out of a handle, so adjusted as to length that when struck a particular note is produced. It is obviously important to have a recognised standard of pitch by which instruments and voices are to be regulated; but there is, unfortunately, not the uniformity that might be desired in the pitch in actual use. For two centuries, down to about 1827, the pitch in use was nearly uniform ($C = 498$ to 515 vibrations per second); but from that time, owing mainly to an aim of wood-wind-instrument makers to obtain greater brilliance of tone, it constantly rose, to the detriment of soprano voices especially, till in 1859, in the Covent Garden opera band, it was a semitone higher ($C = 538$). The French government, on the report of a special committee, in 1859 fixed the pitch of C at 522, which continues in use in France to this day, and is known as French pitch. An international conference, where all the chief European countries were represented except France and England, was held in Vienna in 1855, which resulted in the adoption of French pitch as the standard. In 1891 the American piano-manufacturers agreed to adopt French pitch. Efforts to lower the pitch had

been made in Britain since 1859 without effect, including one by the Royal Academy of Music in 1885. But in 1896 the 'new Philharmonic' pitch was adopted, and it was agreed that the former pitch should be treated as exceptional. And in 1899 the piano trade adopted a pitch with $A = 439$ and $C = 522$. Difficulties, however, arising out of lack of uniformity continued, and in 1920 the British Musical Society recommended the universal adoption of the Queen's Hall Orchestra pitch. $A = 435$. America in 1926 adopted $A = 440$.

See A. J. Ellis, *History of Musical Pitch*, reprinted from the *Journal of the Society of Arts*, 1880, and given in abstract in *Nature* (vol. xxi.); also several articles in *Nature*, 1899.

Pitch. When the tar from wood or coal is distilled, volatile naphtha or 'spirit' is obtained at low temperatures, and as the heat is increased heavy oils and other products appear in the distillate. If the temperature reaches redness, coke or carbon is left as a residue, but if the fire is withdrawn before the distilling vessel becomes red—i.e. before the heavy oils in the tar begin to break up—the residue is pitch. A softer and tougher pitch is obtained if the fire is removed early than if the heat is continued till coking begins. In the latter case it is more black, glossy, and brittle. An elastic pitch is got from bone tar, and another from stearine residues, and both are valued by varnish and tarpaulin makers. Pitch is also obtained from natural petroleum. Wood-tar pitch is much more used in America than in England, chiefly for protecting timber from the weather and the attacks of insects. Coal-tar pitch is most largely employed in the manufacture of patent fuel like Briquettes (q.v.). It is also used in the manufacture of black varnishes for coating iron, and to a less extent for protecting wood and other substances, in the preparation of artificial Asphalt (q.v.), and to yield lampblack when burned. *Burgundy Pitch* is the subject of a separate article (see also PINE).

Pitch-blende, a velvety black mineral found in the Erzgebirge and at Redruth, composed fundamentally of uranium oxides, occluding a small quantity of helium, and containing in minute amount the evasive substance polonium and the still more remarkable radium. See URANIUM.

Pitcher-plants. See INSECTIVOROUS PLANTS.

Pitch Lake. See TRINIDAD.

Pitchstone, a name given to a type of volcanic glass, dark green, reddish brown, yellow, dark blue, or black, and occasionally showing a streaked or clouded appearance. It has a pitch-like or greasy lustre, breaks with a conchoidal or splintery fracture, and is translucent on thin edges. It is usually rich in microlites, and often contains crystalline granules and crystals of felspar, pyroxene, hornblende, biotite, and quartz. Now and again it shows perlitic and spherulitic structures. When conspicuous crystals of sanidine (see FELSPAR) are abundantly present in the rock it is termed *Pitchstone Porphyry*. It occurs in the form of dykes and also as lava-flows. The name pitchstone has sometimes been given to the darker varieties of menilite, a form of opal.

Pitesti, a town of Rumania, in the outlying Carpathians, on the river Arges, 65 miles NW. of Bucharest. It has manufactures of lacquer and varnish, and, situated on the main Wallachian railway, has a considerable trade, the neighbourhood being rich in salt and petroleum, and producing good wine, fruit, and grain. Pop. 20,000.

Pith, or MEDULLA, is the central cylinder of tissue in the stems of Dicotyledons and Gymnosperms. In all plants where it is found it is continuous in the young state. In older plants it may

be continuous, as in the elder, oak, &c., in the form of transverse discs, as in the walnut, or wanting in the internodes, as in hemlock, &c. In very young plants it is composed of thin-walled cells filled with protoplasm and cell-sap, and takes part in the conduction of nutritive substances throughout the plant. The cell-walls usually remain very thin, the protoplasm is soon all used up within the cells, and their further growth ceases. Examined microscopically, pith cells are usually polygonal in transverse section, while they are rectangular in longitudinal section, and not much longer than broad. The ring of wood immediately surrounding the pith consists largely of spiral and annular vessels, and is known as the medullary sheath. The pith is connected with the cortex and bast by the medullary rays, which are composed of cells similar to those of the pith, and which convey sap to the inner parts of the stem. In the early life of most trees the pith serves as a storehouse for starch and other reserve substances; but as the tree becomes older the pith is crushed inwards, communication with the cortex and bast is physiologically obstructed, and the pith cells become dry and full of air.

Pithecanthropus erectus ('erect ape-man'), the name given by Dr Eugene Dubois, of the Dutch army medical service, to the animal reconstructed from fossilised remains found by him in Java. These consist of the upper part of a cranium, a left femur, and two molar teeth, and were found in 1891–2 on the left bank of the Bengawan River, near Trinil, during explorations conducted for the government of the Dutch Indies. The cranium and teeth were found close together, and the femur a few yards away and a year afterwards; but Dr Dubois believed them to belong to the same skeleton, and to be such as could only have belonged to an animal midway between man and the higher apes, and of Pleistocene age. The cranium is midway in form and size between the normal human and the gorilla's skull, and rather closely resembles that of a microcephalous idiot. The find has given rise to much discussion and difference of opinion; many authorities holding that the femur and cranium have not been proved to belong to the same skeleton, and that, while the femur is undoubtedly human, the cranium is also probably of a very low human type; others wholly or partly agree with Dr Dubois. The diversity of opinion extends to the teeth, which are large and powerful.

See Dubois, *Pithecanthropus erectus* (Batavia, 1894, in German); his Royal Dublin Society paper, 1895; *Nature*, vols. li.-liv.; Frau Selenka and Prof. Blankenhorn, *Die Pithecanthropus-Schichten auf Java* (1911); and the article ANTHROPOLOGY.

Pithe'cus. See SAKI.

Pithom, one of the store-cities which the children of Israel built for Pharaoh (Exod. i. 11), identified in 1883 by E. Naville with Tell el-Maskhuta, on the Fresh-water Canal and railway line from Cairo to Ismailia, about half-way between Ismailia and Tell el-Kelbr. The identification has since been discussed afresh by Gardiner and Naville in the *Journal of Egyptian Archaeology* (1918, &c.).

Pitlochry, a Perthshire health-resort, on the Tummel, 13 miles NNW. of Dunkeld. It has a tweed manufactory. Pop. 2200.

Pitman, SIR ISAAC, founder of the Pitman system of Shorthand (q.v.), was born at Trowbridge, 4th January 1813. He was for a time a clerk, and after some preliminary training taught schools at Barton-on-Humber (1832–39) and at Wotton-under-Edge. From 1829 he had studied stenography, and, becoming enthusiastic

for its development, had sought to publish with Bagster a manual of Taylor's system. But at a suggestion made through Bagster that he should develop a system of his own, he evolved a form of shorthand essentially phonographic and not orthographic in character. And in 1837 *Stenographic Sound-hand* appeared. The second edition was published in 1840 as *Phonography*, and under this title many subsequent editions were issued. Throughout, the cheap rate of publication which Pitman was able to obtain on account of earlier services rendered gratuitously in connection with the verification of the references in Bagster's *Comprehensive Bible* went far to popularise the system. Dismissed from Wotton because he had joined the New (Swedenborgian) Church, he conducted a school at Bath (1839-43). In the cause of phonography he wrote, travelled, and lectured untiringly, in the early days expending much of his narrow income. In addition to many manuals he issued dictionaries in connection with his system, published a history of shorthand, and printed in shorthand characters numerous standard works. At Bath he founded a *Phonographic Journal* (1842) succeeded later by other periodicals of different name, especially the *Phonetic Journal*, and established a Phonetic Institute (1843). His reform of spelling was attempted along phonetic lines. Propaganda was undertaken in a great variety of pamphlets, and many standard books were published in reformed spelling, in a phonetic printing alphabet known as 'phonotypy.' In 1845 Pitman opened premises in London for the sale of his various publications. His labours in stenography were rewarded with complete success, the subject being recognised by the Technical Instruction Act of 1889, and in the Education Code of 1890, while his system came to be unapproached among stenographic systems in the extent to which it was taught and used. In his spelling reform, however, the necessity for the introduction of new printing types proved an insurmountable obstacle to general success. Pitman was knighted in 1894, and died at Bath, 22d January 1897. See Life by A. Baker (1908, new ed. 1913).

Piton Bark. See CARIBBEE BARK.

Pitra, JEAN BAPTISTE (1812-89), was born at Champforgeuil, near Autun, taught rhetoric at Autun in 1836-41, then entered the order of St Benedict, and devoted himself to historical studies in the abbey of Solesmes. In 1858 he was sent by the pope to Russia to study the Slavonic liturgy, was created a cardinal-priest in March 1863, librarian of the Vatican in 1869, and Cardinal-bishop of Frascati in 1879. His works include *Histoire de Saint Léger* (1846), *Vie du R. P. Libermann* (1855), the invaluable *Spicilegium Solesmense* (4 vols. 1852-58), a collection of hitherto unpublished works of Greek and Latin Fathers and other early ecclesiastical writers, and its two supplements, *Analecta sacra Spicilegio Solesmensi parata* (8 vols. 1876-91) and *Analecta novissima* (2 vols. 1885-88), *Juris Ecclesiastici Græcorum Monumenta* (1864), and *Hymnographie de l'Eglise Grecque* (1867). See Life by Cabrol (Paris, 1893).

Pitrè, GIUSEPPE, Italian folklorist, was born at Palermo, 23d December 1841. On the outbreak of the revolution in 1860 he volunteered into the army of Garibaldi. At the close of the war he studied medicine at Palermo, and while yet a student published *Sui Proverbi Siciliani e Toscani* (1862), *Profilo biografici di contemporanei Italiani* (1864), &c. In 1866 he graduated and thereafter chose a life of obscurity as a medical practitioner in a poor quarter of Palermo, devoting his days to his profession and his nights to the study of folk-

lore, especially Sicilian folklore. From its foundation in 1882 till it ceased publication in 1912, he was editor, along with Salomone-Marino, of the *Archivio per lo Studio delle Tradizioni popolari*, which became the pivot of folklore researches all over Italy; and in this journal much of Pitrè's best work appeared. As a fitting culmination of his labours the science of folklore received academic recognition for the first time, and on the creation at the university of Palermo of a chair of Demopsychology (as Pitrè preferred to call it) he was appointed first professor. He was made a senator in 1915. In 1916 he died. Among his works are the series 'Biblioteca delle Tradizioni popolari Siciliane' (25 vols. 1870-1913) and an exhaustive *Bibliografia delle Tradizioni popolari d'Italia* (1894); and he edited also the series 'Curiosità popolari Tradizionali' (16 vols. 1885-99). See Evelyn M. Cesaresco in *Folklore* (Sept. 1916) and G. A. Cesareo, *Giuseppe Pitrè e la letteratura del popolo* (1916, in the *Archivio storico siciliano* of the Società Siciliana).

Pitri (Sansk. 'father;' plur. *Pitaras*) in Hindu religion denotes the deceased ancestor, and in the plural the body of such ancestors. In the ritual offerings are normally confined to the last three ancestors, but the whole body of ancestors is regarded as powerful to bless their descendants, and prayers are addressed to them for welfare of all kinds, especially the boon of sons, who are required in order to maintain the worship of the ancestral spirits. Though the *Pitaras* are believed in the period of the Vedas (q.v.) to dwell in heaven with the gods, and are deemed to share in some of the divine powers, they are sharply distinguished from them by mode of worship, offerings to them being normally deposited on the ground, not burned in fire, a practice doubtless derived from the older belief that the spirits of the dead remained near their buried bodies or the bones buried after cremation.

Pitscottie. See LINDSAY (ROBERT).

Pitt, WILLIAM, the elder. See CHATHAM.

Pitt, WILLIAM, the second son of the great Earl of Chatham and of Lady Hester Grenville, was born at Hayes, near Bromley, in Kent, on 28th May 1759. At the time of his birth his father was still in the House of Commons and in the very zenith of his fame, and the future statesman grew up amid associations and surroundings that were well fitted to foster that political ambition which was to be the guiding and almost the sole impulse of his life. His constitution in boyhood seemed very weak; he was never sent to school, but his education advanced so rapidly under a private tutor, that he was able to enter Cambridge when only fourteen. He was then a shy, reserved boy of exceedingly precocious talents, of irreproachable morals, and of regular and studious habits, little drawn to college society and amusements, and already distinguished by a rare self-control and concentration of purpose. From his earliest youth political life was placed before him as his ideal, and all his studies converged to that end. He became an excellent classical scholar, but he valued the classical writers mainly as a school of language and of taste; and it was observed how carefully he analysed their styles, noted down every just or forcible expression, and compared the opposite speeches on the same subject, observing how each speaker met or evaded the arguments of his opponent. Like many others he found in Locke a great master of clear and accurate thinking. His father superintended his studies with much care, and it was remembered that he specially recommended to him the sermons of Barrow as models of style and reasoning, and the histories of Polybius and Thucydides as fountains of political wisdom; that he taught him

elocation by making him declaim the grandest poetry in Shakespeare and the speeches of the fallen angels in the *Paradise Lost*; and that he exercised him in fluency by accustoming him to translate into flowing English long passages from the classical writers. To this last practice Pitt largely ascribed that amazing command of choice and accurate English in which he surpassed all his contemporaries. When little more than a boy he was an attentive and discriminating listener to the debates in parliament. He became thoroughly familiar with the matchless eloquence of his father, and together with his brother-in-law, Lord Mahon, he supported his father into the House of Lords on the 7th April 1778 on that memorable occasion when Chatham delivered his last speech against the surrender of America, and fell down, stricken by mortal illness, on the floor of the House.

Pitt was left with a patrimony of less than £300 a year. He was called to the bar in the June of 1780, and went on the Western Circuit, but in September parliament was dissolved, and he at once threw himself into politics. He stood for Cambridge University, but found himself at the bottom of the poll; his disappointment, however, was speedily allayed, for Sir James Lowther gave him a seat for his pocket-borough of Appleby, and Pitt entered the House of Commons on 23d January 1781.

He came into the House bearing a name which was beyond all others revered by Englishmen, with the advantage of being in no way mixed up with the calamitous American war, and with talents that had already acquired an extraordinary maturity. The Tory ministry of Lord North was then tottering to its fall, crushed by the disasters in America, and confronted by an opposition which consisted of the Old Whigs who followed Rockingham, among whom Fox and Burke were conspicuous, and of a smaller body who had been especially attached to the fortunes of Chatham, and who were chiefly represented by Shelburne, Camden, and Barré. Pitt lost no time in throwing himself into the fray. He spoke on the 26th February with brilliant success in defence of Burke's Bill for Economical Reform, and on several successive occasions he assailed the falling ministry. He denounced the American war and the corrupt influence of the crown with extreme violence, but he refused to throw in his lot irrevocably with the party of the opposition, and shortly before the fall of North he publicly declared that he could not expect to bear a part in the coming ministry as he 'would never accept a subordinate position.' The words are said to have escaped from him in the heat of the debate, and the House was startled and a little amused at the arrogance of a young man who was not twenty-three, who was absolutely without official experience, and who had been little more than a year in parliament, declaring that he would accept no office except in the Cabinet.

But Pitt had attained a position that placed him far above lasting ridicule. Fox spoke of him as already one of the first men in parliament. Burke said of him that he was not a chip of the old block, but the old block itself; Horace Walpole wrote that he had shown logical powers that made men doubt whether he might not prove superior even to Fox; and when upon the resignation of North in March 1782 a ministry was formed under the leadership of Rockingham, combining the two sections of the opposition, Pitt remembered his pledge and refused several offers, among others the Vice-treasurership of Ireland with a salary of £5000 a year. He gave, however, a general and cordial support to the new ministers, but he at the same time brought forward the question of parliamentary reform, on which they were profoundly divided. It was a question which fell naturally to

him, for his father had been one of the first to urge it. On the 7th May he moved, in a speech of great brilliancy, for a select committee to inquire into the state of the representation, and was only defeated by 161 to 141. He soon afterwards supported a measure of Sawbridge for shortening the duration of parliament, and a measure of Lord Mahon for preventing bribery at elections.

A close personal and political connection about this time grew up between Pitt and Henry Dundas, who had been Lord Advocate under North. It proved of great importance to the career of Pitt. Dundas had none of the intellectual brilliancy or of the moral dignity of the younger statesman, but he had one of the best political judgments of his time, he had great talents both for business and for debate, and he was a most shrewd and sagacious judge of the characters of men—a gift in which Pitt through his whole life was somewhat wanting.

The Rockingham ministry lasted only for three months. The king detested it; it was from the first profoundly divided, and a bitter personal and political animosity had broken out between Charles Fox and Lord Shelburne, its two most conspicuous members. On 1st July 1782 Lord Rockingham died, and the question of leadership at once broke up the party. Fox insisted on the leadership of the Duke of Portland, a wealthy and respectable, but perfectly undistinguished nobleman, who was then Lord-lieutenant of Ireland. The king gave the post of First Lord of the Treasury to Shelburne, who had an incomparably higher political position, and who had been a favourite friend and colleague of Chatham, though there were features in his character that already excited great unpopularity and distrust. Fox, with a considerable section of the Rockingham Whigs, at once resigned, and Pitt entered the Cabinet as Chancellor of the Exchequer in the reconstructed ministry. Public opinion generally blamed Fox, and one of the consequences of his resignation was that the House of Commons was divided into three distinct parties. There was the party of Fox, the party of North, and the party of the government, and no one of them could command a clear majority. A coalition of some kind was inevitable. Shelburne leaned towards an alliance with North, but Pitt positively refused to have any connection with the statesman whom he deemed responsible for the American war. Peace was not yet attained, but the negotiations which had been pursued by the preceding ministry were steadily pushed on. Provisional articles of peace between England and the United States were signed in November 1782, and preliminary articles with France and Spain in the following January, while a truce was established with Holland, and the first steps were taken towards a very liberal commercial treaty with the United States.

Pitt bore a leading part in the debates in parliament, and his reputation steadily rose, but the Shelburne ministry was weak, divided, and short-lived. The peace following a disastrous war necessarily involved sacrifices that were profoundly unpopular, and the character of Shelburne aggravated the divisions that had already appeared. Several resignations took place, but Pitt stood loyally by his chief, and endeavoured without success to induce Fox to rejoin the ministry. Fox, however, declared that he would never again serve any ministry with Shelburne for its head, and to the astonishment and indignation both of the king and of the country, he united with the very statesman whose expulsion from public power had been for years the main object of his policy, and whom he had repeatedly threatened with impeachment. North, irritated at the ostracism with which he had been threatened, readily entered into the alliance. Two factions voted of censure directed against the

peace were carried through the Commons by majorities of 16 and 17, and on 24th February 1783 Shelburne resigned.

Pitt had displayed the most splendid parliamentary talents in the discussions that preceded the fall of the ministry, and although he could not overthrow the compact weight of parliamentary influence opposed to him, he profoundly moved the country and placed his own position beyond dispute. On the fall of the Shelburne ministry, the king, hoping to escape the yoke of the coalition, implored the young statesman to accept the leadership, and gave him an absolute authority to name his colleagues. It was a dazzling offer, and Pitt was not yet twenty-four, but he already possessed a judgment and a self-restraint which is rarely found at any age in combination with such brilliancy and such courage, and he saw clearly that the moment of triumph had not yet come. After a long struggle and many abortive efforts the king was obliged to yield, and on the 2d April the coalition ministry was formed with the Duke of Portland as First Lord of the Treasury, and Fox and North as joint Secretaries of State.

It commanded a large majority of the votes, and included a great preponderance of the ability in the House of Commons, but the king viewed it with a detestation amounting to loathing, and the nation was profoundly scandalised by the alliance on which it rested. Pitt was offered his old post of Chancellor of the Exchequer, which he peremptorily refused. As leader of the opposition, he brought forward, in the form of resolutions, an elaborate scheme of parliamentary reform, including an increase of the county members. He was defeated by 293 to 149, but he at least succeeded in bringing Fox and North into direct collision. He brought forward another important measure for the reform of abuses in the public offices, which passed the Commons but was rejected in the Lords. The peace which was carried by the new ministry differed very little from that which they had censured when in opposition; and very soon the bill of the government for subverting in some important respects the charter of the East India Company and reorganising the government of India, produced another great change in the disposition of power.

The feature of the scheme which chiefly excited indignation and alarm was the creation by the existing legislature of a new supreme body in England, consisting of seven commissioners who were to be immovable except by an address from either house for four years, and who were during that period to have an absolute control of the patronage of India. It was contended that this measure would give the party who were now in power an amount of patronage which would enable them to overbalance the influence of the crown, dominate the parliament, and control succeeding administrations. These objections were brought forward by Pitt with great power, but with extreme exaggeration, and the king and the nation were speedily alarmed. The India Bill passed by large majorities through the Commons, but when it came into the House of Lords the king authorised Lord Temple to say that he would consider any man his enemy who voted for the bill. The communication produced an immediate effect. The bill was rejected in the Lords by 95 to 76; the ministry refused to resign, and the House of Commons supported them by large majorities; but the king peremptorily dismissed them on 18th December 1783, and next day it was announced that Pitt had been called to the head of affairs as Chancellor of the Exchequer and First Lord of the Treasury.

Pitt had already abundantly displayed his parlia-

mentary ability, his judgment, and his discretion. He was now to display in the highest degree his courage. In the eyes of nearly all the best judges in England his position was a hopeless one, and his administration was likely to be even more brief than the three which had preceded it. There was a majority of more than a hundred against him in the Commons, and the parliamentary influence behind it was so great that an immediate dissolution must have been disastrous. He was called to office by a grossly unconstitutional interference on the part of the king, and every day which he remained in office under the censure of the House of Commons added to the falseness of his position. Temple, on whom he had greatly relied, threw up the seals of Secretary of State which he had accepted, and in the House of Commons Pitt was himself at this time the only cabinet minister, while Dundas was the only considerable debater who supported him against the united attacks of North, Fox, Burke, and Sheridan. But Pitt fought his battle with a skill and a resolution that have never been surpassed in parliamentary history. A long succession of hostile votes was carried, but they failed to drive him from office, and soon unequivocal signs appeared that the country was with him. The magnanimity with which at this critical period he refused to take for himself a great sinecure office which fell vacant added greatly to his popularity. Addresses in his favour poured in from all the leading corporations in the country. The majorities against him grew steadily smaller. At last, on 25th March 1784, the long-deferred blow was struck. Parliament was dissolved, and an election ensued which swept away nearly 160 members of the opposition, made Pitt one of the most powerful ministers in all English history, and prepared the way for a ministry which lasted, with a few months' intermission, for no less than twenty years.

In this great and powerful ministry English political life assumed much of its modern aspect. The House of Commons acquired a new importance in the constitution, the people a new control over its proceedings, and the First Lord of the Treasury complete ascendancy in the government. The system of 'king's friends' controlling the ministry was finally destroyed, and when the chancellor, Lord Thurlow, attempted to perpetuate it, he was peremptorily dismissed. The skilful management of the regency question established the right of parliament to provide for the exercise of supreme power during the incapacity of the king. Direct parliamentary corruption was finally put down. Great numbers of sinecure places were abolished, and great reforms were introduced into the system of collecting the revenue and issuing public loans. The government of India was reorganised on the system of a double government, which continued with little change till the abolition of the East India Company in 1858. The whole system of taxation and of trade duties was thoroughly revised, and no minister since Walpole had approached Pitt in his complete competence in dealing with trade questions. The finances of the country, which had been extremely disorganised by the American war, became once more flourishing. A commercial treaty, based upon more enlightened commercial doctrines than any English statesman, except Shelburne, had yet adopted, was negotiated with France. In foreign politics Pitt was for some years equally successful. Some troubles that had arisen with Spain were put down by a display of prompt and judicious firmness. In conjunction with Prussia a revolutionary movement in Holland which was fomented by French influence was suppressed, and the triple alliance of England, Prussia, and Holland contributed largely to ter-

minate the wars between Sweden and Denmark and between the emperor and the Turks, though it met with a mortifying failure in its dealings with Russia. Pitt's love of peace was very sincere, but the influence of England in European councils rose greatly under his ministry, and he showed much decision and tact in extricating England from a dangerous complicity with the ambitious designs of her Prussian ally. Up to the time of the French Revolution there was no decline in his ascendancy, his popularity, or his success.

A few adverse criticisms, however, may be justly made. He cast aside too lightly on the first serious opposition parliamentary reform and the abolition of the slave-trade, and it became evident to good observers that he cared more for power than for measures, and was ready to sacrifice great causes with which he had sincerely sympathised and which he might have carried, rather than raise an opposition that might imperil his ascendancy. His once famous Sinking Fund is now universally recognised to have been thoroughly vicious in its principle; and in the latter part of his career it led him to the absurdity of borrowing largely at high interest in order to pay off a debt that had been contracted at low interest. His attempt to establish free trade between England and Ireland failed through an explosion of manufacturing jealousy in England, which obliged him to modify his original propositions in a way which was unpalatable to the Irish. More real blame attaches to him for his opposition to all serious measures to remedy the enormous abuses in the Irish parliament and for the great uncertainty of his policy towards the Irish Catholics. The great evils which grew up in England in his time in connection with the sudden development of the factory system appear never to have attracted his attention, and he made no effort to mitigate them. He created peerages with extreme lavishness and with very little regard to merit, and although his patronage was not positively corrupt, few ministers have shown themselves more indifferent to the higher interests of literature, science, and art.

When the French Revolution broke out his policy was one of absolute neutrality towards the contending parties, and this neutrality he most faithfully observed. He wholly failed, however, to understand the character and the supreme importance of the Revolution. He believed that it was merely a passing disturbance, and that its principal effect would be to deprive France for some years of all serious influence in European affairs, and almost to the eve of the great war he was reducing the armaments of England. There is no real doubt that he was forced most reluctantly into war by the aggressive policy of France in Flanders and towards Holland; but he drew the sword believing that France was so disorganised and bankrupt that a struggle with her would be both short and easy; he was almost wholly destitute of the kind of talents that are needed for a war-minister, and he had to contend with an almost unexampled outburst of military enthusiasm, and soon after with the transcendent genius of Napoleon. His belief in the probable shortness of the war and in the efficacy of his sinking fund, led him into the great error of raising his war expenses in the first stages of the war almost wholly by loans, and thus laying the foundation of an enormous increase of debt. His military enterprises were badly planned and badly executed, and he had none of his father's skill in discovering and bringing forward military talent. For some years it is true his ascendancy in parliament continued to increase. The great Whig schism of 1794 and the secession of Fox reduced the opposition to utter insignificance. But even in his domestic

measures Pitt was no longer fortunate. Through fear of the revolutionary spirit which had infected some portions of the population, he was led into repressive measures very little in harmony with his earlier career. Corn had risen to famine price, and great distress prevailed, and the government attempted to meet it by very ill-conceived relaxations of the poor-laws—by levying rates for the purpose of increasing wages, and by granting parochial relief in proportion to the number of children in a family, and thus offering a direct premium to improvident marriages. In Ireland disaffection was steadily growing, and Pitt tried to win the Catholics by measures of conciliation, and especially by the concession of the suffrage; but the opposition of the king, divided councils, and the vacillation of his own mind impaired his policy, and the injudicious recall at a very critical moment of a popular viceroy contributed largely to the savage rebellion of 1798. He then tried to place Irish affairs on a sound basis by a legislative union which was to be followed by Catholic emancipation, the payment of the priests, and a commutation of tithes. The first measure was carried by very corrupt means, but the king, who had not been informed of the ultimate intentions of his minister, declared himself inexorably opposed to Catholic emancipation, which he deemed inconsistent with his coronation oath. Pitt resigned his office into the hands of his follower Addington in February 1801; but a month later, on hearing that the agitation of the Catholic question had for a time overthrown the tottering intellect of the king, he declared that he would abandon the Catholic question during the remainder of the reign, and he resumed office in May 1804 on the understanding that he would not suffer it to be carried. His last ministry was a melancholy and a humiliating one. The war, which had been suspended by the peace of Amiens, had broken out with renewed vehemence. There was great danger of invasion, and Pitt earnestly desired to combine the most eminent men of all parties in the ministry; but the king forbade the admission of Fox. The principal followers of Fox refused to join without their chief, and Lord Grenville and his followers took the same course. Grenville, who had long been one of Pitt's ablest colleagues, was now completely alienated. A junction with Addington was effected, but it lasted only for a short time, and it added little to the strength of the ministry. Dundas, Pitt's oldest friend and colleague, had been lately made Viscount Melville. He was placed at the head of the Admiralty; but a charge of misappropriating public funds was raised against him, and in 1805 he was driven ignominiously from office. Pitt's own health was now broken. His spirits had sunk; the spell which had once surrounded him had in a great degree passed away, and although the victory of Trafalgar saved England from all immediate danger of invasion, the disasters of Ulm and Austerlitz threw a dark cloud over his closing scene. He died in his forty-seventh year on 23d January 1806. The House of Commons by a great majority voted him a public funeral and a monument in Westminster Abbey.

He was never married, and he never mixed much in general society; but in all his private relations he was pure, amiable, simple, and attractive. He was a warm friend. His temper was very equable, and till near the close of his life very cheerful. He had much ready wit, and he could easily throw off the cares of office, and even join heartily in the games of boys. He maintained to the last his familiarity with the classics, but his serious interests were exclusively political. He only once crossed the Channel, and he appears to have been

wholly untouched by the great contemporary currents of literature and non-political thought. He was not free from the prevailing vice of hard drinking, and he has been justly blamed for having allowed his great indifference to money to degenerate into a culpable carelessness. In 1801 some of his friends subscribed £12,000 towards the payment of his debts, and in the following year he sold Holwood, his country place. But these measures proved wholly insufficient. With no extravagant tastes, with no family to support, with no expensive elections, and with an official income of at least £10,000 a year, he left £40,000 of debt, which was paid by the nation. In public he was cold and repellent, and there was something theatrical in the unvaried dignity of his demeanour; but few men possessed to a higher degree the power of commanding, directing, and controlling, and he inspired the nation with an unbounded confidence both in his character and in his abilities. England has seen no greater parliamentary leader, few greater masters of financial and commercial legislation, and he was one of the first statesmen to adopt the teaching of Adam Smith. If his eloquence was very diffuse, if it showed little imagination, or depth or originality of thought, it was at least supremely adapted to all the purposes of debate, and it rarely failed in its effect. He was, in a word, a great peace-minister; but in the latter part of his life an evil fate brought him face to face with problems he never wholly understood and with difficulties he was little fitted to encounter.

See the *Life* by Lord Stanhope (4th ed. 1879); books on him by Walford (1890), Lord Rosebery (1891), Whibley (1906) and—especially—Holland Rose (1911, 1912, and 1925); and the famous essay by Lord Macaulay. Fortescue (in his history of the *British Army*, vol. iv., and *British Statesmen of the Great War*) has dealt severely with him as war-minister, blaming him for a long series of military disasters; he knew nothing of war, neglected the army, and relied on Dundas, though fearless, sincere, and in many respects a great man.

Pittacus, one of the 'Seven Wise Men' (q.v.) of ancient Greece.

Pittenweem, a small seaport and holiday resort of Fife, a royal (since 1542) and (till 1918) parliamentary burgh (St Andrews group), $3\frac{1}{2}$ miles N.E. of Elbie by rail, with fisheries. There are ruins of a 12th-century priory. Pop. 1800.

Pittsburgh (in accordance with the pronunciation, now often spelt *Pittsburg*), the second city of Pennsylvania, is built on a narrow strip of land where the Allegheny and Monongahela meet to form the Ohio: it extends some 8 miles up the rivers, and 2 or 3 miles down the Ohio. The business portion of the city is on a plain, less than a mile in width, along the banks, while the hills, commanding delightful views, are covered with handsome residences. In this region, where the prevailing soft shales and sandstones have been worn away by the rivers to a depth of 500 or 600 feet, the horizontal layers of coal are exposed, and access afforded to the coal-seams on the sides of the hills and at the bottom of the valleys to an extent elsewhere unknown; the great Pittsburgh coal layer, 8 feet thick, like a broad black band extends around the city 300 feet above the river. After the introduction of natural gas the former sobriquet of the 'smoky city' became a misnomer; and the clearness of the atmosphere gave an impetus to architecture, but this relief from smoke was only temporary, the gradual failing of gas restoring old conditions. Among notable buildings are the Frick office building, the Exposition Building, a large government building containing the post-office and customs offices, and a fine City-County Building, erected, owing to the inadequacy of the city hall, of white sandstone, and of the court-

house (connected with the gaol by a 'Bridge of Sighs') of Quincy granite. Of numerous churches the large Roman Catholic cathedral and Trinity Church (Episcopal) deserve notice. Pittsburgh possesses a good system of schools, and is the seat of important institutions of higher learning. The University of Pittsburgh was established in 1908 by assembling the scattered departments of what was the Western University of Pennsylvania. The Roman Catholic University of Duquesne was originally the College of the Holy Ghost. The Carnegie free library and the Carnegie Institute were built and the latter endowed in 1890 and in 1903 by Andrew Carnegie; the institute comprises a museum of science, department of fine arts, music hall, and technical schools. Among other educational institutions are the Pennsylvania College for Women and Roman Catholic and Protestant theological seminaries. There are some fine public parks, among them the Schenley Park (1890) and the Highland Park (with zoological garden).

Pittsburgh is one of the most important industrial cities in the United States. This has been added to by its absorption (1906) of Allegheny, on the opposite side of the Allegheny River. McKeesport, and many smaller boroughs, are closely allied with Pittsburgh for all business purposes. These boroughs are being gradually absorbed by the city, and in 1903 an act of legislature was passed with the ultimate object of amalgamating all these municipalities into one great city. The district, which practically extends over 25 miles up the Allegheny and Monongahela Rivers and 10 miles down the Ohio, is the great centre of the steel, iron, and glass industries of the United States. Its coalfields are very rich, and it is an extensive shipping-point for bituminous coal. In the district are the great Carnegie steel-works (at Homestead), and the Westinghouse air-brake and electrical works, the largest of their kind in the world. The manufactures of the region include everything which can be made of iron, from the heaviest of guns to nails and tacks; steel in its various applications; all descriptions of glass and glassware; silver and nickel-plated ware; Japan and Britannia ware; pressed tin, brass, copper, bronzes; earthenware, crucibles, fire-pots, bricks; furniture, wagons and carriages; brushes, bellows, electrical machinery, and mechanical supplies of all kinds; natural-gas fittings, and tools for oil and gas wells. The production of pig-iron in the district is said to be nearly a fourth of the entire product of the United States; and the enormous manufactures of iron and steel and of glass to be each about one-half. The production of radium is important. In the city is a cork manufactory said to be the largest in the world. Since about 1883 natural gas has been used for domestic and manufacturing purposes (see GAS, HEATING and LIGHTING BY). On drilling into the earth from twelve to fifteen hundred feet a natural gas—mainly methane—rushed from the opening with a pressure of four or five hundred pounds to the square inch, which was found sufficient to force it through pipes to the houses and factories in the city. The purity of this gas, its great heating power, and its cleanliness made it a most excellent substitute for coal for domestic and manufacturing purposes. But of late the supply is less abundant, and the manufactories have returned to the use of coal, though much gas is still used for domestic purposes.

The position of Pittsburgh on the eastern border of the great Mississippi river-basin, and its facilities for penetrating to every part by river and rail, give the city great advantages for trade; and as a depot for exchange and transshipment many railroads centre here, among them several trunk lines.

The rivers are also of great commercial importance, and much has been spent in dams and locks on the Allegheny, Monongahela, and Ohio, to give slack-water navigation. The traffic on these rivers is enormous, chiefly coal and iron manufactures. There are also fast steamers for passenger and light traffic. Much lumber-rafting is done on the Allegheny.

History.—In the early history of America the site of Pittsburgh was a point of great interest, and was familiarly known as the 'Gateway to the West.' Here traders, settlers, and adventurers, who had worked their way from Philadelphia by a chain of forts, congregated, and here flat-boats were built which carried them down the Ohio to the unknown regions beyond. In 1754 a few English traders built a stockade at the point, but were driven away by the French the following April. The latter replaced the stockade by a fort, which, in honour of the governor of Canada, they called Duquesne. It was near the present outskirts of the city that Braddock (q.v.) was surprised in 1755; and on 15th October 1758 General Grant and his Highlanders had reached the hill on which later the court-house was built when they were surrounded by the Indians and nearly exterminated. The following month, however, General Washington took possession of what remained of old Fort Duquesne, the French having fled down the Ohio, leaving the buildings in ruins. In 1759 the English commenced a large and strong fortification, which, in honour of the elder Pitt (see CHATHAM, EARL OF), then prime-minister, they called Fort Pitt. The fort is said to have cost the English government £60,000. The settlement became a borough in 1804, and in 1816 the borough was incorporated as the city of Pittsburgh. In 1892 there were terrible strikes, accompanied by not a little fighting and bloodshed, at the Carnegie steel-works. Pop. (1810) 4768; (1840) 21,115; (1870) 86,076; (1900) 321,616; (1910) 533,965 (with Allegheny); (1920) 588,343.

Pittsfield, capital of Berkshire county, Massachusetts, 151 miles by rail W. of Boston. Beautifully situated on a plateau where six lakes round the city give rise to the Housatonic River, it contains a marble court-house, a handsome atheneum, and has a fine park near its western border. Cotton and woollen goods, boots and shoes, and electrical and other machinery are manufactured. The place, too, is a summer resort. It has associations with Longfellow, and Oliver Wendell Holmes and Herman Melville lived in the neighbourhood. Pop. (1860) 8045; (1920) 41,763.

Pittston, a city of Pennsylvania, on the Susquehanna River, 8 miles by rail N.E. of Wilkes-Barre. It is in the centre of a field of anthracite coal, and has extensive mining interests, besides other industries. It is connected by several bridges with the residential West Pittston. Pop. 18,000; with adjacent municipalities it practically forms one town with a population of about 58,000.

Pituitary Body, an important organ connected with the under-surface of the vertebrate brain. It is about the size of a small bean in man, and occupies the sella turcica of the sphenoid bone. Its origin is two-fold—an upgrowth from the buccal cavity uniting with a downgrowth from the floor of the optic thalami. It seems to be in part an organ of internal secretion furnishing to the blood some substance which affects growth; its hypertrophy causes the disease of acromegaly; it also produces a secretion which passes into the third ventricle.

Pit Villages are collections of earth-caves, dug in the ground and covered with stones, wooden

or wattle lids, or clay or sods of turf. They were used by prehistoric races or by races at the lowest stages of barbarism. A good example was unearthed during the latter half of the 19th century near St Mary Bourne, north-east of Andover, in north-western Hampshire. The pits are reached by entrance shafts, sloping downwards. The pits themselves are oval or pear-shaped, varying between 22 and 42 feet in length, and are about 12 or 13 feet wide, and 5 feet high, with the fireplace in the centre. Flint and bone implements and rude pottery have been found in them.

Pityriasis (from the Greek word *pityron*, 'bran') is the term given to certain of the squamous or scaly diseases of the skin, in which there is a continual throwing off of bran-like scales of epidermis, which are renewed as fast as they are lost. It is most common on the scalp, when it is known as *dandruff*, and must be treated with weak alkaline lotions, or, if these fail, with diluted white precipitate ointment, provided there is no inflammation. *Pityriasis rubra* is a severe disease, affecting the whole or almost the whole body, and closely allied to, if not identical with, a severe form of dry Eczema (q.v.). *Pityriasis* or *Tinea versicolor* is due to the presence of a parasitic fungus, the *Microsporon furfurans*; it occurs in the form of irregular yellowish or brownish patches, confined to the parts of the body covered by the clothes. Microscopic examination of the exfoliated scales shows the spores and filaments of the fungus. The treatment of this affection must be solely local. Probably the best remedy is the application of a saturated watery solution of sulphurous acid gas, or of one of the sulphites dissolved in diluted vinegar, or of white precipitate ointment.

Piura, a town of Peru on the river Piura, 60 miles by rail from its port Paita. It is famous for its Panamá hats, and in the neighbourhood are the largest cotton plantations in Peru. It was originally founded nearer Paita as San Miguel, by Pizarro in 1531, but the present site was afterwards adopted. Pop. 11,000. The department has an area of 15,190 sq. m., and an estimated population of over 200,000.

Pius, the name of eleven among the Roman pontiffs, of whom the following only appear to call for particular notice.—**PIUS II.**, originally known as *Aeneas Sylvius*, was a member of the noble family of Piccolomini, and was born in 1405 at Corsignano near Siena. His early life was stained with moral irregularities, and, like other humanists of his time, he wrote licentious poems, letters, at least one loose novel (*Lucretia and Euryalus*), and an immoral comedy (*Chrysis*). At twenty-six he was employed as secretary to Domenico da Capranica, Bishop of Fermo, at the Council of Basel. He soon developed a genius for diplomacy, and from 1432 to 1435 was employed in missions to Scotland, England, and Germany. Returning to Basel he sided with the council in its conflict with the pope, and on the election of the antipope, Felix V., was chosen as his secretary. But having been sent on an embassy to the Emperor Frederick III., he was without difficulty induced to accept office in the imperial court, and served on several embassies and other missions of importance on behalf of the emperor. Up till this time he had lived a life of unrestrained self-indulgence, but at the age of forty his passions had burned themselves out, and he was able to take orders and make his peace with Rome—the only means of obtaining a reward adequate to his ambition. He won over Pope Eugenius IV. by the frankness of his apology and earned his gratitude by his adroitness in bringing back to the papacy the allegiance of the neutral German Church. Almost the last act of the pontiff

was to reward him with the bishopric of Trieste. It was not, however, till the end of 1456 that Æneas was free to leave the uncongenial atmosphere of Germany. Nicholas V. had employed him without rewarding him, but Callistus III. created him a cardinal. On the death of Callistus in 1458 he was elected pope, and took the name of Pius II. He possessed a marvellous power of adapting himself to circumstances, and the profligate and shifty intriguer made a most decorous pope. He was embarrassed by contests about Neapolitan and German affairs, but his reign is chiefly memorable for his efforts to organise an armed confederation of Christian princes to resist the progress of the Turkish arms. He died at Ancona, 14th August 1464, his last moments darkened by the failure of his great scheme. Æneas Sylvius was one of the most eminent scholars of his age. His works were published at Basel (1 vol. fol. 1551), and consist chiefly of histories, or historical dissertations and materials of history. The most interesting of his writings, however, are his letters, which throw a vivid light upon their age. The same may be said of a biographical commentary, or rather autobiography, published under the name of the copyist Gobellinus, and apparently altered by his secretary Campanus.

See *Lives* by Voigt (3 vols. Berlin, 1856-63) and Boulting (London, 1908); also two papers by Bishop Creighton in *Macmillan's Magazine*, vol. xxvii., and vol. ii. (1882) of his *History of the Papacy during the Reformation*.

PIUS IV., Giovanni Angelo Medici, was born of humble parents at Milan in 1499, was educated at Bologna, and under Paul III. rose rapidly to be Archbishop of Ragusa, vice-legat of Bologna, and cardinal (1549). He was elected pope at the close of 1559. His reign is chiefly memorable as that in which the protracted deliberations of the Council of Trent were brought to a close. The famous Creed of Pius IV., or Tridentine Creed, was confirmed by a bull dated 26th January 1564. Pius died, December 8, 1565, in the arms of his nephew, St Charles Borromeo. His Correspondence with the Emperor Maximilian II. has been edited by Schwarz (Paderborn, 1889).

PIUS V., originally named Michele Ghislieri, was born of poor parents, in the village of Bosco, near Alessandria, in 1504, and at the age of fourteen entered the Dominican order. His merit was recognised by Paul IV., who named him Bishop of Sutri and Nepi in 1556, and cardinal in the following year. His austere temper prompted him as inquisitor-general for Lombardy to employ the most rigorous measures for repressing the Reformed doctrines. Under Pius IV. he was translated to the see of Mondovi, and was chosen unanimously as his successor, January 7, 1566. As pope he laboured to restore discipline and morality at Rome, reduced the expenditure of his court, prohibited bull-fights and other amusements, suppressed prostitution, and regulated the taverns of the city. He zealously maintained the Inquisition, and strove to enforce everywhere the disciplinary decrees of the Council of Trent. The whole spirit of his pontificate is most strikingly exhibited in the decree by which he ordered the yearly publication of the celebrated bull, *In Cena Domini* (1568)—an attempt to apply to the 16th century the principles and the legislation of Hildebrand. His impotent bull releasing Queen Elizabeth's subjects from their allegiance (1570) fell harmless even upon patriotic English Catholics in a heroic age. But the most momentous event of the pontificate of Pius V. was the expedition which he organised, with Spain and Venice, against the Turks, and which resulted in the

great naval engagement of the Gulf of Lepanto, on 7th October 1571. Pius died in the following May, 1572, and was canonised by Clement XI. in 1712.

PIUS VI., originally named Giovanni Angelo Braschi, was born at Cesena, December 27, 1717. He was selected by Benedict XIV. as his secretary; and under Clement XIII. he was named to several important appointments, which led finally, under Clement XIV., to his elevation to the cardinalate (1773). On the death of Clement XIV. Cardinal Braschi was chosen to succeed him, February 15, 1775. His internal administration was enlightened and judicious. To him Rome owes an attempt to drain the Pomptine Marshes, the improvement of the port of Ancona, the completion of the church of St Peter's, the foundation of the new Museum of the Vatican, and the general improvement and embellishment of the city. Soon after his accession he found himself at serious variance with the Emperor Joseph of Austria and Leopold of Tuscany, whose reforms had swept away much of the papal supremacy. The pope repaired in person to Vienna, but, though received kindly, failed to restrain the emperor from further curtailing his privileges. Soon after came the outbreak of the French Revolution and the confiscation of all church property in France. The pope launched his thunders in vain, and ere long the storm broke upon his own head. The murder of the French political agent Basseville in a street scuffle at Rome (1793) gave the Directory an excuse for the attack. In 1796 Bonaparte took possession of the Legations, and afterwards of the March of Ancona, and by a threatened advance upon Rome extorted from Pius, in the treaty of Tolentino (19th February 1797), the surrender of these provinces to the Cisalpine Republic, together with a heavy war contribution. The murder of General Duphot of the French embassy in December was avenged by Berthier marching on Rome and taking possession of the castle of St Angelo. Pius was called on to renounce his temporal sovereignty, and on his refusal was seized, February 20, and carried to Siena, and afterwards to the celebrated Certosa or Carthusian monastery of Florence. On the threatened advance of the Austro-Russian army in the following year he was transferred to Grenoble, and finally to Valence on the Rhone, where, worn out by age and grief, he died, August 29, 1799.

PIUS VII., originally Gregorio Luigi Barnaba Chiaramonti, was born at Cesena, 14th August 1740. He entered the Benedictine order at an early age, taught philosophy and theology at Parma and at Rome, became Bishop of Tivoli, and on being created cardinal was translated to the see of Imola. After the death of Pius VI. Cardinal Chiaramonti was chosen his successor (March 14, 1800). Rome, which up to this time had been occupied by the French, was now restored to the papal authority, and in the July of that year Pius VII. entered into his capital; while next year the French troops were definitively withdrawn from the papal territory, with the exception of the Legations. Aided by his secretary, Cardinal Consalvi, Pius restored order in his states, and in 1801 concluded a *concordat* with Bonaparte. But much of the advantage thus gained by Rome was annulled simultaneously by Bonaparte's *Articles organiques*, which concerned the discipline of the church on marriage, on the clergy, and on public worship. These had never been submitted to the pope, and called forth his strongest opposition. In 1804 Napoleon compelled Pius to come to Paris to consecrate him as emperor. He was well received, but failed to get any modification of the articles, and not six months after his return to Rome the troops of Napoleon seized Ancona, and finally in February

1808 General Miollis entered Rome, and took possession of the castle of St Angelo. Ere long a decree was issued annexing the provinces of Ancona, Fermo, Urbino, and Macerata to the kingdom of Italy. The usurpation was consummated (May 17, 1809) by a decree annexing Rome and all the remaining papal territory to the French empire. The pope on June 10 retaliated with a bull of excommunication directed against the robbers of the holy see, yet without formally naming Napoleon. The unhappy pope was next removed to Grenoble, then to Savona, and finally to Fontainebleau. There he was forced into signing a new concordat, recognising the annexation of the Roman states to the empire (January 25, 1813). The fall of Napoleon allowed him to return, and on May 24, 1814 he re-entered Rome. The Congress of Vienna formally restored to him his territory, and the remainder of his reign was devoted, under the enlightened advice of Consalvi, to wise measures of internal administration. Brigandage was sternly suppressed, as well as secret societies, especially that of the Carbonari; while the Jesuits were restored, and concordats or conventions concluded with Naples, Prussia, Württemberg, and other courts of Germany. Throughout his life Pius was a model of gentleness, simplicity, benevolence, and Christian charity. He died August 20, 1823, after having broken his thigh through a fall.

PIUS IX., Giovanni Maria Mastai Ferretti, occupant of the papal chair during one of the most eventful periods in the history of the papacy, was the fourth son of Count Jerome Mastai Ferretti, and was born at Sinigaglia, May 13, 1792. His epileptic attacks rendered him unfit for the Noble Guard, whereupon he turned to the study of theology, and was admitted to deacon's orders in December 1818. For five years he presided over the orphanage of Tata Giovanni, next accompanied the Apostolic delegate Monsignor Muzi to Chile. In 1825 he returned to Rome, was made canon of Sta Maria in the Via Lata, and head of San Michele, a great hospital for destitute children. In 1827 he was made Archbishop of Spoleto by Leo XII., and transferred to Imola by Gregory XVI. in 1832. In 1840 he became a cardinal, and on the death of Gregory XVI. in 1846 was elected by acclamation to succeed him. He was avowedly the leader of the reforming party, and twelve hours after his election Cardinal Gaysruck, Archbishop of Milan, reached Rome with instructions from Austria to veto his election. He took the name of Pius IX., and entered at once on a course of reforms, by which he hoped to establish the papal government on a popular but yet firm basis. His first step was to grant an amnesty to all prisoners and exiles for political offences. He next removed most of the disabilities of the Jews, authorised railways, and projected a *Consulta* or council of state, and in March 1848 published his *Statuto Fondamentale*, a complete scheme for the temporal government of the papal states by means of two chambers, one nominated by the pope, the other (with the power of taxation) elected by the people. At first the new pope was the idol of the populace. Mazzini hailed the new policy with enthusiasm, and Carlyle declared that 'the old chimera was rejuvenised!' But the revolutionary fever of 1848 spread too fast for a reforming pope, and the refusal to make war upon the Austrians finally forfeited the affections of the Romans. On November 15, 1848, his first minister, Count Rossi, was murdered in broad daylight, and two days later a threatening mob assembled in the square of the Quirinal. On the 24th the pope escaped to Gaeta, a Neapolitan seaport near the Roman frontier. A republic was proclaimed in Rome, the provisional heads of which proceeded with great moderation and wisdom to a complete

and radical remodelling of the civil government of the state. Pius from his exile addressed a remonstrance to the various sovereigns. In April 1849 a French expedition was sent to Cività Vecchia, and on July 2 General Oudinot took Rome, after a siege of thirty days. The papal government was re-established, but Pius himself did not return till April 12, 1850. From this time his government, swayed by Antonelli, was the very reverse of what it had been, and to the end of his life he continued an unhesitating and unyielding Conservative. After the war for the unification of Italy the Legations, Ancona, and a considerable part of the papal territory southward in the direction of Rome were annexed to the kingdom of Italy, but Pius persistently refused to cede any portion or to enter into any compromise.

In his ecclesiastical policy he was incessantly active, henceforward closely related with the Jesuits, and ever uncompromising in his ultramontanist; and at last he proceeded to promulgate dogmatic definitions about problems that had been left unsettled by the wisdom of the ages. He re-established the hierarchy in England, he sanctioned the establishment in Ireland of a Catholic university, and condemned the Queen's Colleges. He concluded a Concordat (q.v.) with Austria. By the bull 'Ineffabilis Deus' (1854) he decreed the Immaculate Conception (q.v.) of the Blessed Virgin Mary; his famous encyclical 'Quanta Cura,' and the Syllabus (q.v.), or list of prevalent errors, appeared in December 1864. But the most important event of his pontificate was the convocation of the Council at the Vatican (q.v.) in 1869, which proclaimed the Infallibility (q.v.) of the Pope. For the last ten years the pope's temporal power in Rome had been only maintained by French bayonets; and on the withdrawal of the garrison at the outbreak of the war with Germany the soldiers of Victor Emmanuel crossed the frontiers, and, after the short delay of a feeble and half-hearted defence, entered the city amid the acclamations of the populace, and so terminated the temporal power of the pope. For the rest of his days the pope lived a voluntary prisoner within the Vatican, renewing from time to time his solemn protest. He refused the pension of £130,000 voted him by the national parliament; but his loss was in some measure compensated by the revival, as a voluntary contribution, of the ancient tribute of Peter's-pence (q.v.). He died 7th February 1878, a month after Victor Emmanuel (to whom he sent the papal benediction).

See *Lives by Maguire* (new ed. 1878), *Shea* (New York, 1877), *Trollope* (1877), and *Wappmannsperger* (Ratisbon, 1878); also the articles ITALY, GARIBALDI, and MAZZINI.

PIUS X., Giuseppe Sarto, was born 2d June 1835 of humble parents at Riese near Venice, studied at Treviso and Padua, and, ordained priest in 1858, was ere long chancellor of the diocese and vicar of the chapter of Treviso. Made bishop of Mantua in 1884 by Leo XIII., and in 1893 cardinal and patriarch of Venice, he endeared himself by simplicity of life, repression of abuses, and sympathy with the poor. In August 1903 he was elected pope. Remarkable for piety and administrative activity rather than for learning, he was conservative in theology; he sanctioned the condemnation of Abbé Loisy's books. He insisted that church music should return from a florid and secular type to the sacred traditions of Plain-song (q.v.) and that church choirs should not include women. In France and Portugal complete separation of church and state, and in Spain growing toleration, led to strained relations and embarrassment. 'Modernism' in every shape was prohibited (1907, &c.), and efforts to find a *via media* between the church and modern life brought to a standstill.

He died 20th August 1914. See *Life*, by F. A. Forbes (1918).

Pixérécourt, RENÉ CHARLES GUILBERT DE, French playwright, 'the father of melodrama,' known also as 'the Shakespeare' and 'the Corneille of the boulevards,' was born in 1773 of old Lorraine stock at Nancy, and educated there at the collège, and, intended for the bar, at the university. During the French Revolution, as a youth of noble blood, he suffered in a manner much in keeping with his later work in drama many hairbreadth escapes and deadly perils. Stimulated first by Florian he wrote many plays, but though some were accepted none were played till 1797, when *Les Petits Auvergnats* was performed. In the same year *Victor*, his first melodrama, was done, and met with great success. In 1800 he wrote *Celina*, his most celebrated play, and a model for melodrama for years to come. Thereafter he produced as many as fifty-nine melodramas in addition to numerous comedies, comic operas, vaudevilles, and even tragedies. From 1802 to 1836 he held a French government appointment, and within the same period managed the Gaîté theatre at Paris for a time, and also the Opéra Comique. Lawsuits resulting from the burning in 1835 of the Gaîté lost him the greater part of the fortune he had acquired by his writings, and retiring to Nancy he devoted himself to preparing an edition of his best plays, publishing in 1841-43 his *Théâtre Choisi* (4 vols.), with a preface by his friend Charles Nodier and an autobiographical notice. In addition to his dramas he produced an edition of the unpublished works of Florian, wrote a learned commentary on Bret's edition of Molière, and translated works of Kotzebue and other German writers. He was also a noted collector and was one of the founders of the famous Société des Bibliophiles. He died at Nancy in 1844. See a work by Hartog (Paris, 1913).

Pizarro, FRANCISCO, born at Trujillo in Spain in 1478, was the illegitimate son of a colonel of infantry, and, still a boy, served under Gonsalvo di Cordova in Italy. In 1509 he was at Darien. He was with Balbao when he crossed the isthmus and discovered the South Sea, led an expedition as far as Biru, to the south of the isthmus on the Pacific coast, and eventually became a citizen of Panamá. In 1522 Don Pascual de Andagoya also reached Biru, and there collected information respecting the great empire of the Incas. Returning to Panamá to prosecute the discovery, he became so ill that he was induced by the governor to hand over the enterprise to three partners, Francisco Pizarro, another old soldier named Diego de Almagro (q.v.), and a wealthy ecclesiastic named Hernando Luque. Pizarro was to lead the expedition, Almagro was to keep open communications, and Luque was to supply the funds. Their first attempt was a failure, but in 1526 Pizarro and Almagro sailed in two vessels, with Bartolomé Ruiz, a very expert and gallant sailor, as pilot. Pizarro landed his men, Almagro returned to Panamá for supplies, and Ruiz voyaged southward, being the first European sailing in that direction to cross the equator in the Pacific Ocean. Almagro returned, and the expedition proceeded southwards. But they were not yet strong enough to form any settlement, and eventually Almagro was sent back for reinforcements, while Pizarro and part of the force remained on an island discovered by Ruiz, in 1° 57' N., called Gallo. The arrangement caused much discontent. The men complained that they were being left to starve. The governor of Panamá refused to give any further countenance to an enterprise which seemed doomed to failure, and two vessels, under Pedro Tafur, were sent to bring the people back from Gallo. Pizarro refused to

return. Drawing a line along the sand, he called upon those who remained resolute to achieve success in spite of all difficulties to come over to his side. Thirteen men crossed the line. Tafur returned with the rest to Panamá. Pizarro and his devoted little band removed to another island, called Gorgona, where there was more game and better water. For a long time the governor of Panamá refused to allow any help to be sent. At last Ruiz was allowed to sail with one small vessel. He reached Gorgona, and Pizarro embarked, full of hope. Sailing southward they reached the Peruvian port of Tumbes, and collected full information respecting the empire of the Incas. Returning to Panamá, Pizarro proceeded to Spain to apply for authority to undertake the conquest of Peru.

The capitulation between Queen Juana and Pizarro was signed on 26th July 1529. Pizarro was made adelantado and captain-general, while Almagro received the title of marshal. Pizarro took back with him his four brothers, Hernando, Juan, Gonzalo, and Francisco Martin de Alcantara. He sailed from San Lucar on 19th January 1530, and from Panamá on 28th December 1531, with three vessels carrying 183 men and 37 horses. Almagro was to follow with reinforcements. Landing at Tumbes, the Spaniards commenced the march inland in May 1532, and on 15th November entered the city of Cajamarca. The Inca Atahualpa, after defeating his brother and ending a long civil war, was in the neighbourhood, on his way to Cuzco, the capital of the empire. Pizarro captured the native sovereign by treachery, and after extorting an enormous ransom, amounting to 4,605,670 ducats, treacherously put him to death on 29th August 1533. The royal share of the treasure was sent to Spain, with tidings of the conquest. Pizarro then marched to Cuzco, and set up the young Inca Manco as nominal sovereign. On 6th January 1535 Pizarro founded the city of Lima, as the capital of his new government. He was created a marquis by the Emperor Charles V., while Almagro was empowered to occupy territory for 200 leagues from the southern boundary of Pizarro's government. But that southern boundary was not fixed. Almagro declared that Cuzco was within his grant, but was induced to forego his claim, and to undertake the conquest of Chile. The marquis was busy founding cities on the coast, while his brothers were at Cuzco, when a great insurrection of the Indians broke out. Both Cuzco and Lima were closely besieged, and Juan Pizarro was killed. For many months the Spaniards were in great danger, but in the spring of 1537 Almagro returned from Chile, raised the siege of Cuzco, and took possession of the city, claiming to be its lawful governor. The Marquis Pizarro had no intention of allowing his rival to retain Cuzco. Too old to take the field himself, he entrusted the command of his forces to his brothers, who defeated Almagro on 26th April 1538, and beheaded the old soldier soon afterwards. The property of his followers was confiscated. Pizarro remained at Lima, consolidating his power, and despatching various expeditions for discovery and conquest. But Almagro's followers were driven to desperation: they were called in derision 'men of Chile,' and the marquis treated them with contemptuous indifference. One of them, named Juan de Rada, matured a conspiracy for the assassination of the governor. The conspirators attacked his house during the mid-day meal, and murdered the old conqueror on 26th June 1541. The body of Pizarro was buried in the cathedral by stealth and at night.

Francisco Pizarro is one of the most prominent figures in the history of Spanish conquest in the New World. He was brave and determined, a man of inflexible constancy of purpose and infinite

resource. His followers were devoted to his service, and some of his friendships endured until death. The indelible stain on his character is the treacherous execution of the Inca Atahualpa. Although without education, he rose to the greatness of his position, and proved himself to be an able and far-seeing administrator. Falling by the hands of assassins, he was defended by devoted friends, and died as bravely as he had lived. Pizarro was never married. By the Inca princess, Inez Huayllas Nusta, a sister of Atahualpa, he had two children—Gonzalo, who died young, and Francisca, who went to Spain with her step-father, Don Francisco Ampuero, a knight who married Inez after the assassination of the marquis. Francisca married her uncle Hernando Pizarro in 1551, and by him had three sons and a daughter. Hernando, for having beheaded the Marshal Almagro at Cuzco, was imprisoned in the castle of Medina del Campo on his return to Spain, where he remained until 1560. He married his niece during his imprisonment, which could not have been very rigorous. He died at Trujillo, the original home of himself and his brothers, in 1578.

See *Lives by Helps* (1869) and *Towle* (1878); also *Prescott's Conquest of Peru* and *Markham's History of Peru* (1892).

Pizarro, GONZALO, brother of Francisco Pizarro (q.v.), was born about 1505 at Trujillo in Spain, and when a boy served with his father in Italy. He accompanied his brother Francisco in the conquest of Peru, and did very good service when the Indians besieged Cuzco, and in the conquest of Charcas. In 1539 Gonzalo Pizarro undertook an expedition to the so-called Land of Cinnamon, the forest-covered region to the eastward of Quito. He left that city with 350 Spaniards and 4000 Indians on Christmas Day, and the hardships and sufferings endured by Gonzalo and his companions have seldom been equalled. Descending the rivers Coca and Napo, Gonzalo entrusted the command of a small vessel he had built to Francisco de Orellana, one of his lieutenants, who was to go in advance and seek for supplies. But Orellana deserted his starving comrades, made the first descent of the whole course of the Amazon, and returned to Spain. Out of the 350 Spaniards that left Quito 50 deserted with Orellana, 210 died of hunger and disease, and the miserable remnant returned to Quito with their intrepid leader in June 1542.

When Gonzalo Pizarro heard of the assassination of his brother the marquis he retired to his estates in Charcas. In 1544 the new viceroy, Blasco Núñez Vela, arrived in Peru to enforce the 'New Laws.' The Spaniards were dismayed, and entreated Gonzalo to leave his retirement and protect their interests. He consented, chose an old veteran named Francisco de Carbajal as his lieutenant, and assembled a force of 400 men. The viceroy fled, and Gonzalo entered Lima in triumph on the 28th of October 1544 at the head of 1200 Spaniards, and several thousand Indians dragging the artillery. He was declared governor of Peru. Blasco Núñez Vela fled to Quito, but was closely followed by old Carbajal, and defeated and killed in the battle of Anaquito on January 18, 1546. Gonzalo Pizarro was undisputed master of Peru. Carbajal retired to Charcas to work the silver-mines.

When news of this revolt reached Spain the licentiate Pedro de la Gasca, an astute and very able ecclesiastic, was appointed to proceed to Peru as president of an 'Audencia,' or court of five judges, and to restore order. He sailed in May 1546, and arrived at Panamá in August, where he gained possession of Pizarro's fleet by a combination of cunning and force. Gasca landed at Tumbes in June 1547. Gonzalo Pizarro, despairing of being

able to make head against the president, determined to retreat into Chile. But there was a force, under an officer named Diego Centeno, hanging on his rear; and it was necessary to dispose of it first. Centeno was utterly defeated in the battle of Huarina, near the banks of Lake Titicaca, and the doomed Pizarro was so elated at the victory that he abandoned all idea of retiring into Chile. He advanced to Cuzco, and the President Gasca approached him by leisurely marches, encamping on the plain of Sacsahuana, near Cuzco, in April 1548. On the 9th Pizarro and Carbajal marched out of Cuzco, and both sides made ready for battle. But soon there were symptoms of desertion on Pizarro's side. The desertions took place by companies and squadrons. So Gonzalo Pizarro sorrowfully took his way to the president's camp, and gave himself up. Carbajal was seized by the soldiers and hanged. Gonzalo, last of five famous brothers, was beheaded 10th of April 1548. He left, by an Inca princess, a son and a daughter. See works cited at PIZARRO (FRANCISCO).

Pizzicato, in music for the violin, &c., denotes that the strings are to be twitched with the fingers as on a harp or guitar.

Place, FRANCIS (1771-1854), the son of a dissipated London baker, bailiff, and publican, was bred a leathern-breeches maker; led in a strike, and became secretary for his and other trade associations; and as a tailor in London supported Burdett (q.v.) and became a very conspicuous and influential Radical leader. He agitated against the sinking fund, and (more effectually) against the laws preventing workmen's combinations. See *Life by Graham Wallas* (1898, new ed. 1918).

Placebo, in the Catholic service of vespers for the dead, is the first antiphon, which begins with the word.

Placenta, or AFTER-BIRTH, the structure which unites the unborn mammal to the womb of its mother and establishes a nutritive connection between them. The placenta is peculiarly a mammalian structure, but it is not developed in Ornithorhynchus and Echidna, which lay eggs, nor is it more than incipient in the Marsupials, which bring forth their young after a short gestation. In all other mammals it occurs in various forms, partly embryonic in its origin, partly maternal, always acting as a double vascular sponge, by means of which the blood of the mother nourishes and purifies that of her unborn young. Vague prophecies of it occur in two cartilaginous fishes and in two lizards, in which there is a connection between the yolk-sac of the embryo and the wall of the oviduct.

In the hedgehog, which is a conveniently central type of mammal, the connection between embryo and mother has the following history. (a) The outer wall of the embryonic sac is moored to the wall of the uterus by small cellular outgrowths known as the preliminary 'villi,' and minute cavities between these are bathed by the blood of the mother. (b) The growing embryo becomes ensheathed by the double folds of the Amnion (q.v.), the inner parts of which form the 'amnion proper,' while the outer form the 'sub-zonal membrane.' Part of the yolk-sac wall fuses with this sub-zonal membrane; from the united area vascular villi grow out into the wall of the uterus, which is now much modified. Thus is formed a 'yolk-sac placenta,' as exhibited for a time by Insectivores and Rodents. (c) But the most important union between mother and offspring is that due to the union of Allantois (q.v.) and sub-zonal membrane. If there has been a yolk-sac placenta it dwindles before this new and more efficient union. From the united area vascular villi grow out into depre-

sions or crypts in the uterine wall, part of which is modified into a spongy vascular tissue. In Insectivores, Bats, and Rodents the original outer wall of the embryonic sac persists between the placental villi and the maternal blood, and mediates between them.

The final placenta thus consists (1) of a maternal part—viz. a modified region on the wall of the uterus—and (2) of an embryonic part—viz. part of the allantois, fused to the sub-zonal membrane, and giving off vascular villi, between which and the maternal blood the persistent outer wall of the embryonic sac sometimes persists and mediates.

The term 'chorion' has been used in so many senses, that it seems advisable to abandon it. It is best applied to the union of sub-zonal membrane and allantois ('true chorion'), or to the union of sub-zonal membrane and yolk-sac ('false chorion').

The embryonic part of the placenta necessarily comes away at birth, and sometimes the vascular part of the maternal placenta is also discharged when the young is born. When this is the case, the placenta is called 'deciduate,' or better 'caducous.' When the maternal part of the placenta does not come away at birth the placenta is called 'indeciduate,' or better 'non-caducous.' Of non-caducous placentation two kinds are distinguished: *Diffuse*, when the villi are scattered over the surface of the embryonic sac (in *Manis* among Edentates, in the dugong, in Cetacea, in most Ungulates except Ruminants, in Lemurs); *Cotyledonary*, when the villi occur in patches (in Ruminants). Of caducous placentation three kinds are distinguished: *Zonary*, when the villi form a partial or complete girdle round the embryo (in *Orycteropus* and *Dasyurus* among Edentates, in Elephants and Hyrax, in Carnivora); *Discoidal*, when the villi occur on a circular cake-like disc (in most Edentates, in Insectivores and Bats, in Rodents); *Meta-discoidal*, when the villi are at first scattered, but are afterwards restricted to a disc (in Monkeys and in Man). Sir William Turner, the 'grand-master of placental research,' allots the lowest place to such diffuse forms of placenta as that of the pig, but others maintain that the discoidal type as illustrated in the Insectivora is the most primitive. In Botany 'placenta' usually means the portion of the Ovary (q.v.) which bears the ovules. See also AMNION, ALLANTOIS, FETUS, MAMMAL.

Placencia. See PIACENZA.

Placitum Regium (called also *Placet*, *Exequatur*, *Lettres Patentes*) is an act or instrument executed in virtue of the privilege claimed by the government in certain kingdoms to exercise a supervision over the communications of the Roman pontiff with the clergy and people of those kingdoms, and to suspend or prevent the publication of any brief, bull, or other papal instrument which may appear to contravene the laws of the kingdom, or to compromise the public interest. The early Christian emperors, it is well known, freely extended their legislation into the affairs of the church; and one constant cause of conflict between church and state in the mediæval period was the attempt on the part of the sovereigns to control the free intercourse of the pope. In the Pragmatic Sanction in France, and in the similar legislation of Spain, Portugal, Sicily, and the Low Countries during the 15th century, the claims of the state are asserted; and among the so-called 'liberties' of the later Gallican Church (q.v.) was a certain subjection to the state in this particular. But it was in the German states that the claim was most formally embodied in the constitutional law. In England the statute of *Præmunire* (q.v.) was an example of the same tendency.

Placoid Fishes, an order of fishes, in the classification proposed by Agassiz, characterised by having *placoid* (Gr. *plac*, 'a broad plate') scales, irregular plates of hard bone, not imbricated, but placed near together in the skin. They are all Cartilaginous Fishes (q.v.). See SCALES.

Plagal. See PLAIN-SONG.

Plagioclase. See FELSPAR.

Plagiostom'ata. See CARTILAGINOUS FISHES.

Plague, a term used in the middle ages of all fatal epidemics indiscriminately, but now restricted to a very malignant kind of contagious fever prevailing at certain times and places epidemically, characterised by buboes, or swellings of the lymphatic glands, by carbuncles, pneumonia, and petechiæ, and now known to be due to a special bacillus discovered in 1894.

The first extensive outbreak of this disease on record took place in the 6th century A.D., and devastated the whole Roman empire. It is supposed to have started from Lower Egypt; but from this time frequent epidemics occurred in Europe, culminating in the Black Death (q.v.) in the 14th century. It continued to ravage the north and west of Europe up till the 17th century. The last outbreak in England in 1663-65 caused the 'Great Plague of London,' and spread almost all over the country (see the article LONDON). Since the end of the 17th century it has only twice visited western Europe; in 1707-14 it spread from Russia and Hungary as far as Sweden, Denmark, Prussia, and Bavaria; and in 1720-22, being introduced from Syria into Marseilles, it destroyed almost half the population there, and spread through Provence. During all this time its most constant seats, so far as is known, were the countries bordering the Eastern Mediterranean—Lower Egypt, Syria, Asia Minor, and Turkey in Europe. But from all these it has meantime disappeared. The last cases known in Egypt occurred in 1844, and in the others in 1841. It was hoped that the disease had become extinct, but since then it has occurred more than once in Arabia, Tripoli, Persia, and Mesopotamia, and in 1878 it spread to south-east Russia. It has been present in India at least since 1815, sometimes in epidemics (e.g. the 'Páli plague,' 1836-38), but most constantly in districts on the southern slopes of the Himalayas; and it is said to be always found in some parts of China. An outbreak at Hong-kong in 1894 was followed by the fearful visitation at Bombay (q.v.) and India in 1896-1908, and reached (in a mild form) even Lisbon and Glasgow in 1900.

It is the most destructive of all known epidemics. Rarely less than 60, sometimes 90 per cent. of those attacked die. 'It often carries off half the population of a town or of a district in which it prevails, and it may completely root out whole families, so that no survivor remains.' The Black Death of 1348-50 is believed to have destroyed not less than a quarter of the population of Europe.

The general symptoms resemble those of other severe fevers: shivering, rise of temperature, aching in head, back, and limbs, sickness, &c. Great weakness succeeds, with mental disturbance leading to coma or delirium. Death often occurs before any characteristic symptoms are developed; but at an early stage dark spots or patches often appear on the skin, produced by subcutaneous hæmorrhages (petechiæ, ecchymoses), and bleeding may also take place from the various mucous membranes. Bleeding from the lungs, though rare in recent epidemics, was regarded as a characteristic symptom of the Black Death in its most virulent form. About the second or third day the most distinctive features of the disease are developed—viz. one or more buboes or glandular swellings, usually

in the neck, armpits, or groins; these generally break and lead to prolonged suppuration. In a few cases they are absent altogether. Carbuncles frequently develop at a later stage of the disease. Good nursing, good nourishment, free stimulation, and early opening of the buboes are helpful. There can be no doubt that it is a highly infectious disease, and that the infection may be conveyed by clothes, bedding, &c., but as a rule it is spread from place to place by rats, which also suffer from the disease. Fleas form the means of communicating the bacillus from rat to man, and probably also as a rule between one human being and another. For prevention the abandonment of town dwellings before an epidemic, life in camps from which rats are excluded, and inoculation with Haffkine's plague vaccine have proved very useful in India.

Plaice (*Pleuronectes platessa*), a common flat-fish in the same genus as the flounder. It frequents sandy and muddy banks off the European coasts from France to Iceland. It often lies slightly covered with sand, but with the eyes exposed and watchful for prey. The food consists of molluscs, crustaceans, and worms, but especially of the first. It spawns early in the year, and is in best condition about the end of May. The eggs hatch near the surface, and there the youngest stages are found. After a month or so the young fish begins to swim on its left side and sinks to the bottom, moving shorewards into shallow water. From these nurseries there is a gradual movement outwards to greater depths. The male is generally mature at the end of the fourth summer, the female at the end of the fifth. It was once a common belief that shrimps were the parents of plaice. The plaice is in considerable esteem for the table, and is plentiful in the British markets. Those from sandy ground are said to be much more palatable than those from the mud. The general size weighs about 2 to 3 pounds, but much larger specimens are often caught; the coloured side is predominantly olive-brown with orange spots, but the colour changes rapidly in precise harmony with that of the ground on which the fish rests; six blunt tubercles extend from the eye to the beginning of the lateral line.

Plaid. See HIGHLANDS.

Plain, a geographical term which hardly admits of precise definition. It is generally applied to extensive tracts of approximately level or undulating country, which occur at less than 1000 feet above the sea. Broad areas of similar character at higher elevations are usually termed *Tablelands* (q.v.) or *Plateaus*. This is the general rule, but when the surface of a plain slopes gradually upwards to heights of several thousand feet, the whole tract is still called a plain. As an example may be cited the great plains east of the Rocky Mountains, which fall imperceptibly away towards the east from an elevation of 6000 feet or so. Among the most characteristic plains are the wide alluvial lands of the greater rivers. But the term is extended to such low-lying regions as central Ireland, the Midlands of England, middle Europe, &c.—regions which have no great elevation and present a gently undulating surface, interrupted now and again by isolated hills, and lines of cliffs and escarpments. From the same point of view the whole interior of North America lying between the Rocky Mountains in the west and the Alleghany and White Mountains in the east, and extending from the Gulf of Mexico to the shores of the Arctic Ocean, may be called a plain. So likewise more than half of Europe is a plain that is continued into Asia and extends northward over vast regions of that continent. Plains necessarily differ much in appearance according to the nature of soil

and climate, from the dreary, sandy wastes of north Africa to the luxuriant fertility of the South American selvas. Wide regions of comparatively level ground in each of the great continents have acquired various names, such as the *Steppes* and *Tundras* of eastern Europe and Asia, the *Deserts* of Arabia and Africa, the *Savannahs* and *Prairies* of North America, and the *Llanos*, *Pampas*, and *Silvas* of South America. See DESERT.

Plainfield, a city of New Jersey, on Green Brook, 24 miles by rail WSW. of New York, many of whose business men have their homes here. Clothing, machinery, &c. are manufactured. Pop. (1860) 3224; (1920) 27,700, with the adjacent North Plainfield, 34,684.

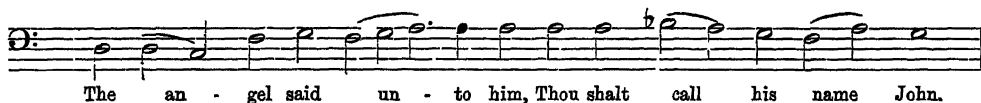
Plain-song, PLAIN-CHANT, GREGORIAN CHANT, or GREGORIAN MUSIC, was used in the Christian church of the West from the earliest times, is still the only prescribed form of music in all Roman Catholic churches, and has been extensively revived in the English Church since the rise of the High Church party. Its distinguishing points are (1) its recitative-like character, as opposed to what was styled *musica mensurata*—i.e. *barred* music, with a marked and regular rhythm, which was the essential point of ancient Greek music, and more or less of nearly all modern music; (2) the *modes*, or scales, in which it is written, which are more numerous and varied than the modern major and minor; and (3) its being (originally) sung in unison, though much of it is susceptible of treatment in harmony, and is now frequently (but incorrectly) so heard. It embraces music for all parts of the Roman services, from the *Accents* (nearly in monotone) proper to the various readings to the more elaborate melodies of the antiphons and hymns, and the various parts of the mass. The best known and most ancient of all is the music of the eight Tones sung to the Psalms, commonly called the Gregorian Tones. As to the origin of these many different views prevail, some ascribing them to a Greek, some to a Hebrew source, others to the early Christians; but it is extremely probable that they were actually originally derived from the music of the Temple service. As at first plain-song was handed down orally only, and the early systems of notation were very defective, it is impossible to determine how far it may have been corrupted. It was first reduced to system by St Ambrose of Milan (died 397), but much more extensively towards the end of the 6th century, by Pope Gregory the Great, after whom the chant receives its name. There have of course been large additions since. Local varieties of the proper melodies gradually sprang up, almost every diocese having an office-book peculiar to itself—e.g. the antiphony and gradual of Sarum, said to be one of the purest. The earliest known existing record of plain-song is the Antiphonarium, or rather Gradual, in the library of the monastery of St Gall in Switzerland, probably of the 9th or 10th century. Various directories have been published, notably that begun by Palestrina and finished by Guidetti, and at the Reformation the Gregorian music was adapted to the new vernacular services of the English Church by John Marbeck, who published in 1550 *The Booke of Common Praier Noted*. The fourteenth century is generally taken as the period when plain-song reached its highest perfection. A decline set in with the rise of Polyphonic (q.v.) music, and church music became dramatic, secular, and began to be accompanied by instruments. The reaction came in the 19th century, when about 1860 the Benedictine monks started to revive the Gregorian chants in their original purity and simplicity and to clear away all the accretions and alterations, dating;

chiefly from the 16th to the 18th century. In 1904, Pius X. promulgated (*Motu proprio*) that only plain-song and the stricter forms of choral music (sung by male voices only) were to be permitted in church services. Anglican Chants (q.v.) are modelled on the Gregorian psalm tones.

The variety of the modes has been acknowledged by first-rate authority as affording greater resource of expression than the more modern major and minor scales; and music has been written in them by great modern composers—e.g. Bach's organ fugue in the Dorian mode, the 'Hymn in the Lydian Mode' in Beethoven's Quartet, op. 132, and portions of Debussy's *Pelléas et Mélisande*. They were derived from, though not identical with, the Greek diatonic scales, after which they have been named. The principle of their formation is that each of the seven natural sounds of the diatonic scale forms the keynote, or 'final' of a mode, which embraced that note and the seven above it. (The melodies rarely exceeded an octave, and no flats or sharps are found except an occasional B flat.) This would give us seven modes; but to each of these is attached another, in which the melody, while having the same final or keynote, instead of ascending to the octave above, ranges from the fourth below it to the fifth above. The former are called the *authentic* modes, the latter *plagal*. The difference of the modes and the effect of the melodies in them is owing, it will be noticed, to the various positions of the two semitones in the scales. The difference between an authentic and a plagal melody may be illustrated from two psalm-tunes—Newton or New London, and the Old Hundredth, in the first of which the melody lies between the keynote and its octave, but in the other between the fourth below and the fifth above the keynote. But while

the whole fourteen modes are enumerated, for the sake of completeness in theory, two of them are universally rejected in practice as defective—the two having B as their keynote. The modes are, then, arranged in pairs as follows. The 1st or Dorian (authentic) embraces the notes from D on the middle line of the bass stave to the D above, and has its keynote on D; the 2d or Hypo-dorian (plagal) has the same keynote, but its compass is from the A below to the A above it; the 3d or Phrygian (authentic) and its corresponding plagal mode, the 4th or Hypo-phrygian, have similarly their keynotes on the E of the third space of the bass stave; the 5th or Lydian and 6th or Hypo-lydian have F for final; the 7th or Mixo-lydian and 8th or Hypo-mixo-lydian have G; the 9th or Æolian and 10th or Hypo-æolian end on A; then come the rejected modes on B, styled the Mixo-locrian and Hypo-mixo-locrian; then the Ionian or Iastian and Hypo-ionian or Hypo-astian on C, numbered variously as 11th and 12th, or 13th and 14th, according to the rejection or inclusion of the two preceding. The Ionian is the modern major mode. St Ambrose's arrangement of the melodies was said to have been confined to the 1st, 3d, 5th, and 7th modes (authentic); while the relative plagal modes, 2d, 4th, 6th, and 8th, were added by St Gregory. In these are written the correspondingly numbered eight psalm tones; the Peregrine Tone, used only for the psalm *In exitu Israel*, is in the 9th mode. The other modes were finally added in the 8th century under Charlemagne. Each mode has its reciting note, or Dominant—not to be confounded with the modern term in Harmony (q.v.) The notation of plain-song was simple, as only one part with a restricted compass was required. Notes of two, or at the most three, shapes, indicating general differences of length,

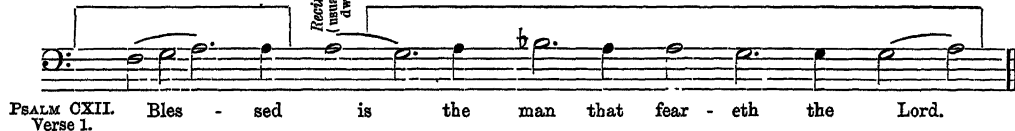
SPECIMEN OF ANTIPHON, LEADING TO A PSALM, SET TO THE FIRST TONE, FROM THE RATISBON 'VESPERAL,' TRANSLATED AND IN MODERN NOTATION.



Intonation
(used only before verse 1).

Reciting Note
(usually longer
dwelt on).

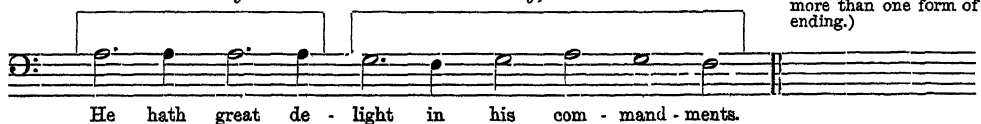
Mediation, Festal form.



Second Reciting Note.

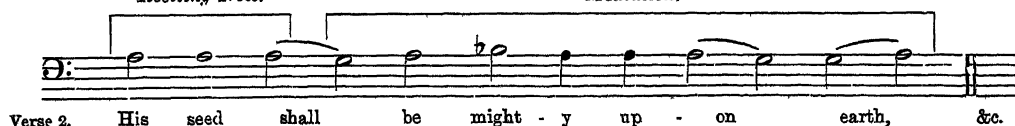
Ending, 1st form.

(Tones 3, 4, 7, and 8 have more than one form of ending.)



Reciting Note.

Mediation.



were set on a staff of four lines, the name of the mode being indicated, and one of the lines chosen to represent the keynote.

See the *Palléographie musicale* (1889, *et seq.*) published by the Benedictines of Solesmes and the *Grammar of Plain-song* (1905) by the Benedictines of Stanhope; J. Pothier, *Les Mélodies grégoriennes* (1881); P. Wagner, *Einführung in die Gregorianischen Melodien* (1911); Gavaert, *La Mélodie antique* (1905); Gastoué, *L'Art grégorien*; T. Helmore, *Manual of Plain Song*, and his primer; and the publications of the English Plain-song Society (founded 1888).

Planarian, a term practically co-extensive with Turbellarian, and applicable to the members of the lowest class (Turbellaria) of worm-like animals. They live in fresh and salt water and sometimes in damp earth. They are unjointed 'worms' with a ciliated skin; the food-canal is often branched, but has no posterior opening; from the simple brain two lateral nerves extend backwards; the body-cavity is undeveloped; there are no respiratory or circulatory organs; the excretory system consists of branching tubes ending in ciliated cells; all but two genera are hermaphrodite. Their simplicity is well illustrated by the fact that some multiply by dividing into two, while a fragment of others may re-grow the whole. In *Microstoma lineare* a temporary chain of eight or sixteen individuals is sometimes formed by budding. In diet they are carnivorous, but a few are parasitic—suggesting the next class of Trematodes. As illustrative genera we may note Planaria, in fresh water; Vortex and Convoluta, with green species (the colour being probably due to partner Algae); Gunda, with hints of segmentation; Microstoma and Stenostoma, the two unisexual genera; Graffilla and Anoploidium, parasitic; Bipalium and Geodesmus, on land; Cœloplana and Ctenoplane, in some ways suggestive of the Cœlenterate Ctenophora. The genus Planaria has furnished material for very important physiological experiments bearing on the problem of natural death. See C. M. Child, *Senescence and Rejuvenescence* (Chicago, 1915.)

Planché, JAMES ROBINSON, playwright, archæologist, and herald, was born of Huguenot descent in London, 27th February 1796. He wrote extravaganzas, designed dresses for C. Kemble's revival of *King John* (the first time that an historical drama had been produced in the costume of its period, furnished English words for Weber's *Der Freischütz*, and in 1826 for *Oberon*; and after 1831, when he was engaged by Madame Vestris at the Olympic, wrote nearly 200 dramatic pieces—most of them adaptations, but a large number original dramas (e.g. *Charles XII.*) and extravaganzas. Of the latter five volumes were published in 1880. In 1843 he helped to found the British Archæological Association, and for many years he contributed valuable papers to the proceedings of the Society of Antiquaries. In 1854 he was made Rouge Croix Pursuivant, and in 1866 Somerset Herald; in 1872 he received a civil list pension of £200 a year. He died 30th May 1880.

Among Planché's works, besides his *History of British Costumes* (1834) and *Cyclopædia of Costume* (2 vols. 1876-9) are his *Regal Records*, or a *Chronicle of the Coronations of the Queens Regnant of England* (1838); *The Pursuivant of Arms* (1852); and *The Conqueror and his Companions* (2 vols. 1874). See his *Recollections and Reflections* (2 vols. 1872).

Planchette, a thin heart-shaped piece of wood mounted on three props, two of which are furnished with castors, and one is a pencil which may be made to trace characters on a sheet of paper by resting the fingers upon the instrument. Its use is as a supposed medium for spiritualistic communications. See the *Proceedings of the Psychical Research Society* (1888, &c.).

Planck, MAX, mathematical physicist, born at Kiel in 1858, became professor there and afterwards at Berlin. Out of his work grew the Quantum Theory (q.v.), and from him 'Planck's Constant' takes its name.

Plane (*Platanus*), the sole genus of the family Platanaceæ. The species of plane are few: natives of temperate climates in the northern hemisphere; tall trees, with deciduous large palmate leaves and smooth whitish bark, which annually scales off in large pieces.—The Oriental Plane (*P. orientalis*), a native of Greece and the East, was planted by the Greeks and the

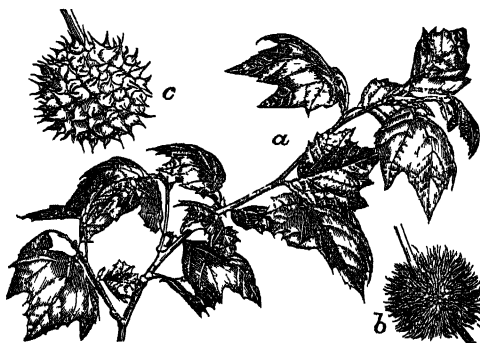


Fig. 1.—Oriental Plane (*Platanus orientalis*): a, branch; b, flower, and c, fruit, on larger scale than a.

Romans as an ornamental tree, no other tree, indeed, commanding equal admiration; and for centuries the youth of Greece assembled under its shade in the groves of Academus to receive lessons in philosophy. The plane is still planted for shade

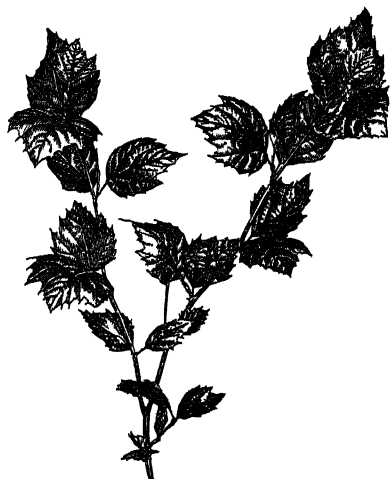


Fig. 2.—Branch of *Platanus occidentalis*.

and ornament in the south of Europe. Many fine trees exist in England, but they were at one time much more numerous, great part having died in the end of the 18th century. The spring frosts and the insufficient duration of the summer for the proper ripening of the wood render Scotland less suitable for its cultivation, yet there is a tree at Gordon Castle, Fochabers, 66 feet high. No tree better endures the atmosphere of a large city, and there are no finer trees within London than its plane-trees (*P. acerifolius*, a hybrid between *P. orientalis* and *P. occidentalis*). Noble specimens are to be seen in Hyde Park and

Russell Square, in London, and the avenue of the Thames Embankment is formed with this tree. In the East *P. orientalis* attains an immense size. One tree in the meadow of Buyukdere, on the banks of the Bosphorus, is 141 feet in circumference at the base, extends its branches 45 feet from the trunk, and is believed to be more than 2000 years old. The wood of the plane, when young, is yellowish white; when old it is brownish, fine grained, takes a high polish, and is esteemed for cabinet-making. A rich alluvial soil and the vicinity of water are most suitable to this tree. The North American Plane, or Buttonwood (*P. occidentalis*), is a very similar tree. It is the largest deciduous tree of the United States, and abounds on the banks of the great rivers of the middle states. Its timber is not very valuable, and is very liable to decay. A tree of this species on the bank of the Thames, in Chelsea Hospital gardens, is 115 feet high, with a trunk 5 feet in diameter.—The name plane-tree is commonly given in Scotland to what in England is known as the Sycamore (*Acer Pseudoplatanus*), which resembles the true planes in its foliage, but is neither a plane nor a true sycamore, being really the Greater Maple. See MAPLE.

Planetarium. See ORRERY.

Planetoids, or ASTEROIDS. See PLANETS.

Planets (Gr. *planētēs*, 'a wanderer') are those heavenly bodies (including the Earth) which belong to our solar system, and revolve in elliptic orbits round the sun. They were distinguished in very early times from the *fixed stars* by their wanderings or movements relative to these bodies, which to the naked eye show no change of position from day to day or year to year (see STARS). The planets at present known are, in the order of their distance from the sun, Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune, and a large number of minor planets whose distances from the sun are between those of Mars and Jupiter. Six of these—Mercury, Venus, and the Earth (which was not, however, then reckoned as a planet), Mars, Jupiter, and Saturn—were known to the ancients; Uranus was discovered by Sir William Herschel (q.v.) in 1781; and Neptune, whose existence and position were predicted theoretically by Leverrier and Adams, was discovered by Dr Galle in 1846. The minor planets, of which 1000 are known, have all been discovered since 1st January 1801, and most of them in recent years by photography. Six of the planets, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptune, are attended by one or more satellites; Uranus (generally), Neptune, the minor planets with rare exceptions, and all the satellites except the moon are invisible to the naked eye. The visible planets can be at once distinguished from the fixed stars by their clear, steady light, while the latter have a sparkling or twinkling appearance. The planets, as observed from the Earth, generally move from west to east among the stars, but for certain periods from east to west, remaining nearly stationary for some time at the point where progression ends and retrogression commences. This peculiarity in their movements was carefully studied by the Greek astronomers, and was represented by them as the result of an epicyclic or combination of circular movements (see PROLEMY). The system of Copernicus, by assuming the sun, and not the Earth, as the centre about which the Earth and planets revolved, explained with admirable simplicity these puzzling movements. The planets move round the sun in ellipses, the sun's position being at a focus of each ellipse. The eccentricity of the ellipse differs for each planet, but is generally small; in fact, none

of the orbits of the major planets, if drawn accurately to scale on a sheet of paper, would be distinguished by eye from a circle, though the position of the sun would be seen to be distinctly eccentric. Another peculiarity of the planetary orbits is the near coincidence of the planes in which they move with the ecliptic or plane in which the Earth moves round the sun. This applies specially to the larger planets, which are consequently always to be found in a narrow belt of the sky extending on both sides of the ecliptic. Among the minor planets there are wide divergences—e.g. the orbit of Pallas has an inclination of 34° 42' to the ecliptic. All the planets move round the sun in the same direction. According to Kepler's Laws (q.v.) the nearer a planet is to the sun the shorter is the time of its revolution. The arrangement of the planets in the solar system bears no known relation to their relative size or weight; for, though Mercury, Venus, and the Earth follow the same order in size and distance from the sun, yet Mars, which is farther from the sun, is much less than either the Earth or Venus, and the minor planets, which are still farther off, are the least of all. Jupiter, which is next in order, is by far the largest, being about one and half times as large as all the others together; and as we proceed farther outwards we find Saturn less than Jupiter, and Uranus than Saturn, though Neptune, the remotest, is somewhat larger than Uranus.

With reference to their distance from the sun, as compared with that of the Earth, the planets are divided into *superior* and *inferior*; Mercury and Venus are consequently the only 'inferior' planets, all the others being 'superior.' The inferior planets must always be on the same side of the Earth as the sun is, and can never be above the horizon of any place (not in a very high latitude) at midnight; they are always invisible at their superior and inferior conjunctions, except when, at the latter, a *transit* (see SUN) takes place. The superior planets are likewise invisible at conjunction, but when in opposition they are seen with the greatest distinctness, being then due south at midnight. The time which elapses from one conjunction to its corresponding conjunction is called the *synodic period* of a planet, and in the case of the inferior planets must always be greater than the true period of revolution.

Mercury, the planet which is nearest the sun, is also, with the exception of the minor planets, the smallest (being only three times the bulk of the moon), and performs its revolution round the sun in the shortest time. Its greatest elongation is never more than 27° 45', and except in high latitudes it is never above the horizon more than two hours after sunset, or the same time before sunrise; on this account, and from its small apparent size (5" to 13"), it is only occasionally observable by the naked eye in Great Britain. It shines with a peculiarly vivid white or rose-coloured light, and shows some indistinct markings. Its year (or sidereal period of revolution round the sun) is 87.969 days.

Venus, the next in order of distance and period, is to us the most brilliant of all the planets. Its orbit is more nearly a circle than any of the others, and when at inferior conjunction it approaches nearer the Earth than any other planet. Its apparent angular dimensions vary from 10" at the superior to 66" at the inferior conjunction. Its greatest elongation varies from 45° to 47° 12', and therefore it can never be except in high latitudes above the horizon for much more than three hours after sunset, or the same time before sunrise. While moving from the inferior to the superior conjunction Venus is a *morning star*, and during the other half of its synodic period an *evening star*.

When this planet is at an elongation of 40° its brilliancy is greatest, far surpassing that of the other planets, and rendering a minute examination through the telescope impossible. At this period it sometimes becomes visible in the daytime, and after sunset is so bright as to throw a distinct shadow.

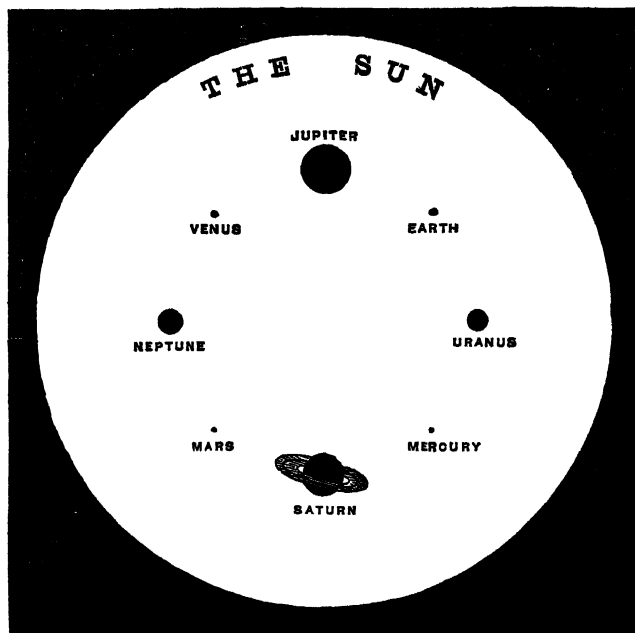


Fig. 1.—Diagram showing the comparative sizes of Sun and Planets.

Astronomers have repeatedly attempted to ascertain the nature and characteristics of its surface, but its brightness so dazzles the eyes as to render the correctness of their observations at best doubtful. From the changes in the position of dusky patches on its surface, which have been frequently noticed, it is concluded that it revolves on its axis, and that its equator is inclined to the plane of its orbit at an angle of 75° ; but many astronomers doubt these conclusions. Its year is 224.7 days. It is uncertain whether Venus rotates around its axis in 23 hours 20 minutes, or so slowly that it always presents the same face to the sun. Both Venus and Mercury necessarily exhibit phases like the moon. For transits of Venus, see SUN.

The *Earth*, the next planet in order, will be found under its own name; it has a single satellite, the *Moon* (q.v.). Its year is 365.256 days.

Mars, the first of the superior planets, is much inferior in size to the two previous, its volume being about $\frac{1}{8}$ th of the Earth's. After Mercury, its orbit is much more eccentric than those of the other planets. When it is nearest to the Earth (i.e. in opposition) its apparent angular diameter is $30''$; when farthest from it (i.e. in conjunction), not more than $4''$. Mars revolves on its axis (which is inclined at an angle of $28^\circ 27'$) in 24 hours 37 minutes, and its year is 687 days long. In 1877 Hall of Washington discovered that it had two satellites, now named Phobos and Deimos. It shines with a reddish light, and is a brilliant object in the heavens at midnight when near opposition; when seen through the telescope markings are visible on its surface, while at each pole is a spot of white. These spots decrease when most exposed to the sun, and increase under the contrary circumstances. The linear markings called *canals* observed by Schiaparelli and Lowell (see Lowell's

Mars) are of great interest. In any attempt to explain them it should be remembered that Mars has a very slight atmosphere and is at a much lower temperature than the Earth. Mars is generally observed near opposition when it is full. Its phases are clearly seen in a moderate sized telescope

when it is a month or two from opposition. The amount of phase never exceeds one-seventh of the diameter of the planet.

Minor Planets.—After Mars in order come the minor planets (see below), formerly called Planetoids or Asteroids.

Jupiter, the next in order, is the largest of all the planets, its bulk being more than 1400 times that of the Earth, though, from its small density, its mass is only 300 times more. After Venus it is the brightest of the planets and the largest in apparent size, its angular diameter varying from $30''$ to $50''$. When looked at through a telescope it is seen to be considerably flattened at the poles, owing to its rapid revolution on its own axis; and its surface is crossed in a direction parallel to its equator by three or four distinct and strongly marked belts, and a few others of a varying nature. Spots also appear and remain for some time on its surface, by means of which its revolution on its axis has been ascertained. Separate spots give, however, slightly different periods (some even move past one another), but 9 hr. 55 min. 21 sec. may be taken as the mean period. Jupiter has nine satellites—the sixth and seventh both discovered by Perrine at Lick Observatory in 1905, one by Melotte at Greenwich in 1908, and one by Nicholson at Lick in 1914. The four discovered by Galileo, easily observable through an ordinary telescope, have proved of service in the determination of longitudes at sea and of the motion and velocity of light (see ASTRONOMY). The smallest of these four is about the same size as our moon; the others are considerably larger. The newly discovered ones are less than 50 miles in diameter. The year of Jupiter is 4332.584 days.

Saturn, next in position, is about 745 times larger in volume, though only about ninety times greater in mass, than the Earth. Its apparent diameter when in opposition is $20.3''$, and there is a considerable flattening towards the poles. Its surface is traversed by dusky belts much less distinctly marked than those of Jupiter, owing doubtless in great part to its inferior brightness; its general colour is a dull white or yellowish. The most remarkable peculiarity of Saturn is its ring, or series of concentric rings, each one parallel and in the same plane with the others and with the planet's equator. The ring is *distinctly* separable into three parts; the two outermost are bright like the planet itself, while the innermost, called the 'Dusky' or 'Crape' ring, is only discernible through a powerful telescope. The rings are composed of a multitude of small satellites in rapid revolution round the planet. They are not always visible when Saturn is in the 'opposite' half of its orbit, for when the plane of the rings passes between the Earth and the sun, their dark surface is turned towards us, and when the sun is in their plane only the narrow edge is illuminated; in both of these cases the ring is invisible from the Earth. Its plane being inclined at an angle of 28° to the ecliptic, we see the two surfaces of the ring alternately for

periods of fifteen years at a time; and at the middle of each period the rings attain their maximum obliquity to the ecliptic, and are then best

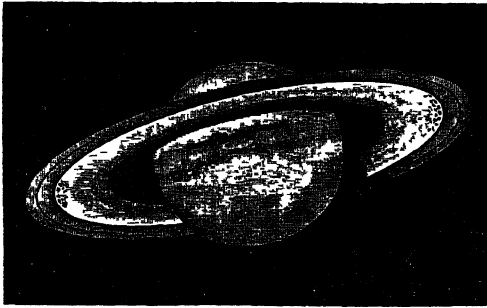


Fig. 2.—Saturn, as observed by Trouvelot with the 26-inch Washington Refractor.

seen from the Earth. The invisibility of the rings when seen end-on proves them to be very thin. The thickness may be estimated at 50 miles. The diameter of the outer ring is 176,000 miles. Saturn has nine satellites. Two of these were discovered by Herschel in 1787 and 1789, four by Cassini in 1672 and 1684, one by Huyghens in 1655, one by Lassell in England and Bond in America in 1848, one by W. H. Pickering in 1898. The ninth has a period of 550 days, and its mean distance from Saturn is 8 million miles, and it revolves about the planet in a retrograde direction. The discovery of a tenth small satellite by Pickering has not been confirmed. The satellites are all situated outside of the ring, and the largest of them is nearly equal to the planet Mars in size. The year of Saturn is 10,759·219 days.

Uranus, the next planet in position, was discovered accidentally by William Herschel on 13th March 1781, and was named 'the Georgium Sidus' and 'Herschel,' but these names soon fell into disuse. It is about seventy-two times greater than the Earth in volume, and thirteen times in mass; but, though so large, its distance is so much greater in proportion that astronomers have been unable to gain much information concerning it. No spots or belts have hitherto been discovered on its surface. It is attended by four small satellites, two of which were discovered by Sir W. Herschel, and two by Lassell. The year of Uranus is 30,686·820 days.

Neptune is the next and outermost member of the solar system, and, at a distance of nearly 3000 millions of miles from the centre of the system, slowly performs its revolution round the sun, accomplishing the complete circuit in about 165 solar years. It is about ninety times larger than the Earth, but from its extreme remoteness is of almost inappreciable magnitude when seen through an ordinary telescope. It was the disturbance in the motion of Uranus caused by the attractive force of this planet which led Leverrier and Adams to a calculation of its size and position, on the supposition of its existence; and the directions which were given by the former to Dr Galle of Berlin, specifying its exact position in the heavens, led that astronomer to its discovery on 23d September 1846 (see ASTRONOMY). Mr Lassell of Liverpool discovered that Neptune is attended by one satellite. The satellites of Uranus and Neptune differ from the planets and from other satellites except the small eighth satellite of Jupiter and ninth of Saturn, in the direction of their motion, which is from east to west, and in the case of the former in planes nearly perpendicular to the ecliptic. Both Uranus and Neptune were observed

long before the times of Herschel and Leverrier, but they were always supposed to be stars. Uranus is known to have been observed by Flamsteed between 1690 and 1715, and Neptune by Lalande in 1795.

In astronomical tables, almanacs, &c. the planets, the Sun, ☉, the Moon, ☾, are for convenience denoted by symbols instead of their names, as follows: Mercury, ☿; Venus, ♀; Earth, ⊕; Mars, ♂; the minor planets, in the order of their discovery, ①, ②, ③, &c.; Jupiter, ♃; Saturn, ♄ or ♅; Uranus, ♅; Neptune, ♆ or ♇.

MINOR PLANETS, the name given to that numerous group of very small planets which is situated in the solar system between Mars and Jupiter. Till the 19th century they remained undiscovered; but for some years before their existence had been suspected, mainly owing to the remarkable hiatus in the series of the planetary distances when compared with the Law of Bode (q.v.). On 1st January 1801 the first of them (Ceres) was detected by Piazzi of Palermo, and his success roused his brother astronomers to search for more planets. Their search was successful, for Olbers (q.v.) discovered two (Pallas and Vesta) in 1802 and 1807, and Harding one (Juno) in 1804; but as all researches for some time subsequent to 1807 were unavailing, astronomers gradually allowed themselves to settle down into the belief that no more minor planets remained to be discovered. But the detection of a fifth (Astræa) by Encke in 1845 revived the hope of fresh discoveries, and from this period no year (excepting 1846) has passed without adding to the list. The number known at the beginning of 1851 was 13, of 1861 was 62, of 1871 was 112, of 1881 was 219; at the end of 1923 there were over 1000. This great success of the astronomers of our time is due to the systematic manner in which the zodiacal belt has been explored, and to the ease with which a body moving among the stars can be detected on a stellar photograph.

The magnitudes of these bodies are in general very small. Barnard at the Lick Observatory was able to see perceptible discs for Ceres, Pallas, Vesta, and Juno, and measured their diameters as 485, 304, 243, and 118 miles respectively. There are probably a few more whose diameters are greater than 100 miles, but generally speaking they are not more than 20 miles. From the absence of a perturbing effect on Mars the total mass has been determined to be less than 1/100th of that of the Earth. Some of their orbits are much more eccentric than any of the major planets, and they are also inclined at greater angles to the ecliptic. Among the planets of greatest eccentricity are Polyhymnia (0·34) and Æthra (0·38), whose aphelion distances are about double of their perihelion distances. The greatest inclination to the ecliptic of any of the orbits is that of Pallas (35°). The orbits of the minor planets present several features of dynamical interest. Their mean distances range over a considerable space between the orbits of Mars and Jupiter. But there are gaps where none are found, probably due to the commensurability of orbits at those distances with that of Jupiter. Six of the minor planets—Patroclus, Hector, Achilles, Nestor, Agamemnon, Priamus—appear to oscillate about a position 60° from Jupiter, thus exemplifying the possibility recognised in theoretical dynamics of the sun, Jupiter, and a small planet remaining permanently at the angles of an equilateral triangle. The planets Victoria, Iris, and Sappho, and still more Eros, are of interest because their near approach to the Earth has made them the means by which our most accurate knowledge of the sun's parallax, and thus of the scale of the solar system, has become known. The perturba-

tions of the planet Polyhymnia have been used to determine the mass of Jupiter.

For a Table of the periods, distances, size, density, &c. of the planets, see SOLAR SYSTEM. See also ORBIT, PHOTOGRAPHY, and SPECTRUM.

Planimeter, a machine for measuring areas on a plane. The best-known form, Amsler-Laffon's, consists of two rods hinged together. The extremity of the one rod is fixed, so that the free extremity of the other is able to trace out any form of curve limited only in size by the dimensions of the apparatus. The theory of the instrument depends upon the fact that, as the free end is made to trace out the boundary of any closed area, the hinged end oscillates to and fro along a curve, but traces out no area. Rigidly attached to the rod whose one end traces out the plane area is a graduated roller fixed with its axis of rotation parallel to the line joining the hinge and the tracing point. As the closed curve is being described the roller rotates because of the lateral movement of the rod; and the difference of the readings before and after the tracing has been accomplished gives a number proportional to the area that has been gone round.

Plankton is the name for all organisms in the sea, whether plant or animal, floating at the mercy of winds and currents, and unable to propel themselves. Nekton is the term for those that can swim, but plankton is sometimes used loosely to include these. It occurs in all depths, but is most abundant from the surface to about 100 fathoms. Both plants and animals occur, the former chiefly unicellular and microscopic, but the latter including representatives of most classes of marine animals. The distribution of plankton depends on temperature, salinity, light, currents, and the abundance of food. Much investigation is needed on these lines, especially as regards its distribution in depths. The proportion between plants and animals varies, but plants are generally more frequent than animals in polar waters, while the converse is true in tropical and often in temperate seas. Phytoplankton is present from the surface to about 500 fathoms, the depth to which light penetrates. Its importance in the economy of the ocean is great, as it is practically the only plant-life and the ultimate source of food for all animal-life. Phytoplankton consists mainly of unicellular algae, including diatoms with a siliceous test, peridinians with no test, many of them phosphorescent, and coccoliths and rhabdospheres with calcareous shields. Diatoms are most abundant in coastal and polar waters. In the latter they may render the surface waters green or brown and opaque over large areas. Peridinians are mainly oceanic. Among the microscopic animals represented in plankton are foraminifera with calcareous tests, which are tropical and subtropical, and radiolaria with siliceous tests. Larger organisms in great abundance are copepods and ostracods among crustaceans, pteropods among molluscs, medusæ such as the Portuguese man-of-war, as well as many pelagic eggs or larvae of echinoderms, annelids, bryozoa, crustaceans, and fishes.

Plantagenet, surname of an Angevin house which in 1154-1485 reigned in England. The name was adopted by Geoffrey, Count of Anjou, husband of Matilda, daughter of Henry I., from the badge of a sprig of broom (*planta genista*) which he wore. See articles on the several kings, from Henry II. to Richard III., also ROSES (WARS OF THE).

Plantain. For the tropical plantain (*Musa*), see BANANA. The English plant so called belongs to the Plantaginaceæ, a family of dicotyledons, mostly herbaceous; the leaves forming rosettes, flat and ribbed, or taper and fleshy; the flowers

usually in spikes, and generally hermaphrodite; the calyx 4-parted, persistent; the corolla hypogynous, membranous, persistent, its limb 4-parted; the stamens four, inserted into the corolla, with long filaments; the ovary free, of a single carpel, 1-4-celled; the cells containing one, two, or many ovules; the fruit a membranous capsule with a lid. The testa of the seeds abounds in mucilage, which is easily extracted by boiling water. There are about 200 known species, diffused over all parts of the globe, but most abundant in temperate and cold countries.

The most important genus is Plantain, the species of which often receive the English name Plantain. Six of this genus are found in the United Kingdom, including *P. Edmondstonii*, which has been found in Orkney and Shetland. The Greater Plantain, or Waybread (*Plantago major*), is one of the commonest of British plants; a perennial, with broad ovate stalked leaves and long cylindrical spikes, growing in pastures, waysides, &c. It is very widely diffused over the world. Its seeds are a favourite food of birds.—The Ribwort Plantain, or Greater Plantain (*Plantago major*).



Ribgrass (*P. lanceolata*), is another very common British plant, forming no small part of the herbage of many meadows and pastures. Its leaves are lanceolate, and taper at both ends; its spikes are short, ovate or cylindrical, and placed on long angular stalks. Its seed is acceptable to cage-birds. This is the plant commonly known as 'bullies,' or 'sodgers,' the striking off the heads (or spikes) of which is a favourite amusement of children.—The mucilage of the seeds of *P. Ispaghula* and of *P. Psyllium* is much used in India in catarrhs and other complaints; and *P. Psyllium*—called Fleawort, and its seeds Fleaseed—is cultivated in France for the sake of this mucilage, which is used by paper-stainers in preference to that obtained from linseed, and is also extensively used by muslin manufacturers for stiffening their goods. The plant has a branched spreading stem and recurved leaves. For Water Plantain, see ALISMACEÆ.

Plantain-eaters, or TOURACOS (*Musophagide*), a family of arboreal African birds. The flight-feathers yield a peculiar crimson pigment called turacin, containing copper, and so soluble that it is washed out in heavy rains. Another remarkable feature of touracos is that they are the only birds with green pigment, though green colour is common enough. Representative genera are Turacus, Musophaga, Gallirex. An interesting fossil form, Necornis, occurs in the middle Miocene of France. They are shy, restless birds, noisy except during rain or in the midday heat, feeding mainly on fruits and insects, making flat twig nests like pigeons. For Turacin, see Church, *Phil. Trans. Roy. Soc.*, 1869, 1893.

Plantation. See FORESTRY, PRISONS, TRANSPORTATION.

Plant-houses are garden structures designed for the protection and cultivation of the plants of warmer climates than our own. Apart from the style of architecture, a plant-house must be so constructed as to admit a maximum of light to the interior; there must also be ample provision for ventilation, and means for maintaining such atmospheric temperature as is necessary to the plants that are to be cultivated in it. Glass, wood, and iron are the materials of which plant-houses are made. Masonry is not essential in the erection of plant-houses, but it is very generally employed to give stability, durability, and architectural effects. Glass obviously is the most important material: the larger the amount of it that enters into the structure of a plant-house the better adapted will it be for the cultivation of plants; the means for securing the maximum of light is thereby provided, and its regulation is then under the control of the cultivator.

Plant-houses are broadly divided into three classes—viz. hothouse or plant-stove, intermediate house, and greenhouse. The structure of each class may be the same in all respects except in the power of the heating apparatus. In the hothouse it must be adapted to create and sustain tropical temperatures irrespective of the temperature of the outer air; in the intermediate house the heat of extra-tropical and temperate countries must be provided; and in the greenhouse all that is required of the heating apparatus is the exclusion of frost or the maintenance of a minimum temperature of 40° F. Hothouses are either dry or moist, according to the needs of the plants to which they are devoted. Thus there may be tropical orchid-houses, tropical fern-houses, tropical aquatic-houses fitted with tanks of heated water, for *Victoria regia*, *Nymphaeas*, and the like; but the more common class of stove is that in which the internal arrangements are made with the view of accommodating a large variety of plants, having considerable diversity of constitutional requirement. The intermediate house may be subdivided in the same way into the cool orchid-house, the cool fernery, &c.; but the more commonly it is adapted to the wants of miscellaneous plants, and very often indeed it is used temporarily for tropical plants during their period of rest, when a lower temperature and less humidity than those of the stove are desirable. The greenhouse may be a heath-house if exclusively devoted to the culture of Cape heaths (*Erica*) and kindred plants; and so on.

The conservatory is a plant-house in which a miscellaneous collection of plants, after having been grown elsewhere, is placed in order to display the beauty of flowers and foliage. It may be either cool or hot, according to the classes of plants accommodated in it. Being usually a place of resort, or a lounge accessible from the drawing-room or some other part of a house, its architectural features should be in harmony with those of the building; but due regard should also be had to the providing of ample light, and perfect ventilation. The propagating house is a plant-house devoted to the rearing of the several classes of plants indicated in the foregoing. It may be heated or cool, and differs from the ordinary plant-house chiefly in being more restricted in atmosphere. It is fitted with close glass-cases, fixed or portable, for the purpose of preventing exhaustion, by the atmosphere, of cuttings and other subjects temporarily destitute of roots. An essential feature of the internal arrangements of the propagating house is a bed or beds filled with sand, coconut fibre, or any other cleanly material, in which the pots containing cuttings may be plunged

at will to prevent evaporation from their sides and fluctuations of temperature in their contents. These beds are usually provided with hot-water pipes, tanks, or flues below, for the purpose of giving bottom heat when required.

Plantigrades. See BEAR, CARNIVORA.

Plantin, CHRISTOPHE, an eminent printer, was born at St Avertin, near Tours, in 1514, and settled as a bookbinder at Antwerp in 1549; some six years later he began to print. The books that came from his office are distinguished for their accuracy and beautiful workmanship and finish. His business prospered, and he had often twenty presses or more in active operation at once. The most noted of all his publications is the *Biblia Polyglotta* (8 vols. 1569-73), which was printed under the personal superintendence of Arias Montanus, the court chaplain of Philip II. of Spain. Plantin's editions of the Bible in Latin, Hebrew, and Dutch, and editions of the Greek and Latin classics, are scarcely less celebrated. He died at Antwerp, 1st July 1589. He had set up printing-establishments in Leyden and Paris, and these, with that in Antwerp, were carried on by the husbands of his daughters. His office in Antwerp remained in the possession of the family of John Moretus, his son-in-law, until it was bought by the city in 1876 for 1,200,000 francs; out of it was created the 'Musée Plantin' (1877).

See Life by Max Rooses (in French, Antwerp, 1892); Backer and Ruelens, *Annales de l'imprimerie Plantinienne* (Brussels, 1865); DeGeorge, *La Maison Plantin* (3d ed. Paris, 1886); and *Correspondance de Plantin* (edited by Rooses, Ghent, 2 vols. 1884-86).

Plant-lice. See APHIDES.

Plants. It is not possible to frame a complete definition of a plant as opposed to an animal; the most obvious distinction is that a plant is fixed, while an animal moves; and though it is quite true that plants form that kingdom of nature which is characteristically passive in its life, while the animal life is more vigorous, yet there are many animals, such as a sea-anemone, which are as fixed as a plant; and all plants are sensitive to the sun's rays, and move in response. Nor can we make a formal distinction between them in terms of the food they require; for although it is true that plants live upon simple unorganised materials, the salts and water of the soil, and the carbonic acid and oxygen of the air, and indeed serve as the source of all food for animals, yet there are many parasitic plants which live on the juices of other living creatures. What chiefly makes such a definition impossible is that at the bottom of the ladder of life there are innumerable living creatures which it is a mere formality to call either plants or animals. From such creatures as these it is possible that the two great kingdoms of nature have been evolved step by step in constantly diverging lines. But the diversity of nature of plant and animal life is such that they are mutually helpful to each other; plants having the means of feeding upon the carbonic acid of the air, using the carbon and giving out the oxygen, thus forming matter for the life of animals, who in return, by breathing out carbonic acid, help to keep the air in a fit state for plants. This mutual relation of the two kingdoms finds another expression in the aid that insects and some birds give to the higher plants, for in their search for honey they become covered with pollen, and carrying it from flower to flower secure cross-fertilisation; while it is probable that the bright colours of flowers have been to a certain extent evolved by the selection which the insects that visited them have exerted.

The four great divisions of the vegetable kingdom are *Thallophyta* (Algae and Fungi), *Bryophyta*

(Mosses and Liverworts), Pteridophyta (Ferns, Horsetails, &c.), Spermatophyta (Gymnosperms and Angiosperms). For subdivisions see those heads.

See also BOTANY, PHYSIOLOGY (VEGETABLE), BIOLOGY, ROOT, FLOWER, &c.

MOVEMENTS OF PLANTS.—These may be divided into—(1) those due to the unequal growth in growing organs; (2) those due to unequal expansive energy of turgid tissues in mature plants. Each group may be subdivided into spontaneous movements (autonomic), caused by diffuse stimuli, and induced movements (paratonic), caused by unilateral stimuli. The whole phenomenon is a manifestation of irritability, a fundamental property of living matter.

Spontaneous growth movements are seen in the spiral course executed by the root and the shoot during elongation, described as circumnutation. It is by virtue of circumnutation that twining plants are able to climb round a support. The leaves in a bud are packed close, due to greater growth on the underside (hyponasty); later, the maximum growth shifts to the upper surface (epinasty), and the bud unfolds. Tendrils, before they coil, nutate and become hooked. The opening of crocuses on a bright day and the opening of tulips brought into a warm room are examples of thermonastic movements. These curvatures are primarily the result of stimulation, which, in spite of the homogeneous external conditions, causes unequal growth of the two sides of the growing organ.

Induced Growth Movements. Gravity.—A bean root marked in equal divisions and placed horizontally bends downward at the region of growth. This geotropic curvature is a response to gravity and not to the weight of the root, as a horizontally placed root will still bend though supported by mercury. Slow rotation, so as to cause the direction of gravitation to alter constantly with regard to the sides of the root, results in horizontal elongation. Substitution of centrifugal force for gravity results in elongation of the root away from the centre of rotation. Tap roots are positively geotropic, lateral roots are diageotropic. Stems are generally negatively geotropic. Reversal of the response takes place in certain flowers—e.g. poppy and narcissi, and, after fruiting, in the ground-nut and cyclamen. Various explanations have been put forward to account for the perception of gravity. A root with its tip amputated does not respond, indicating that the perceptive organ is in the apex. Haberlandt found large starch grains which were movable, and propounded a statolith theory of perception. Czapek put forward a chemical explanation. Small attempts to account for the different behaviour of root and of shoot by the difference in acidity of the continuous phase in each, and brings in an electric explanation.

Light has a retarding influence on growth; consequently unilateral illumination of window plants results in a bending of the stem toward the light (positive heliotropism), while the leaves place themselves at right angles to the incident rays. The goat's-beard and the sunflower follow the sun's course. The roots in cress and ivy are negatively heliotropic. In oats seedlings and in those of Canary grass the tip of the cotyledon is the light perceptive organ. In Crucifer seedlings the top of the hypocotyl performs the function. Curvature takes place in the growing region, and there is thus a transmission of stimuli in plants. Haberlandt has suggested that the epidermal cells function as lenses and account for light perception. Heliotropic curvature is not confined to green plants, as the sporangiophores of *Pilobolus* are positively heliotropic and discharge their spores towards the light. Movements of the chloroplasts, in response to variations in the intensity of light, occur in the Algae,

mosses, fern prothalli, and in *Oxalis* and *Lemna*. Motile organisms, such as zoospores, are positively heliotropic and phototactic in moderate light, but the responses are reversed in strong light. Oscillaria, diatoms, and desmids place their long axis parallel to the incident rays.

Temperature.—The roots of cress and maize bend towards the warmer side of an unequally heated box. The opening and closing of many flowers is brought about by changes in temperature.

Moisture.—Inequalities in the amount of soil-water cause roots to grow to the moister soil. The moulds are positively hydrotropic until spore formation, when the response is reversed. Myxomycetes move toward the moister position (hydrotaxis), but at spore formation move to the drier situation.

Contact, Wounding, &c.—Roots grow away from an obstruction. The coiling of tendrils is due to the stimulus of contact. The traumatic response of a wound root has been named the Darwinian response, in honour of Charles Darwin, who first described it.

Chemical.—The movement of the male gametes in the fern towards the archegonium is due to a chemical attractive substance. The phenomenon is known as chemotaxis. The chemotaxis of the spermatozooids is paralleled by the chemotropism of the pollen tube in the higher plants.

Spontaneous Movements of Variation.—The lateral leaflets of the telegraph plant (*Desmodium gyrans*) twitch through an elliptical path, and earn the plant its popular name. Slower movements are exhibited in the terminal leaflet of red clover and the wood sorrel.

Induced Movements of Variation.—The leaves of the sensitive plant (*Mimosa pudica*), which droop at the slightest touch, are the best example. The two halves of the leaf of *Dionaea* close on a touch like a man-trap, while the tentacles of *Drosera* and the edges of the leaves of *Pinguicula* roll inward more slowly over a captured insect. The stamens of a large number of plants—*Berberis*, *Mahonia*, *Opuntia*, *Cereus*, *Portulaca*, *Helianthemum*, *Mesembrianthemum*, and *Sparmannia*—move when touched, thus dusting their insect visitors with pollen. The filaments of the *Cynareæ* contract, and the stigma shoots the pollen out like a pop-gun. The flaps of the bifid stigma of *Mimulus* close rapidly when touched, thus enclosing pollen.

The sleep movements (nyctotropic) seen in many leaves in the Leguminosae, Oxalidæ, and Marsileæ, and the closing of certain flowers, are due to the stimulus of changing light intensity, or change of temperature, or both stimuli combined.

MEDICINAL PLANTS.—The study of plants with genuine or fancied curative properties is as old as human thought and sickness. Even animals seek such medicines, and it must be remembered that our early ancestors were much more familiarly acquainted with fruits and seeds, roots and bulbs than are their more carnivorous descendants. But, while it may be contended that ancient medical treatment was in great part a natural return to more primitive vegetarian diet, it is obvious that men would be quick to profit by a wide and often costly experience of plants with special properties, poisonous and emetic, tonic and narcotic, excitant and sudorific. While botanical science is partly rooted in the garden, no small part of it has grown out of a primitive materia medica. Assyrian and Babylonian cuneiform plant-lists mention about 250 vegetable drugs. In the writings of Hippocrates (460-377 B.C.) and those to which his name is extended 236 medicinal plants are recorded; the list swells in the works of Aristotle (387-322 B.C.) and Theophrastus (371-286 B.C.), while the 'Materia Medica' of Dioscorides (born in the 1st century A.D.) includes the

names and partial descriptions of about six hundred. His work remained authoritative for fifteen centuries, and was continued on the one hand through the herbalists like Gerard and Culpepper into the botanical side of the modern pharmacopœia, on the other hand through such early botanists as Cæsalpinus into the independent—doubtless too independent—science of botany.

In connection with medicinal plants there are many interesting chapters of history with which the student should make himself acquainted—the weird stories of the old traffic in vegetable poisons; the magicians' use of narcotics and excitants; the mystical doctrine of Signatures (q.v.), according to which plants bore signs indicative of their virtues; the gradual decay of herb gathering and the loss of much of the ancient traditional lore; the persistent record of the old uses of plants in both technical and popular names, such as Pulmonaria, Sanicula, Tussilago, and wound-wort, scurvy-grass, gout-weed; the additions to the British flora by such importations as belladonna; the elimination from the modern pharmacopœia of many vegetable drugs whose value was only fanciful; the relegation of others to the list of spices; the modern discovery or rediscovery of the potencies of Calabar bean, cinchona, coca, and many more.

See BOTANY, MATERIA MEDICA, PHARMACOPŒIA.

DISEASES OF PLANTS (*Phytopathology*). Scientific investigation of the diseases of plants has not till recently been so widely and systematically followed up as the importance of the subject deserves. Bacteria and parasitic fungi are the chief causes. Wet rot in the potato, rot in the bulbs of the hyacinth and the onion, wilt in the tomato and other solanaceous plants, and in the cucumber; crown-gall in the rose, vine, and hop; striping in the tomato, leaf-spot in the bean, yellows in the peach, and pink decay in wheat may be cited as examples of diseases of plants ascertained to be caused by bacteria. The bacteria may act by dissolving away the cementing material that holds the cells together, or by damming the conducting elements, by exciting hypertrophy, or by destroying tissues.

Parasitic fungi are extremely numerous, and are as varied in their action and peculiar in the parts they affect as they are numerous. Some attack the roots, others the stem and branches, while the flowers, the several organs of reproduction, and the fruit are each liable to be attacked by some particular parasite which induces disease. They are almost always local in their action, and it is very rare to find a case in which the whole organism of a plant is affected in the sense that man and other animals are said to be constitutionally diseased. Instances there are in varieties of cultivated plants of something extremely like constitutional proneness to disease. Certain varieties of peas and wheat are extremely liable to mildew. A similar tendency to canker is seen in some varieties of the apple, and certain varieties of the potato are more liable to succumb to disease than others. On the other hand, resistant or immune varieties of many plants have been found or produced.

In the suddenness of outbreak and the rapidity with which they spread when they first appear in a country or locality, there is a strong resemblance in some plant diseases to certain epidemics in animals. And this resemblance is carried further in tracing the subsequent history of notable plant diseases. They appear, like epidemics in animals, to exhaust their extreme virulence after a time. The cases of attack may continue numerous and frequent, but the type is less severe. The potato disease of 1845 has continued annually in greater

or less severity since that time; but from that year, and the two or three years immediately succeeding, it has ceased to be so formidable. The vine disease (*Urcinula necator*; see OIDIUM), the hollyhock disease (*Puccinia malvacearum*), the celery disease (*P. Apii*), all made their appearance suddenly with such virulence and widespread rapidity as to threaten extinction of the species attacked, but are now sources of neither trouble nor alarm.

The direct action of parasitic fungi in causing disease in plants is through the mycelium or spawn injuring the host plants either by depriving them of nourishment, by impairing their power of assimilation, or by abnormally accelerating or retarding growth. The extent of injury inflicted is extremely variable, in some cases exterminating in degree, and in others, though widespread and general, having little ill effect upon the health of the subjects. Adverse external circumstances—such as unsuitable temperature, excess of dryness or moisture in the air and in the soil, deficiency of light, the presence of deleterious elements in the soil or of noxious gases in the atmosphere—by debilitating the plants render them more liable to attacks of fungi, and aggravate their severity.

The effects of disease in plants are extremely various. One of the most common manifestations of the presence of parasitic fungi in the tissues is *hypertrophy* in the parts affected. This may be either local or general; the roots, the stems, the leaves are all liable to this peculiar disorder. Many of the conifers are particularly subject to hypertrophies in disease. The so-called *Cedar-apples* of the United States, which occur in great abundance on the branches of *Juniperus virginiana*, are caused by *Gymnosporangium macropus*. They are reniform tumours, and originate by the mycelium entering a leaf and growing downwards into the bark of the smaller branches. Its presence acts as a source of irritation to the cells. The stem and branches of *Juniperus communis* are subject to hypertrophies caused by *G. clavariæforme*. This is frequently to be observed in Britain, and the enlargements are of a very persistent character, and in effect impede the supply of sap to the branches beyond them. Similar tumours occur on the branches of the silver fir, which are caused by the spawn of *Peridermium elatinum*. But the most remarkable example of hypertrophy in connection with the diseases of any of the conifers is that which occurs in the larch disease, which is caused by the spawn of *Peziza Willkommii* (or *Dasyscypha calycina*). The presence of the threads in the cortex, cambium, and woody tissues causes their death; but hypertrophy of the tissues of the surrounding parts is set up. The fissuring of the bark of the affected parts follows in due course, and the branch attacked eventually dies, and sooner or later also the tree succumbs to the disease. There are many other examples of this form of plant disease, nor are they peculiar to ligneous plants, but occur in humble herbaceous subjects, such as the violet, anemone, ranunculus, grasses, and so on.

Anbury (q.v.) and Club-root are the common names given to a disease which attacks the turnip, cabbage, cauliflower, and other members of the Cruciferae. It assumes the form of tumours on the roots generally. They increase in number and in size as the plants grow, but eventually the plants cease to develop and die; the tumours becoming foetid masses, and leaving the spores of the fungus (*Plasmodiophora brassicae*) in the soil.

Diseases of plants of traumatic origin are those which result as a consequence of wounds which may have been received by a tree or shrub. Nature may have succeeded in covering over the wound,

and superficially all may appear well; but it often occurs that some fungus, perhaps harmless to the subject while its bark is intact, finds a lodgment in the wound, and sets up parasitic disease.

Canker, most familiar to some of us upon the apple-tree, is not uncommon upon the oak, ash, elm, beech, &c. It is caused by the same fungus (*Nectria ditissima*) in every case.

Of large conspicuous fungi attacking wood exposed by wounds examples are to be found on the ash and the elm in *Polyporus squamosus*, and in two species of *Agaricus*, *A. ulmarinus* and *A. adiposus*, the latter attacking wounded ash and beech trees, and the former wounded elm-trees, while *A. ostreatus* attacks injured laburnums.

Rot or gangrene in the stems of firs and other trees is caused by *Armillaria mellea*, the mycelium of which finds its way into the woody tissues by the roots and gradually ascends the trunk, inducing decay either in the form of moist or dry rot. See PHOSPHORESCENCE.

Atrophy occurs in the pine, in wheat, and in other plants in consequence of attacks of various minute parasitic fungi. *Uredo pinitorquum* attacks the pine tribe, and by arresting the flow of sap at the points attacked starves the branches beyond, causing sterility and eventually death. In like manner *Puccinia graminis* attacks the straw of wheat, and renders the ear abortive. But sterility is also caused by parasitic fungi attacking the organs of reproduction directly. Certain species attack the male organs only, as *Ustilago violacea*, some, such as *Thecaphora hyalina*, affect only the female organs, while *Ustilago carbo* effects the destruction of all the floral organs.

A singular feature in the economy of many of the minute parasitic fungi is that in one stage of their existence they are capable of living only on one kind of host plant, and at another stage on a species quite distinct; so distinct indeed, as in the case of the *Puccinia* above named, that in one form it attacks the barberry and in another stage wheat. It has long been a matter of common observation among farmers in Britain, on the continent of Europe, and in parts of the United States, where the common barberry has been introduced, that the proximity of that shrub to wheat-fields had some mysterious connection with mildew in wheat. In the state of Massachusetts a law was passed in 1760 enjoining the extirpation of the shrub, in consequence of the belief that it caused or at least intensified the wheat disease. The problem was solved by De Bary in 1864, who, by placing the promycelial spores of the *Puccinia* (wheat-mildew) on the barberry produced *Æcidium berberidis*, the mildew which frequently attacks that shrub. Since that many species have been shown to have this heterocœcious habit.

Cures for plant diseases are as yet empirical rather than scientific. In many cases the subject affected is fatally smitten before evidence of disease is visible. Mildew, which is one of the most common phenomena of plant disease, is the fructification, the final stage, of the parasite. The mycelium, whence the mildew springs, is working its deadly function on the plant in parts which external remedial applications cannot effectively reach. In many cases of plant disease the affected subject dies without any apparent cause; investigation after death may discover it, but too often also it reveals the fact that our knowledge does not enable us to prescribe a cure. Internal remedies are yet undiscovered. Soot, sulphur, soap are safe external remedies for mildew—that is, they destroy the pest without injuring the foliage on which it preys—but do not always eradicate the disease. *Bordeaux Mixture* and *Paris Green*, both having copper for their base, are very effectual externally

against fungi, but require to be used with great caution. The only safeguard against attack appears to be the maintenance of the plant in perfect health.

There are separate articles in this work on plant-diseases such as ERGOT, RAPHANIA, RUST, SMUT, and under the names of the plants affected—e.g. POTATO; and on the various insect-pests which induce diseased conditions, such as the Aphides and Phylloxera. See also PARASITIC PLANTS; Marshall Ward, *The Diseases of Plants*, (1901); F. L. Stevens, *Plant Disease Fungi* (1925); and manuals by Massee (1915), and Stevens and Hall (1910).

PLANT-LORE. There is abundance of traditionary lore associated with all kinds of trees, plants, and flowers. The study of this throws much light on many puzzling survivals in popular folklore, and Mannhardt (1831–80) and Sir J. G. Frazer have shown its importance for part of the problem of primitive religion. It is not infrequent among Australians and Red Indians to find the Totem (see TOTEMISM) taking the form of a plant or tree, and for these the individual shows his reverence by refusing to gather or destroy them. We find the worship of trees widely prevalent among savages everywhere, and we have ample evidence that it was an important element in the religion of all the families of the Aryan stock. The oak was especially associated among Aryan peoples with the thunder-god—Zeus, Thor or Thunor, the Lithuanian Perkunas, whose name is cognate with *Quercus* (See BONIFACE, DODONA, DRUIDISM). The sacred fig-tree of Romulus in the centre of Rome, the *Ficus religiosa* of India, and the sacred groves of the Semitic and pre-Semitic races still surviving at Carthage a century after Augustine are ready examples of tree-worship from sufficiently wide centres of civilisation. The primitive mind of the savage readily conceives of a tree as animated by a conscious soul cognate with his own, and he may regard the tree either as its permanent outward organism or merely its characteristic dwelling-place. Buddhists do not include trees among sentient beings possessing mind, but recognise the existence of the genius of the tree, and the Buddha himself was such as often as forty-three times during his transmigrations. The reverence paid to the famous Bo-tree (q.v.) shows how fundamental a fact is tree-worship, which undoubtedly formed a large part of the old indigenous religion amalgamated by the new philosophical faith. But none the less are the sacred tree and grove to be found within the range of Semitic and Aryan influences, and the obstinate revival, even under the shadow of purer rites, of the Canaanitish Asherah worship proves how deeply they were rooted in the old religion of the land. From all sides we find evidence at once of the great antiquity and uniformity of the worship of trees, whether for the services they render to man, for their venerable antiquity, their form, for particular qualities ascribed to them as containing the seeds of fire, for their situation, as on sombre and lonely mountain-tops, or for their association with certain phenomena, as plagues and pestilences, or certain events in the history of the homestead. In the growth, life, decay, and death of the plant the primitive man easily sees an analogue to his own life-history, and herein we may find the philosophy of the widespread rustic rites associated with marriage and with the birth of children. The custom of scattering flowers and the fruits of the field over the footsteps of a newly-married pair conveys an obvious reference to the belief in the reproductive powers of vegetation and to the fundamental postulate of all sympathetic magic that any effect may be produced by imitating it. Primitive ideas of the fertilising and fruit-bearing powers

of nature led easily, according to Mannhardt, to the belief that each tree or plant possesses spiritual as well as physical life, being tenanted either by semi-divine spirits or by the ghosts of the dead; and a natural generalisation of this notion made plants and trees collectively the abode of particular inhabitants—an example of animism developing into polytheism. A forest-god has been deduced from a mere tree-soul, both alike regarded as powerful to produce rain or sunshine, to cause fruits to spring and cattle easily to bring forth their young. A still higher generalisation gave a belief in a genius of plant-life or forest-life, or, higher still, a genius of growth or fertility in general. This universal genius of growth was symbolised by a bush or tree, brought in triumph from the forest, gaily decked, and solemnly planted near the homestead or in the village. We have thus seen both the spirit incorporate in the tree, suffering and dying with it, and the tree considered as the mere dwelling-place of the god; but still further in many cases we find the tree-spirit regarded as detached from the tree, and, through a confusion of his vegetable and anthropomorphic representations, clothed in human form as a man or a girl decked with flowers—the May King, Queen of the May, the Old Woman or Corn-mother of German harvest-fields, the Jack in the Green of young London sweeps, and the like. The existence of those Corn-spirits which especially haunted and protected the waving corn we see dimly recognised in characteristic ceremonies of an English harvest-home, and in the German custom of leaving the last sheaf of rye in the field as a tribute to the Roggenwolf. The French and German custom of the Harvest May, in which a branch or tree decked with ears of corn is carried home in the last wagon from the harvest-field and hung on the roof of the farmhouse till next year, is closely cognate with the *eiressiōnē* of ancient Greece, and suggests a parallel with some of our own old harvest customs. In the wassailing of apple-trees, still practised in many parts of England with libations and incantations, a boy is sometimes sent up among the branches, perhaps a reminiscence of the tree-spirit, or perhaps of human sacrifice.

Sympathetic affinities between plant and animal life strongly impress the primitive imagination; we find them playing an important part in many cosmogonies, as in the Iranian account of how the first human pair grew up as a single tree, the fingers or twigs of each one folded over the other's ears, till the time came when they were separated, and infused by Ahuramazda with distinct human souls. Other mythical cosmogonic trees that need only be named are the heavenly fig-tree of the Vedas, and the ash-tree Yggdrasil of Norse mythology. In some places trees are informed when their owner dies, and an apology formally made to them by the woodcutter before he fells them; and every one is familiar with the custom of planting a tree at the birth of a child, and the notion of a sympathetic relation subsisting throughout life betwixt the two. The trees planted by kings and queens on their visits to various towns, and the Trees of Liberty planted to mark a new political régime, convey unconsciously a survival of the same sympathetic symbolism. The belief that a child's rickets can be cured by passing him through a cleft ash-tree still lingers obstinately in corners of England, and stories of trees giving forth human groans and exuding human blood are common in folk-tales everywhere. Families, as well as individuals, have tutelary or guardian trees; and Hytén-Cavallius, for example, tells us that the three families of Linnæus (or Linné), Lindelius, and Tiliander were all called after the same tree, an ancient linden or lime which grew at Jonsboda Lindergord. When

the Lindelius family died out one of the old lime's chief boughs withered; after the death of the daughter of the great Linnæus the second main bough fittingly bore leaves no more; and when the last of the Tiliander family expired the tree's active life came to an end, though the dead trunk continued to be highly honoured.

We see then how natural is the notion of symbolising the genius of vegetation under the form of a tree, and thus, as has been shown, we find some hint at the real philosophy underlying the joyous old-world May-day usages, the Maypole decked with streamers, round which young men and maidens danced in chorus, and not less the high ceremonies attending the harvest-home. Even our Christmas-tree, which originally made its way into England and France principally through the influence of Prince Albert and the Duchess Helen of Orleans, is really nothing but a survival of an ancient German custom of heathen origin, and we may safely disregard the foolish theory of its being Christian because the 24th of December chances to be consecrated to Adam and Eve. One legend relates how Adam brought from Paradise a fruit or slip from the Tree of Knowledge, from which sprang the tree from which the Cross was made—an example of a process of myth-making after the fact to which we owe not a few beliefs and customs not understood. But many plants have received a kind of religious consecration from the name of some saint whose festival fell on the day on which they were gathered. And Christianity, like Buddhism, early showed a marvellous adaptability in the way in which it adopted popular rites of an earlier religion, and subtly rebaptised them as its own. Many remnants of primitive superstitions survive in the local English names of plants and flowers, chiefly in connection with the fairies, the devil, the Virgin, and the Cross, and we have a great wealth of association from one cause or other between saints and flowers, as St Agnes with the Christmas rose, St Joseph of Arimathea with the Glastonbury thorn, St Patrick with the shamrock, the Virgin with the white lily, just as Thor had his oak-tree, Venus her myrtle. Curious and interesting, but obscure, are the notions of magical properties connected as persistently with some plants as medicinal properties are with others. Most prominent in European folklore are the elder, the thorn, and the rowan or mountain-ash; but strange properties are still ascribed to the rosemary, vervain, St John's wort, mandrake, asphodel, and to 'fern-seed'; and many flowers lend themselves through some obscure inherent fitness to special methods of divination. The doctrine of Signatures (q.v.) opens up a special chapter.

Sir J. G. Frazer's *Golden Bough* contains a contribution of the greatest value to a scientific knowledge of the worship of vegetation, but it seems probable that a serviceable enough theory has been carried too far, and at any rate many of its conclusions remain to be tested by the fresh generalisations of a later day. Its starting-point is the mysterious story of the Arician lake, well known through Turner's picture and the allusion in Macaulay's *Life of the Battle of Lake Regillus*. The lake occupies the site of the ancient sanctuary of Diana Nemorensis. In its grove grew a sacred tree, from which whoever succeeded in breaking off 'the Golden Bough' had the right to challenge the priest of the sanctuary to single combat, and, if victorious, to reign in his stead. Sir J. G. Frazer sees here a survival of ancient tree-worship, the priest being an incarnation of the spirit of the tree, which passed continuously on his being killed into a new and more vigorous incarnation. He finds it also an evidence of primitive human sacrifice, and

identifies the Golden Bough with the mistletoe growing on the oak—the only thing in nature which could bring Balder to his doom. He has with unequalled learning and ingenuity traced many cognate customs in classical antiquity, as well as parallels in our modern rustic spring and midsummer customs, and finds the same significance of the death and resurrection of vegetation under the various forms of the Greek myth of Demeter and Persephone, the Syrian Astarte and Adonis, the Phrygian Cybele and Attis, the Egyptian Isis and Osiris.

See W. Mannhardt, *Roggenwolf und Roggenhund* (Danzig, 1865), *Die Korndamonen* (Berl. 1868), *Der Baumkultus der Germanen und ihrer Nachbarstämme* (Berl. 1875; new ed. 1904), *Antike Wald- und Feldkulte* (Berl. 1877), and the posthumous *Mythologische Forschungen* (Strassb. 1884); M. von Strantz, *Die Blumen in Sage und Geschichte* (Berl. 1875); H. Pfannenschmidt, *Germanische Erntefeste im heidn. u. christl. Cultus* (Hanover, 1878); Hilderic Friend, *Flowers and Flower-lore* (1884); V. Jahn, *Die Deutschen Opfergebräuche bei Ackerbau und Viehzucht* (Breslau, 1884); Evans, *The Mycenaean Tree and Pillar Cult and its Median-ranean Relations* (1901); J. G. Frazer, *The Golden Bough* (3d ed. 1911–15) and other works, various papers by Dr Rendel Harris.

Planudes, MAXIMUS. See ANTHOLOGY.

Planula. See HYDROZOA.

Plasencia, a decayed town of Spain, in Cáceres province, 130 miles W. by S. of Madrid and 43 N.E. of Cáceres, is surrounded with double walls (1197), has a fine Gothic cathedral (1498), and a pop. of 10,000. The monastery of San Yuste, to which Charles V. retired after his abdication, lies 24 miles to the east of Plasencia.

Plasma, a rare siliceous mineral, a variety of quartz or chalcedony, of a dark-green colour, black when unpolished and seen by reflected light, but sub-translucent when held between the eye and the light. It is very nearly allied to heliotrope or bloodstone. The name is also used in biology for the simplest form of organised matter in vegetable and animal bodies, out of which the tissues are formed, especially of the blood-plasma (see BLOOD).—*Plasmion* is the name given to a food powder prepared from separated milk.

Plasmodia. See CELL, MYXOMYCETES.

Plassey (*Paldist*), a battlefield on the Bhágirathi River, 96 miles N. of Calcutta. The river has now eaten away the scene of the struggle. Plassey is celebrated in the history of India for the great victory gained by Clive over Suraj ud Dowlah, subahdar of Bengal, 23d June 1757, a victory which really laid the foundation of British supremacy in India. See CLIVE.

Plaster. See CAST, GYPSUM, BUILDING.

Plastering, the art of covering the internal faces of walls, the partitions, and the ceilings of a house or other building with plaster. It is difficult to get plaster to keep completely dry on the inside faces of external walls unless they are first covered with lathing (narrow strips of wood, see LATH). Ceilings and wooden partitions are always lathed so as to hold or key the plaster. Plastering is sometimes done in two, but most usually in three coats. The first or foundation coat is formed of lime and sand (mortar) mixed with hair. This is called *pricking* if done upon lath, and *rendering* if it is spread on a bare brick or stone wall. It is crossed with deep incised lines to key the second coat, which consists of fine lime mixed with some coarse plaster of Paris (see GYPSUM) floated on. The first coat should be completely dry before the second is added, but the latter is generally still a little damp when the third coat or *set* is put on. This last coat is usually composed of a mixture of fine lime, plaster of Paris, and a little size, and

is worked so as to produce a very smooth surface. The implements used by the plasterer are chiefly trowels and floating tools, with running moulds for mouldings. Ceiling ornaments and other enrichments are formed of plaster of Paris cast in moulds. Mouldings are run in the same material.

Plaster of Paris. See GYPSUM, CEMENTS.

Plasters are a class of medicinal agents consisting of 'adhesive substances, spread upon leather or cloth, so as to stick to the part of the body to which they are applied.' The plasters of the British Pharmacopœia owe their adhesiveness either to a combination of oxide of lead with fatty acids, or to the presence of a tenacious resin, or to both. The most important are lead plaster, or diachylon, which enters into the composition of many of the others; resin and pitch plasters; belladonna plaster; mercury plaster; menthol plaster; soap plaster; and cantharides or blistering plaster. Some of the most tenaciously adhesive of plasters (not in the Pharmacopœia) are made with preparations of india-rubber. Court or sticking plaster, for dressing slight wounds, consists of a thin layer of isinglass spread upon silk, and differs from the others mentioned in requiring to be softened with warm water before it will adhere. They are employed with two distinct aims—viz. to act *mechanically*, as by affording artificial support to weak muscular structures, by preventing movement of injured or inflamed parts, as in fracture of ribs, sprain of the ankle, &c; and to act *medicinally* as counter-irritant, stimulant, anodyne, &c.

Plastilina. See CLAY.

Plata, LA. See ARGENTINE REPUBLIC, LA PLATA, LA PLATA (Río DE).

Platea (Gr. *Plataia*), a city in the western part of Boeotia, on the borders of Attica, and at the foot of Mount Cithæron, 6 miles from Thebes. In 480 B.C. it was destroyed by the Persians, because the inhabitants had taken part with Athens in the battle of Marathon; but in the following year it was the scene of the glorious victory won by the Lacedæmonian Greeks, under Pausanias and Aristides, over the Persian hordes commanded by Mardonius. In the third year of the Peloponnesian war (429) it was attacked by a Theban-Lacedæmonian force, and heroically defended itself for more than two years, until it was starved into surrender; the little garrison of about 200 men were put to the sword, and the city was razed to the ground. Such of the Plateans as escaped were hospitably received at Athens. By the treaty of Antalcidas (387) their children were allowed to go back again, and rebuild their city, after an exile of forty years; but they were again driven out by their implacable enemies the Thebans; and half a century elapsed before the victory of Philip of Macedon at Chæronea enabled the Plateans to return finally to their homes. After this the city was inhabited till the 6th century A.D.

Platanus. See PLANE.

Plateaus. See TABLELANDS.

Plate-marks. See HALL-MARKS.

Plate-powder, a composition of Rouge (q.v.) and prepared chalk used for cleaning gold and silver plate and plated articles. A gray plate-powder is also sometimes made by levigating quicksilver with twelve times its weight of prepared chalk; it puts a remarkable brilliancy on silver-plate, but is very injurious to it.

Plating signifies the covering of an inferior metal with one of the precious metals, the object being to give the appearance of silver or gold to articles chiefly intended for table use. Previous to the introduction of electro-plating (see ELECTRO-

METALLURGY) the method generally pursued was *Sheffield-plating*—by means of a plating furnace—soldering on to one or both sides of an ingot of the baser metal a thin plate of silver. See also TIN-PLATE, GALVANISED IRON.

Platinotype. See PHOTOGRAPHY.

Platinum (sym. Pt; atom. number 78; atom. wt. 194.8; sp. gr. 21.48 to 21.50) is one of the 'noble metals.' It is found only in the native state, usually occurring in small glistening granules of a steel-gray colour, which always contain, along with some gold, copper, iron, and sand, an admixture, in varying proportions, of several metals—iridium, rhodium, palladium, osmium, ruthenium—most of which are rarely found except in association with platinum. Sometimes, however, it is found in masses of the size of a pigeon's egg, and pieces weighing ten or even twenty pounds have occasionally been found. It was originally got in the Spanish gold-mines of Darien, but is now chiefly obtained from the Ural Mountains, though it has also been found in Brazil, Colombia, San Domingo, California, Oregon, Canada, Borneo, and the Transvaal.

There are two modes of obtaining platinum in the form of ingots from the crude native metal, both of which require notice. The earlier method—Cocks's, usually attributed to Wollaston (c. 1800–28)—was to precipitate a solution in *aqua regia* by a solution of sal ammoniac; the precipitate on incineration gave spongy platinum, which was pressed into form and hammered hot, so as to form an ingot, which it happens to be able to do, since platinum welds like wrought-iron when not too highly polished.

Deville and Debray's method is first to form a fusible alloy of this metal with lead, by exposing the platinum ore—2 cwt. being used in a single experiment, with equal weights of galena and litharge gradually added, and a little glass to act as a flux—to full redness in a reverberatory furnace lined with clay. The sulphur of the galena is oxidised and expelled, and the liquid alloy of lead and platinum is allowed to rest for some time, to allow the osmide of iridium, which is not affected by the preceding operations, to sink to the bottom. The upper portions of the alloy are then decanted, and cast into ingot-moulds, which are submitted to cupellation: and the metallic platinum which is left after the cupellation is melted and refined in a furnace of lime—which is employed in consequence of its being a very bad conductor of heat—by means of the oxyhydrogen blowpipe. The platinum obtained in this manner is nearly pure, and very ductile and malleable.

Platinum exhibits a bluish-white metallic lustre; it is exceedingly malleable and ductile, and is very infusible, melting only before the oxyhydrogen blowpipe, or in a very powerful blast-furnace, such as that used by Deville and Debray (fusing-point, 1779° C.). It expands less by heat than any other metal, and it is the heaviest form of matter known, with the exception of iridium (sp. gr. = 22.42) and osmium (22.48). It is unaffected by atmospheric action, and does not undergo oxidation in the air at even the highest temperatures. It is not acted on by nitric, hydrochloric, sulphuric, or hydrofluoric acid, or, in short, by any single acid; but in *aqua regia* it slowly dissolves, and forms a soluble tetrachloride. In consequence of its power of resisting the action of acids it is of great service in experimental and manufacturing chemical processes, platinum spatulas, capsules, crucibles, &c. being employed in every laboratory. Platinum is, however, corroded if heated with the alkalis or alkaline earths, and especially with a mixture of nitrate of potash and hydrated potash, an oxide

being formed which combines with the alkaline bases. In consequence of its infusibility and its non-oxidisability by atmospheric action, it is in great demand for electrical as well as for chemical apparatus. The introduction of platinotype processes in Photography (q.v.) caused such a run upon platinum that its price rose from about 35s. per oz. in 1880 to 80s. in 1890.

The form of the metal known as *spongy platinum* has been already noticed. The metal may, however, be obtained in a state of subdivision much finer than that in which it is left on heating the double chloride of platinum and ammonium—viz. in the state known as *Platinum Black*. In this form it resembles soot. It may be prepared in various ways, of which one of the simplest is to boil a solution of tetrachloride of platinum, to which an excess of carbonate of soda and a quantity of sugar have been added, until the precipitate formed after a little time becomes perfectly black, and the supernatant liquid colourless. The black powder is then collected on a filter, washed, and dried by a gentle heat. In its finely comminuted state, either as spongy platinum or platinum black, it possesses a remarkable power of condensing and absorbing gases, one volume of platinum black being able to absorb more than 100 volumes of oxygen. This absorption appears to be accompanied by a conversion of some or all of the oxygen into the modification known as Ozone (q.v.), since the metal becomes capable of exerting the most energetic oxidising action, even at ordinary temperatures. For example, it can kindle a jet of hydrogen, can oxidise sulphurous acid into sulphuric acid, ammonia into nitric acid, and alcohol into acetic acid, the rise of temperature in the last case being often sufficiently great to cause inflammation. Platinum in the compact form, as foil or wire, possesses similar powers, but in a far lower degree.

Platinum may be easily alloyed with most of the metals, the alloys being in general much more fusible than pure platinum. Hence care must be taken not to heat the oxides of metals of easy reduction, such as lead and bismuth, in platinum crucibles, as, if any reduction took place, the crucible would be destroyed by the fusion of the resulting alloy. An alloy of platinum, iridium, and rhodium is found, by the investigations of Deville and Debray, to be harder and capable of resisting a higher temperature than the pure metal, and hence is admirably adapted for the formation of crucibles, &c.; but it is not now in the market.

There are two *oxides* of platinum, a platinous PtO, and a platinic PtO₂. The *sulphides* and *chlorides* correspond in number and composition to the oxides. Of these compounds the tetrachloride, PtCl₄, alone requires notice. It is formed by dissolving platinum in *aqua regia*, and evaporating the solution to dryness; and it is obtained as a deliquescent, reddish-brown mass, which forms an orange-coloured solution in water, from which, on evaporation, it crystallises in prisms. It is also freely soluble in alcohol and ether. A solution of this salt is much used for the recognition and determination of potash and ammonia.

Plato, the great Athenian philosopher, was born during the early years of the Peloponnesian war, most probably in 427 B.C. Diogenes Laertius (q.v.), in his gossiping *Lives of the Philosophers*, and other writers of the Christian era have handed down a considerable amount of detail respecting his life, but most of it is of very doubtful value. As time went on, legends gathered round a famous name; and many of the authorities used by Diogenes were in all probability, like Diogenes himself, almost entirely wanting in critical capacity. According to one account Plato was born in Athens itself, according to another in

the island of Ægina. He came of an aristocratic family, his father Ariston boasting descent from Codrus the last king of Athens, who was said to be descended from the god Poseidon; whilst the family of his mother, Perictione, claimed kinship with Solon, and through Solon with Neleus, a son of Poseidon. Even this double claim to superhuman ancestry was not sufficient for the admirers of the 'divine' Plato. Diogenes tells us on the alleged authority of (among others) Speusippus, Plato's own nephew and successor in the academy, that the story was current at Athens that his real father was Apollo, and that the god appeared in a vision to Ariston, who thereupon kept away from his wife till her child was born. Plato's birthday was celebrated on the same day (at the end of May) as that of Apollo himself. Bees from Hymettus are said to have fed the infant with their honey. Plato was originally named after his grandfather, Aristocles; but his gymnastic teacher is said to have called him 'Platōn,' because of his broad shoulders, though others say he got this name from the breadth of his forehead. There is a story that he wrestled at the Isthmian games. He cannot well have escaped military service during the terrible struggle of Athens in the last years of the Peloponnesian war. In youth he is said to have written poetry, and this we can easily believe: a few epigrams in the 'Anthology' are ascribed to him. With regard to his philosophical education we have the important testimony of Aristotle (*Metaph.* i. 6), that from his youth he had been familiar with Cratylus, a follower of Heraclitus, and that the other philosophic influences under which he came were those of Socrates and of the 'Italic' schools—i.e. Pythagoreans and Eleatics. Critias (afterwards one of the 'Thirty Tyrants') and Charmides were both maternal relatives of Plato, and both belonged to the Socratic circle. Possibly it was through them that Plato came under the decisive influence of Socrates. If Plato was, as Diogenes says, twenty years old when he first became companion of Socrates, his discipleship lasted for eight years. According to his own account in the *Phædo*, Plato was prevented by illness from being present at the last conversation and death of his master (399 B.C.).

Plato made no attempt to enter on a political career. Through family ties he was connected with the anti-democratic party, who admired Sparta. His youth was passed amid the disasters and failures of the Athenian democracy; and the martyrdom of the teacher who had inspired him would not tend to increase his sympathy with that form of government. After the death of Socrates he seems to have stayed some time at Megara, where Euclides, who had been one of the Socratic circle but belonged also to the Eleatic school, had established himself. Euclides developed the Eleatic philosophy in the direction which Zeno ('the father of logic') had begun—he was chiefly occupied with what, after Aristotle's time, came to be considered logical questions. His school was known as the 'Dialectical' or 'Eristic'—i.e. 'disputatious.' This sojourn at Megara was doubtless an important stage in the development of Plato's thought. How long he stayed at Megara we do not know; nor can we tell with certainty whether he was back at Athens in 394 (he is said to have taken part in a Corinthian campaign), or whether he did not return to Athens till ten or twelve years after the death of Socrates. During this period of his life he is said to have undertaken extensive travels—to have visited Cyrene, Egypt, Italy, and Sicily. The visit to Sicily is almost certain; visits to the Magi and the Persians, the Babylonians, and the Hebrews are undoubtedly fictions of a later age, which supposed that wisdom could only come out

of the East. The despotism of the elder Dionysius in Syracuse probably helped to suggest the pictures of the tyrant in the *Republic* and *Gorgias*. On his way back from Sicily Plato is said to have been seized by order of Dionysius and sold as a slave in Ægina, but to have been ransomed by a certain Anniceris of Cyrene. The return to Athens has been variously assigned to the years 389 and 387. Plato now began to teach in the Academy (q.v.), a place of exercise in the western suburb of Athens, planted like a grove, and named from the hero Acadēmus. There and in his own garden, which was adjacent, he gathered round him a band of disciples, teaching them probably, like his master Socrates, mainly by conversations, and embodying the results of his thinking and teaching in his written *Dialogues*. Two more visits to Sicily interrupted the quiet of these later years. Soon after the death of the elder Dionysius (368) his friend Dion summoned him to come to Syracuse, in the hope that he might convert the younger Dionysius to philosophy, and so realise the dream of a philosopher-king. The young despot welcomed him warmly, but soon became weary of serious discussions, quarrelled with Dion, and banished him; and Plato had to give up his fruitless task. A third journey to Sicily (about 361) was undertaken in the vain attempt to reconcile Dionysius to Dion. Plato's own life, it is said, was only saved from the tyrant by the intercession of the Pythagorean Archytas. On his return to Athens (360) he again resumed his teaching and writing, till, after a peaceful old age, he died 'in his eighty-first year' at a wedding-feast (347). He was succeeded in the Academy by his sister's son, Speusippus; but his greatest disciple was Aristotle, who must have come under his influence after the return from the second Sicilian voyage.

Of Plato's philosophical writings none apparently have been lost; but along with undoubtedly genuine works there have come down to us others whose authenticity is open to question. Thrasyllus, a scholar of the time of Augustus and Tiberius, considered thirty-six of the works ascribed to Plato to be genuine, rejecting a few quite unimportant writings as spurious. This 'canon of Thrasyllus' probably represents the tradition of the Alexandrian library. Aristophanes, one of the Alexandrian librarians (about 264 B.C.), had arranged several of Plato's dialogues in 'trilogies' (groups of three), following the analogy of Attic dramas. Plato himself suggests at least two such trilogies—viz. *Republic*, *Timæus*, *Critias* (unfinished); *Sophist*, *Statesman*, *Philosopher* (never written). Thrasyllus adopted an arrangement in tetralogies, making nine groups of four, only one of which groups (viz. *Euthyphro*, *Apology*, *Crito*, *Phædo*), which give a connected picture of the trial, last days, and death of Socrates) is anything but extremely artificial. Grote accepts all the works in the 'canon of Thrasyllus,' believing that the Alexandrian library had every means of obtaining a genuine collection of Plato's writings from his successors in the Academy; but almost all other modern scholars reject the *Epistles*, some of which may, however, be very early forgeries. And the authenticity of some ten or more of the dialogues has been very much disputed. Fortunately, the more important works are the least open to question. We have Aristotle's statement that the *Laws* were written by Plato after the *Republic*. Beyond that we can only conjecture the order in which the dialogues were written; and the hypotheses of different scholars have varied greatly. We may safely put aside the theory of Schleiermacher (with whom the modern critical study of Plato begins), that Plato quite early in life had formed a complete system of philosophy in his mind, and that

the dialogues were published by him in an order intended to unfold this system gradually to the world. It would be more true to say that Plato never had any completely formed system, and during a long life of speculation his opinions must have undergone modification. We cannot, indeed, with complete certainty arrange his dialogues in a series representing exactly his mental development (as K. F. Hermann and others have attempted); but the student may most profitably consider them in groups, suggested by the different influences that acted on him, and especially by his changing attitude towards the teaching of Socrates. First of all would come those short dialogues in which, so far as we can judge by comparing him with Xenophon, Plato does not go beyond what the actual Socrates might have said. Such are the dialogues which deal with some particular virtue; thus, in the *Charmides* Socrates questions the beautiful and modest youth Charmides as to what the virtue of modesty or 'temperance' is. In the *Laches* he questions the soldier Laches about courage. The most important of this group is the *Protagoras*, in which Socrates argues against this famous sophist that all virtue is one, and that it is identical with knowledge. Some of these slighter dialogues may have been composed before the death of Socrates; Diogenes Laertius tells us that Socrates on hearing Plato read the *Lysis* (which deals with friendship) said: 'O Hercules! what a lot of lies the young fellow has told about me.' Ancient tradition made the *Phædrus* the earliest dialogue; but this almost certainly belongs to a later period, though earlier than the *Republic*. The *Apology*, or 'Defence of Socrates on his Trial,' has probably more historical accuracy than any other composition of Plato's (Plato tells us he was present at the trial), and may have been written soon after the death of Socrates. The *Euthyphro* (concerning piety) and the *Crito* (Socrates in prison) may belong to the same period. The *Phædo*, however (the last conversation of Socrates, on the immortality of the soul), is probably of later date, as it implies the theory of ideas, and may be assigned to a time after Plato's visit to Sicily—i.e. after he had come more strongly under Pythagorean influences. Some modern scholars, laying great stress on the 'Megarian' influence, assign the great metaphysical dialogues (*Parmenides*, *Theætetus*, *Sophist*, *Statesman*) to the time between 399 and 386, when Plato began his teaching at the Academy. Others, with more probability, consider these dialogues and the *Philebus* to belong to a later period than the *Republic*, and this opinion is gaining ground. The *Phædrus*, *Symposium* ('Banquet'), *Gorgias*, *Republic*, *Phædo*, in which (along with the *Theætetus*) Plato's literary skill is at its very highest, may perhaps be all assigned to the period of his life after forty, but before his old age. In these dialogues the personal characteristics ascribed to Socrates are probably represented with historical and, at least, with dramatic truth; but theories are introduced which betray strong Pythagorean influences. We must of course remember that while Plato idealises Socrates, and makes him more of a metaphysician than in all probability he was, Xenophon, who has a very unphilosophical mind, most certainly understates him, and makes him more of a commonplace moralist than he must have been in order to stimulate Greek thought as he did. In the *Timæus* Plato would have felt it inappropriate to make Socrates the exponent of theories about the physical universe, and after a short introductory conversation the dialogue form is deserted, and Timæus, a Pythagorean, expounds the cosmogony of his school. In the *Sophist* and *Statesman* 'an Eleatic stranger' is the chief speaker; in the

Parmenides the youthful Socrates is criticised by the great Eleatic philosopher. In the *Laws* Socrates does not appear at all, the leading speaker being 'an Athenian stranger' (Plato himself?). May we not regard this as an indication that in his later years Plato felt himself farther away from his master? These later dialogues, in fact, seem like a transition from the Plato of the *Phædrus* and of the *Republic* to Aristotle.

It is customary to treat of Plato's philosophy under the three heads of dialectic (or logic), physics, and ethics. But, it must be remembered, these divisions did not exist for Plato himself, nor, in fact, had he, strictly speaking, a 'system' of philosophy. Plato's philosophy may most correctly be regarded as a development of the teaching of Socrates, but containing elements derived from the earlier philosophies from which Socrates had purposely turned away. Aristotle's philosophy is, however, a development of Plato's; and we, knowing what becomes of Plato's suggestions in the hands of his pupil, are able and apt to see a greater amount of system than Plato himself would have recognised.

The dialogue was to Plato much more than a mere literary form into which he chose to fit his thoughts. The 'conversations of Socrates' gave to Plato his conception of the method of philosophy. 'Dialectic' comes from a word which means 'to converse,' 'to discuss,' and it is significant that Athenian philosophy originated not in the meditations of the solitary recluse, but in the discussions of a city of talkers. It is said that Zeno the Eleatic used the dialogue for philosophical writing before Plato, but this is very doubtful. In many of the later dialogues the chief speaker has so much of the talking to himself that the dialogue becomes a rather empty form, and is evidently yielding place to the lecture as the vehicle of philosophical exposition.

According to a well-known sentence of Aristotle, the germs of logical doctrine which may be ascribed to Socrates are 'the inductive method' and the endeavour to get 'general definitions.' When people spoke about persons or acts as just or beautiful, Socrates would insist on asking 'What is justice?' 'What is beauty?' and would test every definition brought forward by applying it to particular instances, content to remove error even where complete truth could not be obtained. This is the procedure of Plato in the earlier dialogues. In the *Theætetus*, however, the Platonic Socrates asks the profounder question, 'What is knowledge?'—i.e. true or scientific knowledge. It is not 'sensation' (or 'perception'), as Protagoras and his followers suggest: sensation alone gives us no objective certainty, valid for every one. Nor is it 'opinion.' Opinion may be true, but has no certainty. A man only 'knows' when he has got at the reasons or causes of things, when he sees facts not in an isolated way, but connected by the 'chain of causation' (*Meno*): he must be dealing with what is permanent and universal. What then is this? Plato's answer comes to be found in the theory of 'Ideas.' (The word means properly 'forms' or 'shapes,' and so 'kinds.' The analogy of sculpture may help one to understand how the Greeks came to regard 'the form,' in contrast to the 'material,' as the essential element.) This theory, following Aristotle's guidance, we may consider a development of the Socratic 'universal conception,' and also of the Pythagorean doctrine of 'numbers.' By this theory Plato seeks to reconcile the opposing views of the Heracliteans and of the Eleatics (q.v.). According to Plato, both the one, the permanent, and the manifold, the changing, have their place in the universe, the former in the world of ideas, the

intelligible world, with which 'science' deals, the latter in the world of sense, with which mere 'opinion' is content. In the *Republic* Plato elaborates this theory of knowledge, and gives a symbolical representation of it in the famous image or 'myth' of 'the Cave'. The majority of mankind are pictured by him as prisoners in a subterranean cavern, chained with their backs to a fire, looking at the shadows thrown by it on the rocky wall and mistaking them for realities. The turning round of some of these prisoners to the light, and the toilsome ascent up the steep slope to the mouth of the cave, and the gradual training of their eyes bewildered in the sunlight to see the real things in the upper world, and finally to look up to the sun itself—this represents the education of the philosopher. Education is 'a turning round of the eye of the soul.' Learning, according to the more startling language of the *Meno* and *Phaedrus*, is 'recollecting': the soul in a previous existence has beheld the 'ideas,' and knowledge is possible just because the mind does not acquire something alien to it, but recovers what is its own. The way from the life of the senses and of mere vague opinion to the highest or philosophical knowledge is through the mathematical sciences. Mathematics, being the only science which had then outgrown the merest infancy, is to the Greeks the type of science in general. (Plato is said to have had the words 'Let no one ignorant of geometry enter' inscribed on the door of his school.) In the conceptions of mathematics we have a clue to the understanding of Plato's theory of ideas. The geometrician looks at a particular triangle, but he speaks not of *this*, but of *the* triangle. The triangles we see are triangles only by 'participating in' ('imitating,' the Pythagoreans would have said) *the* triangle. And it remains true for us still that we can only scientifically know anything in so far as we can find in it a universal element, which manifests itself or 'is present' (in Platonic language) in the particular. The botanist, for example, knows a particular plant only as a specimen of a *species* (the Latin equivalent of Plato's 'idea'). But the philosopher must not remain in the region of the various special sciences: he has the passion for unity and universality. Plato has a vision of the true science which is above all particular sciences, and is the unity and 'coping-stone' of them all; and this he calls in a special sense 'dialectic,' which does not like mathematical thinking need the help of sensible images, but deals with 'ideas' alone in their relation to one another and to the highest of all, 'the idea of the good.' These ideas are not mere concepts of our minds: they are, in Plato's phrase, 'the most real existences.' The extreme form of mediæval 'Realism,' according to which universals are prior to and more real than particular things, is a crude version of Plato's doctrine. It is indeed an adaptation of Platonic philosophy to Christian theology, for which Plato gives no sanction, if the ideas are called 'the thoughts of God'; but the phrase is perhaps less misleading than many others which have been used about them. Plato does speak (in *Republic*, x.) of God having 'made' the ideas, as a human artificer makes things in imitation of them; but he is there talking in pictorial language. God in Plato's system is rather the 'idea of the good,' the good-in-itself, which is the cause alike of knowing and of being, as the sun in the visible world is the cause both of light and of life. In the *Timæus* the world is said to be fashioned by the Creator or Artificer after the pattern of the ideas; but here also the language is figurative. Plato's 'ideas' must, however, be thought of both as 'real kinds' and as archetypes. Plato's presentation of his theory varies: most probably the theory itself underwent modification. In the

Parmenides some of the objections made to it are the same as were afterwards urged by Aristotle—a remarkable instance of a philosopher criticising himself.

The relation of the hierarchy of the ideas to the supreme idea of the good is nowhere worked out by Plato. Dialectic remains only an ideal science. The true dialectician is he who will see things in their unity (compare Herbert Spencer's definition of philosophy as 'completely unified knowledge'): he will also 'divide things rightly according to their kinds.' The method of philosophy is a bringing together and a dividing (*synagōgē* and *diairesis*). In this we may recognise the germ of Aristotle's 'induction and deduction.'

The *Timæus* is the one work which Plato has devoted to the philosophy of nature; and though it has exercised directly and indirectly an enormous influence over the ancient and mediæval world, as it has specially attracted mystical and theosophical commentators, in Plato's own view it occupies a very subordinate position. We are again and again warned by him not to expect strict truth, but only approximations and figurative statements ('myths') in dealing with such subjects. The notion of 'emanations,' which plays so great a part in later philosophy is latent in the *Timæus*. The *Cosmos*, or order of the universe, is the 'one only-begotten' image of God, its father and creator (*Demiourgos*—i.e. 'artificer'). The Creator was good, and wished to make the world as like himself as possible; but no created or visible thing can be perfect. The material out of which the orderly world is made introduces imperfection into it. (This conception of matter as evil had a potent influence in later times, especially when combined with Oriental ideas—e.g. in Gnosticism, q.v.) So, too, the eternal Creator could not make the world eternal like himself, and in making it made Time, 'the moving image of eternity.' To the obscure details of Plato's cosmology and physics it would be unprofitable to refer here. Cosmology is again introduced, but briefly, and with similar warnings that it is to be treated as mythical, in connection with the immortality of the soul in the *Phædo* and *Republic*. The soul of man (like the 'soul of the universe') is intermediate between the ideas and the corporeal. The human soul, as it exists in the body, has three parts or elements: (1) the rational; (2) the spirited element; (3) the appetitive. The rational element alone, which is the soul in its true being as it is apart from mixture with body, is properly immortal. The doctrine of immortality (i.e. the pre-existence of the soul as well as its existence after death) is introduced in the *Phædrus*, *Republic*, and *Phædo*, and is the main subject of the third. In all Plato makes use of the Pythagorean notion of transmigration. What he says must be taken as largely mythical and figurative. His whole philosophical thinking implies the eternity of Reason, but how far he believed in what is now understood by personal immortality has been and may be doubted. Wordsworth's famous *Ode on Immortality* is generally considered 'Platonic'; but it turns on a misapplication of Plato's doctrine of 'recollection.' Plato would certainly not hold that the new-born infant is nearer perfection than the aged philosopher.

Plato is so far true to the example of Socrates that, though he has metaphysical interests which were alien to his master, yet the practical interest always predominates. Philosophy is to him not mere intellectual speculation, but a habit of mind and a manner of living. As we have seen, the highest of the ideas is 'the good.' He cannot accept the Cyrenaic view that pleasure is the good; but neither does he agree with the Cynics that all pleasure is evil. Pleasures are good or bad, high

or low, according to the part of the soul to which they belong. Socrates had identified virtue and knowledge, had asserted that virtue was one, and that virtue could be taught. All these doctrines Plato accepted; but modifications gradually appear. In the *Republic*, the dialogue in which all the various elements of his philosophy are united more than in any other, Plato accepts without proof the popular distinction of four 'cardinal virtues' (as they afterwards came to be called), and fits them in with his psychology. Wisdom is the virtue of the reason, Courage of the spirited element, Temperance (i.e. Moderation, Self-control in general) is the virtue of the lower parts in their relation to the higher, while Justice ('Righteousness' would perhaps be a better word) is not the virtue of any special part, but of the whole soul, and is defined as 'every part doing its own work and not interfering with the others.' To arrive at the nature of Justice (the professed object of the discussion) the Platonic Socrates has turned 'from the small to the large letters'—i.e. from the individual to the state, where human nature can be seen 'writ large.' Wisdom is the virtue of the rulers, Courage of the warriors, Temperance or Moderation is the harmony resulting from the obedience of the lower to the higher, and Justice is the virtue of the whole state. A perfect state would require a special ruling caste, and the only true rulers in Plato's opinion are philosophers. Plato allows that there may be ordinary virtues resulting from custom or right opinion (cf. *Meno* and *Phaedo*), but the highest type of conduct must be bound up with the highest type of knowledge. Those alone who have the philosophic nature (which is sometimes described by him as the passionate love of truth) are the proper rulers in a perfect state, and in the philosophic nature all virtues are united. In this ideal commonwealth (the parent of so many 'Utopias'), besides the paradox of the philosopher-king, the other paradoxes by which Plato startled his contemporaries were (1) that men and women should have the same education and the same pursuits, and (2) that private property and the family should be abolished. All things were to be in common; and the breeding and rearing of the citizens was to be entirely under the control of the philosopher-rulers. Just as in his theory of knowledge Plato's ideal is unity, so his political ideal is that the state should be as much as possible one, one as a family is one, or rather as one individual is. All are to be 'members of one body.' Some of the features in Plato's ideal state were doubtless suggested to him by the Pythagorean brotherhoods, many of them by the actual institutions of Sparta. In fact, Plato's ideal state might be described as a combination of philosophy with Spartan military discipline. Without the philosophy we have an inferior form—the Spartan state, or 'timocracy,' in which not philosophy but military honour is the ruling principle. Inferior to that comes oligarchy, of which the ruling principle is wealth. Lower still is democracy, the equality of good and bad alike; and worst of all is tyranny, the rule of the 'wild-beast element in man.' In the *Statesman* Plato gives a rather different classification of constitutions, recognising both a better and a worse form of democracy, and placing both below aristocracy, but above oligarchy: in the true state the number of the rulers matters not, if only they have 'the science of ruling.' In the *Lysis* he elaborates a second-best state, giving up communism as too difficult of attainment, and proposing a complete equalisation of property. In the *Lysis* also he praises 'mixed government.'

In the earlier part of the *Republic* Plato discusses the place of art in education. Homer and

Hesiod were the Greek 'Bible'; but Plato objects to much in the poets and in the popular religion as false and immoral. Music and poetry should be simple (here again the complex, the manifold, is of the nature of evil), and should imitate only what is good, hence dramatic art is especially objected to. Towards the end of the dialogue he goes further, and objects to all 'imitation,' whether in painting or in words, as being only a copy of the so-called real things, which are themselves only a copy of the true reality—the ideas: and so he drives the poets from his ideal state. Aristotle's *Poetics* may be regarded as in part a 'Defence of Poesy' against Plato's criticism. Why, it has often been asked, has Plato, himself so great an artist, dealt so Puritanically and so unsympathetically with art? Partly, perhaps, because the first steps in reflection about art, as about religion, imply a certain withdrawal from the sway of that which is to be criticised and understood. But the *Republic* gives only one side of Plato's thought on art. In the *Symposium* (in which the banqueters praise Love in turn) and in the *Phaedrus* 'the beautiful' occupies the same place that 'the good' does in the *Republic*. Plato is after all a true Athenian, and thinks of the good under the form of the beautiful. ('Beautiful-and-good' is the Greek equivalent of 'noble' or 'gentleman' in its best sense.) 'All that is good is beautiful,' he says in the *Timæus*. The true lover is akin to the philosopher, and loves the beauty of the soul rather than the beauty of the body, and ascends from the love of the many beautiful to the love of absolute beauty. There is indeed a strain of asceticism in Plato's view of life; but there is none of the Cynic contempt for the beauty of the human form and for the graces of social intercourse. In the *Phaedo* Socrates speaks of the body as 'the prison-house of the soul,' and of philosophy as 'the practising of death.' But Socrates at the banquet speaks somewhat differently from Socrates awaiting his end: and in the *Republic* the body has to be carefully trained that it may be a fit servant of the soul, and the young are to grow up amid fair sights and sounds.

Plato's influence on human thought has been even more widely diffused, but is more difficult to measure than that of Aristotle. The various schools of the Old, Middle, and New Academy caught only a small portion of his spirit. The Stoics, especially the later Stoics, borrowed much from him. Perhaps no school of Greek philosophy was unaffected by him. In Alexandria Jewish thinkers fell under his fascination (see PHILO); and Christian theology is largely Platonic. But the Alexandrian Platonists and the Neoplatonists (see NEOPLATONISM) differ from Plato himself in making the *Timæus* the centre of his system. The writings ascribed to Hermes Trismegistus and Dionysius the Areopagite belong to the Neoplatonic period. The latter was translated by Erigena in the 9th century, and Platonism reached the western world in the middle ages through the medium of those mystical writers. The Italian Renaissance and the revolt against Scholastic Aristotelianism revived the study of Plato's own writings; but the enthusiasm for Plato in the 15th century at Florence and the less important 'Cambridge Platonism' of the 17th century were both after the Neoplatonic manner, and, like the mediæval 'Aristotelianism,' brought more veneration than understanding to the interpretation of the philosopher. Of all Plato's disciples (to adapt a famous saying) perhaps only one had understood him—Aristotle—and he did not. His criticisms are often strangely unsympathetic. Yet Aristotle's whole system gives a more trustworthy clue to Plato's real philosophical significance than is to be

got from mystical interpreters whose zeal was not always according to knowledge (see ARISTOTLE).

The first printed edition of the Greek text of Plato is the Aldine (Venice, 1513). Plato is constantly cited according to the pages of the edition printed by H. Stephanus (Paris, 1578). There are editions by Stallbaum, Baier, Orelli and Winckelmann, K. F. Hermann, Schanz, and Burnet (works, 5 vols. 1900-8; *Phædo*, 1911; *Euthyphro*, *Apology*, *Crito*, 1924). Plato was first printed in Latin translation by Ficino (Flor. 1483), which was the best outcome of the Platonic revival, and is the basis of the ordinary Latin versions. A complete English translation was published by Thomas Taylor, 'the Platonist'—i.e. Neoplatonist, in 1804 (including nine dialogues translated by Sydenham about 1759). The poet Shelley translated the *Symposium* (included along with other fragments of Platonic translations in Buxton Forman's edition of his *Works*). Jowett made Plato an English classic (*Trans. with Introductions*, 3d ed. 1892; reissued 1925). In the 'Loeb Library' is an edition with translation by various scholars. There are many translations of separate dialogues. Among works on Plato's philosophy may be named Grote's *Plato*; Whewell's *Platonic Dialogues* (1860); Zeller's *Plato*; Pater's *Plato and Platonism* (1893); T. B. Strong's *Platonism* (1896); Bussell's *The School of Plato* (1896); Gomperz's *Greek Thinkers* (trans. 1901-5); J. A. Stewart's *The Myths of Plato* (1905) and *Plato's Doctrine of Ideas* (1909); A. E. Taylor's *Plato* (1922), *Platonism and its Influence* (1925), and *Plato, the Man and his Work* (1926); the *Histories of Philosophy* by Schweigler, Ueberweg, Erdmann, &c. Lutoslawski in *The Origin of Plato's Logic* (1897) rearranged the order of Plato's works on the ground of style alone, the doctrine of the ideas as objective existences being, he asserts, but a passing phase. Wilamowitz-Möllendorf's *Platon* (1919) is an important and valuable work in spite of defects. For the Cambridge Platonists, see the articles LATITUDINARIANS, CUDWORTH, MORE, SMITH (JOHN), WHITCHOTE.

Platoff, COUNT MATVEI IVANOVICH, was born at Azov, 17th August 1757. He served in the Turkish campaign of 1770-71, and in subsequent wars showed such capacity and courage that he was named by Alexander I. in 1801 Hetman of the Cossacks of the Don. As such he took part in the campaigns against the French, 1805-7, and, after the enemy had evacuated Moscow, hung upon their rear with pitiless pertinacity, wearing them out by incessant attacks, cutting off straggling parties, and capturing their convoys of provisions. He defeated Lefebvre at Altenburg, 28th May 1813. After the French disaster at Leipzig he harassed their retreat on French soil, gained a success at Laon, and made his name memorable by the devastations of his hordes of semi-savages. He was enthusiastically welcomed, and presented with a sword of honour on the occasion of his visit to London in company with Blücher. The tsar gave him the title of Count in 1812. After the war he retired to his own country, and died near Tcherkask, 15th January 1818.

Platonic Love, the love of soul for soul, a love into which sensual desire is supposed not to enter at all. See the last paragraph but one in the article PLATO.

Platt-Deutsch, or LOW GERMAN, the direct descendant of Old Saxon, is spoken to-day in different dialects by the peasantry of north Germany from the Rhine to Pomerania. It resembles Dutch, Flemish, Frisian, and English in the absence of the High German consonant-shift, and has simple grammatical rules. It is very appropriate in the mouths of the people who use it, their chief characteristics being naïveté, a childlike good-nature, and sturdy honesty; and it lends itself readily as a vehicle for fairy-tales, folk-tales, and simple folk-songs, such as those collected in Firmenich's *Germaniens Völkerstimmen*. Klaus Groth (q.v.) and Fritz Reuter (q.v.) have given it a high literary standing.

See German works on Platt-deutsch literature by Krüger (1913) and Stammeler (1920); Schön's *Geschichte der deutschen Mundartdichtung* (1921); also the articles GERMANY (*Language and Literature*), GRIMM'S LAW, EULENSPIEGEL, REYNARD THE FOX.

Platte, or NEBRASKA, an affluent of the Missouri River, is formed by the junction in west central Nebraska of the North and South Forks, which rise among the Rocky Mountains, in Colorado, are respectively some 800 and 550 miles long, and are neither of them navigable. The general course of the Platte is eastward, in a wide shallow stream, over the treeless plains of Nebraska, till it reaches the Missouri after a winding course of about 450 miles. With its forks it drains some 300,000 sq. m., but like them it is not navigable.

Platten-See. See BALATON.

Plattsburg, capital of Clinton county, New York, on Lake Champlain, at the mouth of the river Saranac, 73 miles by rail S. of Montreal. It has manufactures of flour, lumber, iron, typewriters, sewing-machines. In Plattsburg Bay, on 11th September 1814, a British flotilla of sixteen vessels was defeated and partly captured by Commander Thomas Macdonough, with fourteen vessels; while a large land force, under Sir George Prevost, was repulsed by General Macomb, with 1500 men. Pop. 11,000.

Platypus. See ORNITHORHYNCHUS.

Plauen, in Vogtland, one of the most important manufacturing towns of Saxony, stands in the south-west corner, on the White Elster, 78 miles S. of Leipzig by rail. Its chief industries are the manufacture of muslin, gauze, tulle, curtains, lace, embroidery, textile machinery, and large bleaching and spinning works. Pop. (1890) 46,899; (1919) 104,918; (1925) 109,953.

Plautus, M. ACCIUS (or more correctly *T. Maccius*), the chief comic poet of Rome, and probably among his own countrymen the most popular Roman author of any age, was born about 250 B.C. at Sarsina, a village in Umbria, a district which must at this time have been thoroughly Latinised. We have no knowledge of his early life and education, but it is probable that he came into Rome while still young, and acquired there his complete mastery of the most idiomatic Latin. Though born in the country, he introduces countrymen chiefly as subjects for ridicule; he always writes as a townsman, familiar with city life, especially among freedmen, craftsmen, and the middle classes. At Rome he found employment in connection with the stage, of what kind precisely we do not know. In this position he saved money enough to enable him to leave Rome and start in business on his own account in the way of foreign trade; and such early thrift shows strong character and determination to rise in the world. His plays evince close familiarity with seafaring life and adventure, and an intimate knowledge of all the details of buying and selling and keeping accounts—experience probably acquired during this period. We know that he failed in business, and returned to Rome in such poverty that he had to earn his livelihood in the service of a baker by turning a hand-mill, work generally performed by slaves. At this time, shortly before the second Punic war broke out, he was probably about thirty years of age, and while in this humble occupation he composed three plays which he sold to the managers of the public games. The price paid him enabled him to leave the mill, and he spent the rest of his life at Rome. Probably he commenced to write about 224 B.C., and for forty years, until his death in 184, he continued to produce comedies with wonderful fecundity. Most of the plays we have belong to the last ten years of

his life. It is not certain whether Plautus ever obtained the Roman franchise. He was the contemporary of Nævius and of Ennius.

His plays appear not to have been published during his lifetime, but to have been left in the hands of the actors, who probably both interpolated and omitted passages to suit them for the stage. Almost all the prologues were written after his death. About 130 plays were attributed to him in the time of Gellius, who held most of them to be the work of earlier dramatists, revised and improved by Plautus. Roman critics considered most of them to be spurious. Varro in his treatise *Questiones Plautinae* limited the genuine comedies to twenty-one; and these so-called 'Varronian comedies' are the same which we now possess, only one, the *Vidularia*, being lost. Plautus' plays were immensely popular on the stage, not only with the people, but with the educated classes, and were acted, as Arnobius tells us, in the time of Diocletian, five centuries later. Plautus borrowed his plots to a large extent from the New Attic Comedy, which dealt with social life to the exclusion of politics; he doubtless imitated its general types of character, but he 'adapted' very freely, and infused into his borrowed framework a new and robust life, which was Roman to the very core. His perfect spontaneity, vivacity, and vigour of language, and the comic power of his dialogues, show that these are the genuine fruit of his own genius. The scenes of his comedies are always laid in Athens or in some Greek town. Had he depicted the family life of Romans as so corrupt, the magistrates would no doubt have interfered; but the Greek personages of his plays speak and act in every respect like Romans; they refer familiarly to places in Italy, to streets, magistrates, and customs at Rome. Not even Shakespeare is more careless about inconsistency of this kind. It is probable that Plautus wrote with great rapidity; some of his finest comedies are spoilt through the action being too hurried towards the close. Roman comedy expressed 'a rebound from the severer duties of life;' Plautus' audience were in holiday mood, and did not expect to be admonished as to duty or entertained with serious reflection. His leading characters possess boundless animal spirits, infinite resource in difficulty, and but small conscience. His heroines show that, as Sellar says, Plautus was more familiar with the ways of 'libertinae' than of Roman ladies. His favourite subject is a plot by which a slave, on behalf of his young master and the mistress of the latter, cheats a father or some one else. Plautus shows no feeling for nature, though he is fond of describing the sea in calm and storm; his lack of any sense of natural beauty and of high imagination makes a deep gulf between him and Aristophanes. Yet he shows distinct creative power, as in the character of Euclio the miser in the *Aulularia*, who, though entirely possessed by his one idea, is still honest and independent and not contemptible. Fine touches are not wanting. In the *Captivi* the slave Tyn-darus, cheerfully willing to sacrifice all for his young master, shows that Plautus had the power to conceive a really noble character. The charm of Plautus, lying in his genuine humour and powerful grasp of character, goes deep down to the roots of human nature; he delights his readers to-day as truly as when he made Roman theatres ring with applause, or when St Jerome solaced himself in his cell by reading the well-loved comedies. His joyous sense in all circumstances of the gladness of life is the sign of a strong and manly nature; he makes his reader look involuntarily at the bright side of things. According to Sellar, the five best plays are *Aulularia*, *Captivi*, *Menæchmi*, *Pseudolus*, *Rudens*. Shakespeare has imitated the plot of the *Menæchmi*,

entirely recasting it, in his *Comedy of Errors*. Molière's *L'Avare* is borrowed from the *Aulularia*. So probably Plautus utilised Greek comic authors.

English translations are by Thornton and Warner (1767-74), Riley (1880), Sugden (1895), Allison (five plays, 1914), Wright and Rogers (three plays, 1925), and Nixon (with text, 5 vols. 'Loeb Library,' 1916 *et seq.*). Ritschl showed great acuteness in restoring Plautus' text, which is very corrupt; see the edition by Goetz and Schoell (1893-94), and that of W. A. Lindsay (1903); Westaway, *The Original Element in Plautus* (1917); also Sellar's *Roman Poets of the Republic*.

Play. See ATHLETIC SPORTS, and the articles on the several sports and games; also Groos, *The Play of Animals* (trans. 1898); *The Play of Man* (trans. 1902).—For stage plays, see DRAMA, THEATRE. A relic of the censorship of the press survives in Britain in the licensing of stage plays. By an Act of 1843 no plays may be acted for hire till they have been submitted to the Lord Chamberlain, who may refuse to license them in whole or in parts; the official who reads them for this purpose being the 'examiner of stage plays.' A penalty of £50 attaches to the offence of acting an unlicensed or prohibited play; and the theatre in which it is represented forfeits its licence. During the reign of Charles I. the censorship, which for three-quarters of a century had been entrusted to the Master of the Revels and others, was in the hands of the Lord Chamberlain. This arrangement, of course, came to an end with the closing of the theatres at the beginning of the Civil War. The censorship as it now exists owes its origin to Sir Robert Walpole, who acted from purely political motives. Fielding had produced his play *Pasquin* in 1736, and next year *The Historical Register*. In these he had exposed the corruption by means of which the government carried out its policy. Annoyed by this satire, Walpole had a bogus play of scurrilous character prepared, laid extracts from it before the House of Commons as the work of Fielding, and ended Fielding's dramatic career by procuring in this way the passing of the Licensing Act of 1737. Among other restrictions which it placed upon theatres, this act subjected all plays to the censorship of the Lord Chamberlain. The Theatres Act of 1843, while relaxing some of the provisions of its predecessors, strengthened the hands of the censor. A Select Committee of the House of Commons in 1866 reported favourably of the mode in which the censorship had been exercised; but about forty years later a strong movement for its abolition became apparent among dramatists, dramatic critics, and others. Theatre managers, while they suffered to a certain extent, were inclined to submit to the continuance of the censorship, because, once passed, a play was practically secure against any interference on the part of the authorities. The objectors urged that the censorship, while it had often allowed plays to pass which were written in a spirit by no means conducive to good morals, had habitually been used to prohibit those in which the subject was religious, or in which unpleasant facts had been honestly faced; and that in this way the drama was prevented from exercising any serious function, and kept out of touch with the most important sides of life. A joint committee was appointed, and its report in 1909 proposed a compromise likely to please both sides: that the examinership of plays should continue, but that the submission of any play to its censure should be optional. If passed, a play should be virtually exempt from interference; if not passed, it could still be acted, but the Public Prosecutor should have the power of indictment for indecency, and the Attorney-General the power of appealing to a committee of the Privy Council, on the ground that it insulted a friendly

power, incited to a breach of peace, contained offensive personalities, or the like.

Player-pianoforte. See PIANOFORTE.

Playfair, LYON, Lord Playfair of St Andrews (1818-98), born at Chunar, Bengal, became professor of Chemistry in Edinburgh University (1858-69), member of parliament (1868-92), and a peer (1892). He was postmaster-general (1873-74), chairman of ways and means and deputy speaker (1880-83). See his *Memoirs and Correspondence* by Sir Wemyss Reid (1899).

Plea, the answer of the defendant to the plaintiff's demand or charge. Pleas were divided formerly into pleas dilatory (where the party seeks to break down the conclusion of the action without entering into the merits of the case) and peremptory, Demurrers (q.v.), in abatement, special in bar, &c.; now the plea is usually Guilty or Not Guilty (see CRIMINAL LAW). In Scots law, plea means also a written statement by counsel of the legal grounds on which the party bases his case. In English civil procedure this is called *Pleading*; a term applied in criminal law to the accusation of the prosecutor or the answer of the accused. Pleadings have been much simplified by the Judicature Acts (1873-76). In the United States the New York legislature established a uniform procedure which has been adopted by most of the states. 'Pleas of the Crown' is an old term for criminal cases. In the Houses of Parliament pleading, as in the superior courts of law, must be conducted at the Bar (q.v.).

Plebeians. See ROME (*History*).

Plebiscite, the name given, in the political phraseology of modern France, to a decree of the nation obtained by an appeal to universal suffrage. Thus, Louis Napoleon was chosen president, and subsequently emperor, by a plebiscite, and in 1870 obtained the sanction of a third plebiscite (7½ million votes). The word is borrowed from the Latin; but the *plebiscitum* of the Romans properly meant only a law passed at the *Comitia Tributa*—i.e. a assembly of the *plebs*. The word is often used in Britain for an attempt to secure an expression of opinion on some special point of local interest by all the inhabitants of a district—often by means of return post-cards. The Treaty of Versailles applied the principle to international frontier questions, several areas of the defeated countries being given power to decide their future nationality by a vote, or at least to express their preferences.

Plectognathi, an order of Bony Fishes (q.v.).

Pledge. See PAWNBROKING.

Pleiades, in Greek Mythology, were, according to the most general account, the seven daughters of Atlas and Pleione, the daughter of Oceanus. Their history is differently related by the Greek mythologists: according to some authorities, they committed suicide from grief, either at the death of their sisters, the Hyades, or at the fate of their father, Atlas (q.v.); according to others, they were companions to Artemis, and, being pursued by Orion (q.v.), were rescued from him by the gods by being translated to the sky; all authorities, however, agree that after their death or translation they were transformed into stars. Their names are Electra, Maia, Taygete, Alcyone, Celano, Sterope (the invisible one), and Merope. The group of the Pleiades, called the 'Seven Stars,' is placed on the shoulder of Taurus. Looked at directly, only six stars are visible to the eye, though, if the eye is turned sideways, more can be seen; a good telescope shows fifty or sixty. Photography discloses thousands, with nebulae intermixed.

The name *Pleiad* is frequently applied to reunions of poets in septenary groups; and this use of the

word dates from the time of Ptolemy Philadelphus at Alexandria, who treated seven Greek poets with special distinction, and denominated them his *pleiad*. His example was followed by Charlemagne. But the name *Pleiade* is specially associated with a group of 16th-century French writers, of whom Ronsard (q.v.) and Du Bellay (q.v.) are the most notable, who endeavoured with marked result to reform the French language and literature after classical models. The other names are de Baif; Jean Dorat, or Daurat (q.v.), a celebrated Hellenist; Amadis Jamin; Étienne Jodelle; and Pontus de Thiard. In place of the two last, other authorities give Scévole de Saint Marthe and Marc Antoine Muret (q.v.); and, instead of Jamin, Belleau.

Plein-air, a term applied to painters, especially certain of the Impressionist school, who lay more importance on painting in the open air than in the studio. It is a development of the principles that 'the principal person in a picture is the light,' to quote Manet, and that no restriction ought to be placed on the artist as regards choice of subject. The chief difficulty in always painting a piece of nature just as one sees it is that this piece of nature may or may not be also a work of art. Aesthetic and natural beauty need not correspond. Though accuracy of colour can be obtained *en plein air*, selection of material and concentration of light can best be obtained in the studio. See IMPRESSIONISM.

Pleiosaurus. See PLESIOSAURUS.

Pleistocene (Gr., 'most recent') or GLACIAL SYSTEM. This system comprises the older accumulations belonging to the Quaternary or Post-Tertiary division. Almost all the molluscs met with in beds of this age are existing species. The system is termed Pleistocene or Glacial according as we have reference to the character of its organic remains or to the physical conditions under which the greater portion of its deposits were accumulated. These deposits are of very diverse nature and origin, and are subject to endless modifications, but nevertheless they show certain well-marked phases which are persistent over wide areas. Thus, throughout all northern Europe and the hilly and mountainous districts of the central and southern regions of the continent they exhibit the same general character and succession. The deposits of these regions consist for the most part of glacial and fluvioglacial detritus, which betoken the former presence of a great ice-sheet in northern Europe, and of extensive snowfields and glaciers in the mountain districts farther south. For an account of these deposits and glaciation generally, see GLACIAL PERIOD. In the regions outside of the glaciated areas the Pleistocene system is represented principally by fluviatile accumulations, calcareous tufas, peat, and deposits in caves. The old river-gravels, &c. are well seen in the valleys of southern England, France, Belgium, central Europe, Spain and Portugal, Italy, &c., where they occur at the surface. But when they are followed into regions in which glacial and fluvioglacial accumulations are well developed they disappear underneath these or are dovetailed with them. Cave-deposits are of course met with even in glaciated regions.

Thus, in general terms, the Pleistocene deposits of northern Europe and the mountainous regions of the central and southern parts of the continent are of glacial origin, while the accumulations outside of those areas are chiefly fluviatile. The latter were for some time believed to be upon the whole younger than the former, but the two series are now generally recognised to be contemporaneous. The occurrence of fossiliferous beds intercalated between sheets of morainic matter (boulder-clay,

&c.) proves that the so-called glacial period was interrupted more than once by epochs of milder climatic conditions, during which the inland ice of the north retired from all the low grounds, while the great glaciers of the Alps, &c. shrank back to the inner recesses of the mountains. The organic remains obtained from fresh-water interglacial deposits have been correlated with those which occur in the river-accumulations of the non-glaciated tracts, and the result is that these accumulations are now admitted to be for the most part of interglacial age also. In short, the peat, river-deposits, tufas, and cave-accumulations are the equivalents in time of the glacial and interglacial deposits.

Life of the Period.—The plants and animals of the Pleistocene betoken great changes of climate—one series indicating an extremely cold or Arctic climate, while the other could only have flourished under uniformly clement or even genial conditions. While a cold climate prevailed, such plants as *Dryas octopetala*, *Betula nana*, *Salix polaris*, &c. flourished in the plains of Germany, and similar northern and Arctic forms clothed the low grounds of Switzerland. In Northern France grew birch, alder, larch, spruce, juniper, and yew, while in Northern Italy the Cembra pine flourished in the neighbourhood of Ivrea, and the Scots pine on the shores of Lake Varese. Contemporaneous with this flora we meet with land and fresh-water shells which are equally indicative of cold and ungenial conditions. And the same tale is told by the boreal and Arctic species of molluscs which occur more or less abundantly in the shelly clays of north Germany, Scandinavia, and the British Islands, and by the presence of northern forms in the Pleistocene marine beds of the Mediterranean area. The character of the land animals is quite in keeping with this evidence. Living in the low grounds of central and southern Europe at this time were reindeer, glutton, musk-sheep, Arctic fox, Alpine hare, marmot, snowy vole, mammoth, woolly rhinoceros, &c. The remains of these northern and Arctic plants and animals are met with both in glaciated countries and in the caves and fluviatile deposits that occur in regions that never were covered with glacier-ice. The relics and remains of man himself also accompany the same flora and fauna. In strong contrast with such an assemblage of plants and animals is that of which we find abundant traces in interglacial beds and cave- and river-deposits. In northern France grew willows, hazels, ash, dwarf elder, sycamore, spindle-trees, perfumed cherry-tree, box, clematis, common ivy, judas-tree, Canary laurel, &c. The presence of that laurel, which flowers in winter, proves that the winters must have been very clement, and the other plants are indicative of a genial humid climate. The summers were not so hot and dry as they now are in France, and the winters were not so cold; and similar conditions obtained in Central Europe and the Mediterranean region—although the floras of those different zones were distinguished from each other by the presence of certain forms and the absence of others. The land and fresh-water shells associated with this flora are equally indicative of genial conditions, and similar evidence is supplied by the mammalia. Thus, we find a strange commingling of southern and temperate forms which is quite in keeping with the similar association in one and the same place of various plants which no longer live together in Europe. Amongst the animals were hippopotamus, hyæna, serval, lion, leopard, various extinct species of elephant and rhinoceros, an extinct dwarf hippopotamus and machairodus. Contemporaneous with these were urus, bison, horse, stag, roe, saiga, beaver, hare, rabbit, otter, weasel, wild-

cat, fox, wild-boar, brown bear, grizzly bear, cave-bear, Irish deer, &c. The relics and remains of Palæolithic man likewise accompany this flora and fauna.

It is obvious, therefore, that the Pleistocene period was distinguished by great climatic oscillations. At one time the whole of northern and north-western Europe, down to the 50th parallel N. lat., was covered with a vast *mer de glace*, while from the Alps and all the considerable mountain-ranges of middle and southern Europe great glaciers descended to the low grounds. From ice-sheet and glaciers mighty rivers flowed all the year round, but in summer they rose in flood and inundated wide tracts, which in time became overspread with gravel, sand, and clay. It was under such conditions that a boreal and Arctic vegetation clothed the low grounds of middle Europe. While these conditions obtained, northern Europe appears to have been an area of high barometric pressure, and the dominant wind therefore blew strongly from north to south. During the winter season, when the rivers were much reduced, and the low-lying tracts, exposed to the floods of spring and summer, were laid bare, the glacial and fluvi-glacial deposits covering such regions were subject to this action by the prevalent wind, and much fine dust was swept southward. Similar conditions seem to have continued until the northern *mer de glace* had disappeared from the low-lying areas of middle Europe, which then formed a great region of steppes—a region of drifting sands, constantly subject to dust-storms. Jerboas (jumping hare), pouched marmots, bobac, pika, &c., were then common denizens of those wind-swept tracts. The same lands, which in some places were clothed with pine-forests, were roamed over by great herds of reindeer, mammoths, &c.—the bones of which sometimes occur together in such large numbers as to lead to the belief that the animals may have perished in snow-storms or 'blizzards.' It was then, too, that the reindeer and its associates flourished in the low grounds of southern France, where they were hunted by Palæolithic man. With the advent of interglacial times such ungenial conditions of climate passed gradually away—the ice-sheet vanishing entirely from the low grounds of north-western Europe, while the mountain-glaciers of central and southern regions dwindled to insignificance. Great migrations of plants and animals accompanied these changing conditions, the Arctic-alpine flora and northern and alpine fauna retreating northwards and retiring to mountain elevations, while the steppe fauna retired eastward into Asia. At the climax of interglacial times an extremely mild and genial climate, recalling that of the Pliocene, prevailed in Europe. The Canary laurel, the fig-tree, the judas-tree, and many others flourished then as far north as Paris, in which region, therefore, frost must have been rarely experienced. Elephants, hippopotamuses, rhinoceroses, &c., and vast herds of bovine and cervine animals then wandered over all temperate Europe—the British area included. How often such changes of climate were repeated has not yet been definitely ascertained. The great cycle appears to have commenced towards the close of the Pliocene period. At all events it is in the latest Pliocene deposits that we encounter the earliest traces of approaching glacial conditions, as evidenced by the gradual immigration of boreal and Arctic forms of life into our present temperate regions. The earliest recognisable glacial epoch would seem to have been less severe than the next glacial stage, during which the European snowfields and glaciers attained their maximum development. The subsequent glacial epochs diminished successively in importance, and the same would appear to have been the case with the several interglacial epochs—the most genial epoch

having followed after the epoch of maximum glaciation, while those that succeeded became less and less strongly marked. There would seem, in short, to have been a gradual 'ringing-in' of the alternating cold and genial stages, until they finally died away and gave place to the conditions that now obtain. Most geologists are of opinion that during Pleistocene times Europe experienced at least three successive glacial epochs of extreme severity. But in the Alpine Lands there is clear evidence of four such epochs, the earliest of which was probably contemporaneous with the closing stage of the Pliocene period, as already mentioned. Moreover, it is well known that considerable climatic oscillations did not cease with the passing away of the latest of these four glacial epochs. On the contrary, the evidence supplied by the peat-bogs, raised beaches, and younger moraines of north-west Europe leaves us in no doubt that alternating glacial and interglacial conditions, of gradually diminishing importance, continued to affect our area down to quite recent times. If these later climatic oscillations be taken into account, then we must admit a succession of five or even six cold epochs, separated one from another by epochs of more genial conditions. The cause of such changes of level has been much canvassed by geologists. From the fact that evidence of submergence so frequently accompanies proofs of severe glaciation, it has been inferred that the subsidence may have been due to the presence of the ice. It has been suggested, for example, that the weight of the great ice-sheets which covered such vast regions in our hemisphere during glacial times may have displaced the earth's centre of gravity, and thus caused a rise of the sea in the north. Others, again, think it probable that under the pressure of a great ice-sheet the earth's crust may have yielded and sunk down more or less gradually. Some, again, have thought that a thick ice-sheet would exercise sufficient attraction upon the sea to cause it to rise upon the land. It must be admitted, however, that some of the oscillations of level which took place in Pleistocene times were on much too considerable a scale to be explained by any of the hypotheses referred to. Whatever influence the ice-sheets of the glacial period may have had upon the sea-level, it seems most probable that the greater oscillations were the result of considerable earth-movements, such as have taken place at many different stages of the world's history.

Pleistocene in other Continents.—In North America deposits of the same character and showing the same general succession as those of Europe are encountered—the glacial and interglacial conditions that characterised the latter continent having been equally characteristic of the former. The Pleistocene fauna of North America embraced Mastodon, a true elephant, species of horse, bison, beaver, peccary, bear, &c., and gigantic extinct forms of sloth, such as Megatherium, Mylodon, and Megalonyx. In South America the Pampa deposits have yielded a large number of remains of the great sloths and armadillos (Glyptodon), besides other mammals. There is abundant evidence also to show that snow-fields and glaciers had in Pleistocene times a considerable development in the Cordilleras, while in Fuegia ice seems to have overflowed much of the low grounds. The mountains of central Asia and the Chinese ranges show abundant traces of former glaciation; while the glaciers of the Himalayas are pigmies as compared with

their Pleistocene predecessors. So likewise the alpine tracts of New Zealand and Australia have been more or less extensively glaciated.

Cause of the Glacial and Interglacial Condition of the Pleistocene.—This question has given rise to much discussion, and many hypotheses and theories have been advanced, none of which, however, has proved satisfactory. The belief grows that the remarkable climatic changes owed their origin to extra-telluric causes, and that ere long astronomers may succeed in discovering what these causes were. In short, it seems highly probable that the peculiar climate of the Pleistocene was the result of variations in the amount of heat supplied by the sun.

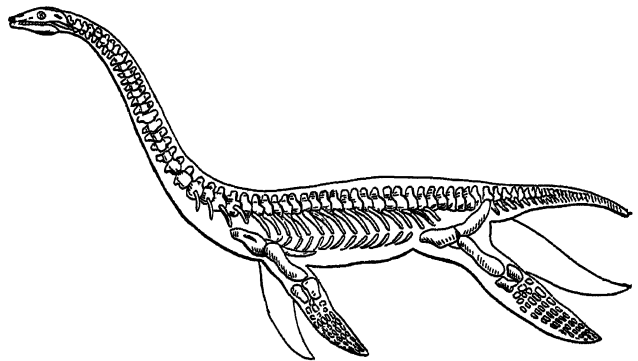
Antiquity of Man in Europe.—All the human relics met with in Pleistocene deposits belong to what is known as the Palæolithic stage. Hitherto no indubitable evidence is forthcoming to show that man was an occupant of Europe before the glacial period. It is quite possible he may have been, but we lack evidence sufficient to prove this. He certainly lived, however, throughout the earlier glacial and interglacial conditions described above. It is remarkable that no trace of his occupation has been met with in beds of later date than the last great Baltic glacier. If we were to judge from negative evidence (which it is always unsafe to do) we should infer that he vanished from Europe at or about the time that most extensive ice-flow was melting away. The oldest human relics hitherto discovered in beds of a later date are Neolithic.

See Croll's *Climate and Time* and *Climate and Cosmology*; J. Geikie's *Great Ice Age* and *Antiquity of Man in Europe*; W. B. Wright's *The Quaternary Ice Age*; Chamberlin and Salisbury, *Geology*, vol. iii.; Penck and Brückner, *Die Alpen in Eiszeitalter*; Wahnschaffe, *Die Ursachen der Oberflächengestaltung des Norddeutschen Flachlandes*.

Plenipotentiary. See AMBASSADOR.

Pleochroism. In some crystals, such as some specimens of topaz, three distinct colours may be observed on looking through them along three rectangular axes. In intermediate directions intermediate tints may be observed; and this property is that of pleochroism or polychroism. In some other cases a similar range of intermediate tints may be observed, lying between two extreme tints visible along two axes (dichroic crystals—e.g. tourmaline, ruby, sapphire, and some specimens of mica).

Plesiosaurus (Gr. *plēsios*, 'near,' *sauros*, 'a lizard'), the type or leading genus of a family



Plesiosaurus dolichodeirus.

(Plesiosauridae) of fossil sea-reptiles, which are characteristic of the Mesozoic systems. The skull of *Plesiosaurus* is small and depressed, with a short

mandibular symphysis. The teeth (sunk in distinct sockets) are long, slender, and cylindrical, and show fine longitudinal ridges on the enamel. The most striking peculiarity of the vertebræ is the great length of the neck portion, which was composed of from 30 to 40 vertebræ—the anterior ones being generally very small. The cervical vertebræ consist of a centrum, neural arch, and two ribs, which are firmly articulated to the centra of the vertebræ, the terminal faces of which are more or less biconcave. In the dorsal vertebræ the ribs are articulated to diapophyses from the neural arch; and in the tail they gradually descend again to the sides of the centrum. The tail is much shorter than in *Ichthyosaurus* (q.v.). In the abdominal region the extremities of each pair of ribs are connected below by the development of the hæmal spine. The scapulæ are of moderate size and widely separated. The two pairs of limbs correspond closely in structure. The humerus and femur are comparatively short and distally much expanded; the radius and ulna, tibia and fibula are short and flat; the 'hand' and 'foot' are long, the phalangeals being increased in number beyond the normal complement. The limbs were covered with integument so as to form simple undivided paddles, as in the turtle. *Plesiosaurus* was undoubtedly aquatic, and probably haunted the shallow seas and estuaries of Mesozoic times. Its remains have been met with frequently in a fine state of preservation. Some specimens exhibit embryos within the abdomen, and hence must have produced their young alive. Gastrolites often accompany the skeletons. *Cimoliosaurus*, met with in the Jurassic and Cretaceous strata of Europe, North and South America, and New Zealand, attained a length of between 30 and 45 feet. *Pliosaurus* was another genus, with a shorter neck (the vertebræ twelve in number) and a comparatively larger head than *Plesiosaurus*. In this genus the lower jaw was sometimes nearly 6 feet long.

Plessis-les-Tours. See TOURS, LOUIS XL

Plethon, GEORGIOS GEMISTOS, a Greek scholar, was most probably a native of Constantinople, and found employment in the Peloponnesus under the 'despots' Manuel and Theodore Palæologus. He was sent as a deputy to the council held at Florence in 1439, and here, if he did little for the union of the Eastern and Western Churches, he did much to spread a taste for Plato. He returned to Constantinople, and died there about 1455. See vol. i. of F. Schultze's *Geschichte der Philosophie der Renaissance* (Jena, 1874).

Plethora (Gr. *plêthōra*, 'fullness'), a general excess of blood in the system. It may arise either from too much blood being made or from too little being expended. The persons who become plethoric are usually those in thorough health, who eat heartily and digest readily, but who do not take sufficient bodily exercise, and do not duly attend to the action of the excreting organs. With them the process of blood-making is always on the increase, and the vessels become more and more filled, as is seen in the red face, distended veins, and full pulse. The heart is often dilated and the seat of fatty or other form of degeneration, and hence palpitation, shortness of breath, and probably a sleepy feeling may arise; and there is frequently a raised blood-pressure, by which the morbid condition is aggravated. The state of plethora thus gradually induced may be extreme without any functions materially failing, and yet the subject is on the verge of some dangerous malady, such as apoplexy, or structural disease of the heart or great vessels, or of the lungs, kidneys, or liver.

Pleurisy, or inflammation of the investing membrane of the lung (*pleura*), is one of the most common diseases of the chest. It is very often, but by no means invariably associated with inflammation of the substance of the lung, commonly known as *Pneumonia* (q.v.). Pleurisy without pneumonia is much more common than pneumonia without pleurisy. When both are present, but pneumonia preponderates, the correct term for the affection is *pleuro-pneumonia*, although it is frequently spoken of simply as pneumonia, probably in consequence of the remedies being applied mainly to it, as the more important of the two elements in the compound malady.

The pleura being a serous membrane, its inflammation is attended by the same course of events as have been already described in our remarks on the two allied diseases, *Pericarditis* and *Peritonitis*. The inflammation is of the adhesive kind, and is accompanied by pain, and by the effusion of serum, of fibrinous exudation, or of pus into the pleural cavity. In the last case it is called *empyema*. In consequence of the anatomical relations of the pleura—one part of the membrane (the parietal) lining the firm walls of the chest, while the other part (the visceral) envelops the soft and compressible lung, and these opposed surfaces being freely movable on one another—it follows that very different effects may be produced by its inflammation. For example, the visceral layer may be fixed to the parietal layer, so as to prevent all gliding movement between them, and to obliterate the pleural cavity (similarly to what often happens in *Pericarditis*, see PERICARDIUM); or the two surfaces which are naturally in contact may be abnormally separated by an effusion of serum between them; or, from a combination of these results, the opposite surfaces of the pleuræ may be abnormally united at some points, and abnormally separated at others.

The symptoms of acute pleurisy are rigors, pain in the side, fever, difficulty and rapidity of breathing, cough, and discomfort in certain positions; and of these the most marked is the sharp pain in the side, often described by the patient as like a knife between the ribs. The pain, often very severe, and often limited to one small spot, is usually at the lower part of the affected side; but is occasionally felt in other parts—as in the shoulders, in the hollow of the armpit, beneath the collar-bone, along the breast-bone, even in the loins, simulating lumbago; or, in the abdomen, so as to suggest peritonitis or appendicitis. In some cases it is altogether absent. The pain is increased by percussion, by pressure between the ribs, by a deep inspiration, by cough, &c.; and the patient is often observed to shrink from drawing more than a short and imperfect breath. Cough is not invariably present, although it is an ordinary symptom. It is short, suppressed as far as possible by the patient, and is either dry or accompanied by the expectoration of slight catarrh. If much frothy mucus is brought up it is a sign that Bronchitis (q.v.) is also present, and the appearance of rust-coloured sputa indicates the co-existence of pneumonia. Although the above-named symptoms, especially when most of them occur together, afford almost certain evidence of the existence of pleurisy, yet to the physician the physical signs are still more valuable, especially those furnished by auscultation and percussion. The *friction-sound*, characteristic of pleurisy in the dry stage in its most marked form, resembles the creaking of leather: the patient is often himself conscious of the grating sensation produced by the rubbing of the pleural surfaces; and it may sometimes be felt by a hand laid on the affected part. If fluid effusion be present the friction-sound is

lost; but dullness on percussion replaces the normal resonance over the area occupied by the fluid.

Pleurisy frequently arises after unusual exposure to cold, and when it persists in a severe form with effusion, it is often an early manifestation of tuberculosis, which appears later in the lung; it often complicates rheumatic fever and Bright's disease; but it may be occasioned by mechanical violence (as by a penetrating wound of the thorax, by the splintered ends of a broken rib, &c.), or by the accidental extension of disease from adjacent parts. The disease may terminate in resolution and complete recovery; or in adhesion, which often only causes slight embarrassment of breathing; or it may end with such a retraction of one side of the chest as to render the corresponding lung almost useless; or it may cause death, if the effusion is very copious, and is not removed by tapping. It is seldom that simple pleurisy proves fatal; but empyema in adults is a very serious disease.

In the treatment of pleurisy rest in bed, careful nursing, and light diet are essential. In acute cases in the early stage cupping, application of a large plaster or strips of plaster to diminish movement, or blistering is generally indicated. When effusion has taken place, purgatives, diuretics, and absorbents should be given. But when fluid is present in large amount and is not diminishing from day to day, it is usually desirable to draw it off by tapping. If the fluid be serous this usually greatly hastens recovery. Even when it is purulent (empyema) aspiration, repeated when necessary, is often successful in the case of children; but more generally, especially in adults, free opening and drainage of the cavity by removal of part of a rib alone affords hope of cure.

Pleurisy Root. See BUTTERFLY WEED.

Pleurodynia is the name sometimes applied to neuralgia of the chest-wall, which may simulate closely the pain of pleurisy.

Pleuronectidæ. See FLAT-FISH.

Pleuro-pneumonia. The disease of this name in the human subject is mentioned at PLEURISY; the following article deals with the disease in cattle so called. Pleuro-pneumonia Contagiosa is a contagious febrile disease of cattle supposed to have originated in central Europe and thence to have been conveyed to all parts of the world. It cannot be certainly traced further back than 1769, when it was known in eastern France as *Murie*. Not till 1802 was it seen in Germany, 1824 in Russia, 1841 in Great Britain and Ireland, 1843 in the United States, 1858 in Australia, and 1864 in New Zealand. The causal organism of the disease is an exceedingly minute micrococcus, discovered in 1898 by MM. Nocard and Roux with collaborators. Inoculation of the virus, after an incubative period of from 8 to 28 days, induces extensive inflammatory exudations in the substance of the lungs and surfaces of the pleura, finally resulting in consolidation of some portions of the lungs, occlusion of the air-tubes, plugging of the blood-vessels, and, generally, adhesion of the pleural surfaces.

It is now clearly demonstrated that pleuro-pneumonia never occurs independently of infection, that it may be favoured by overcrowding, exposure, wet, damp, dirty hovels, that these influences may predispose an animal to succumb more readily, or, in other words, to become a more suitable soil for the increase of the specific organism to which the disease is due, but they do not originate it.

There is much variety in the manifestation of the disease. In some instances, especially during its first outbreak in a district, it runs a rapid course, destroying life in the course of a few days;

in other cases, and these are the most numerous, its onset, course, and termination occupy a period of from two to eight weeks, or even longer; some animals recovering after the shorter periods, whilst others become emaciated, finally succumbing to an exhaustive diarrhoea, imperfect aeration of the blood, hydrothorax or water in the chest, the depressing influence of degenerated animal materials absorbed into the blood, and anæmia. The more prominent symptoms are slight rigors or shiverings, elevation of temperature, loss of appetite, secretion of milk diminished, an occasional cough is heard which is dry and hard in character, rumination becomes irregular, the bowels rather constipated, and the urine is scanty and high-coloured. In cases that do not begin to recover at this stage the signs of general disturbance more or less rapidly increase: the cough becomes more persistent, the respiratory movements increase in frequency, when the animal stands the elbows are turned out, and whilst recumbent the weight of the body is thrown upon the sternum or breast-bone—a posture in which, owing to the anatomical conformation of this bone, the animal can most readily expand the chest. The breathing is often but not always accompanied by a moan or grunt.

Experience has led the great majority of professional men to the conclusion that the disease is little influenced by medicinal remedies; it runs a course. If the dose of the contagium is small, or the animal able to withstand a larger one, it terminates spontaneously in apparent recovery; but an animal which has thus apparently recovered still contains the germs and products of the disease, and remains a source of danger to others for an indefinite period, probably during the remainder of its existence. If, on the other hand, the dose of the specific cause be strong or the animal weak, death soon occurs. By the provisions of the Pleuro-pneumonia Act, 1889, all cattle suffering from the disease, as well as those in contact with them, have to be slaughtered, part of the loss being borne by the local authority.

Plevna (Bulg. *Pleven*), a town of Bulgaria, 19 miles S. of the Danube and 85 NE. of Sofia, with 28,000 inhabitants. Here in 1877 Osman Pasha, the Turkish general, after defeating the Russians in several engagements, entrenched himself against their reinforced and superior numbers early in September, and repulsed their endeavours to take the place by storm; but, after making an unsuccessful attempt to cut his way through the investing Russian army, he was compelled, provisions and ammunition running short, to capitulate (10th December) with 42,000 men and 77 guns. The siege cost the Russians 55,000 men, the Rumanians 10,000, the Turks 30,000. See W. V. Herbert, *The Defence of Plevna* (1895).

Pleximeter. See PERCUSSION.

Pleyel, IGNAZ JOSEPH, born 1st June 1757 at Ruppertsthal, near Vienna, studied under Haydn and in Italy, and in 1783 was made Kapellmeister of Strasburg Cathedral. In 1791 he visited London, and he harmonised many of the melodies for Thomson's *Collection of Scottish Songs*. At Strasburg, during the French Revolution, he barely escaped with his life as a royalist. In 1795 he opened a large music shop in Paris, and in 1807 joined thereto a pianoforte manufactory. He died in Paris, 14th November 1831. His compositions consisted of quartets, concertos, and sonatas.

Plica Polonica was the name given to a disease of the scalp, in which the hairs became matted together by an adhesive and often fetid secretion, and which was at one time prevalent in Poland, although it occasionally occurred in other

countries. The hair was found, on microscopic investigation, to be infested with a fungus of the genus *Trichophyton* and with vermin. The only treatment that was beneficial was the removal of the hair, and cleanliness; but, as it was popularly believed in Poland that this affection afforded a security from all other sickness and misfortune, it was often difficult to persuade patients to have recourse to these means.

Plimsoll, SAMUEL, 'the sailors' friend,' was born at Bristol on 10th February 1824. In his seventeenth year he became clerk in a Sheffield brewery, and rose to a position of trust in the firm. In 1854 he started business on his own account, in the coal trade, in London. Shortly afterwards he began to interest himself in the sailors of the mercantile marine, and the dangers to which they were exposed. He accumulated a mass of facts proving that the gravest evils resulted from the wilful employment of unseaworthy ships, from overloading them, and under-manning them, from bad stowage, and from over-insurance; unscrupulous owners insured rotten or 'coffin' ships at a value greatly exceeding their real value, and sent them to sea, hoping they would founder, by which means they would make bigger profits than they could make by legitimate carrying of merchandise. Failing to induce parliament to take legislative steps to put an end to these evils, Mr Plimsoll himself entered parliament, for Derby, in 1868; but it was not until he had published *Our Seamen* (1873) and had made an appeal to the general public that he succeeded in getting passed the Merchant Shipping Act in 1876, to supersede temporary measures passed during three preceding sessions. By this act the Board of Trade was empowered to detain, either for survey or permanently, any vessel deemed unsafe, either on account of defective hull, machinery, or equipments, or improper loading, or overloading; a penalty not exceeding £300 was incurred by any owner who should ship a cargo of grain in bulk exceeding two-thirds of the entire cargo, grain in bulk being especially liable to shift on the voyage; the amount of timber that might be carried as deck cargo was defined, and enforced by penalties; finally, every owner was ordered to mark (often called the 'Plimsoll Mark') upon the sides of his ships, amidships, a circular disc, 12 inches in diameter, with a horizontal line 18 inches long drawn through its centre, this line and the centre of the disc to mark the maximum load-line—i.e. the line down to which the vessel might be loaded, in salt water. Failure to comply with this last regulation exposed the owner to a fine not exceeding £100 for each offence. By an Act of 1894 the fixing of the load-line is taken out of the owner's discretion and made a duty of the Board of Trade. Mr Plimsoll retired from parliamentary life in 1880. But he did not slacken his efforts to make the sailors' calling safer: in 1890 he published a work on *Cattle-ships*, exposing the cruelties and great dangers connected with the shipping of live cattle across the ocean to British ports. He died 3d June 1898. See Japp, *Good Men and True* (1890).

Plinlimmon, or PLYNLIMMON, a large mountain-mass (2469 feet) of Wales with three summits, on the boundary between Montgomery and Cardigan, 10 miles W. of Llanidloes. The name is said to be a corruption of a Celtic word signifying Five Rivers, five rivers having their sources on its slopes; one is the Severn, another the Wye.

Plinth, the square member at the bottom of the base of a Column (q.v.). Also the plain projecting band forming a base of a wall.

Pliny (GAIUS PLINIUS SECUNDUS), called the

Elder, to distinguish him from his nephew, came of a North Italian stock possessing estates at Novum Comum (*Como*), where he was born 23 A.D. He claimed to be a compatriot of Catullus, but the reference is too vague to warrant the assumption that their common birthplace was Verona. His education was carried on in Rome, under every advantage of wealth and family connection, till, when about twenty-three years old, he entered the army, serving on the staff of L. Pomponius Secundus, then conducting a campaign in Germany. He became colonel of his regiment (a cavalry one), and while attentive enough to his military duties to make a special study of the throwing of missiles from horseback, on which he wrote a treatise (*De Jaculatione Equestri*), and to compile a history (afterwards published in twenty books) of the Germanic wars, he gratified his thirst for miscellaneous knowledge by a series of scientific tours, investigating the region between the Ems, the Elbe, and the Weser, and the sources of the Danube. Returning to Rome in 52 with Pomponius, he studied for the bar, at which he practised just long enough to satisfy himself that his aptitudes were not of the forensic order. Accordingly he withdrew to his native Como, and there, during the greater part of Nero's reign, devoted himself to reading and authorship encyclopædic in their range. Apparently for the guidance of his nephew he wrote in three books his *Studiosus*, a treatise defining the culture necessary for the orator before entering on his career, and also for his nephew the grammatical work, *Dubius Sermo*, in eight books. About the close of Nero's life he was appointed procurator (collector of the imperial revenues) in Spain, where in 71 he heard of his brother-in-law's death, by which he became guardian of his sister's son, Pliny the Younger, whom, on his return to Rome two years after, he adopted. Vespasian, by this time emperor, whom he had known in the German campaign, was henceforth his most intimate friend, but court favour did not wean him from study, and so we find him bringing down to his own time, in thirty-one books, the history of Rome, by Aufidius Bassus. A model student, amid metropolitan distraction, he began work by candle-light, in autumn before the day was spent, and in winter by 1 or 2 A.M. Ere dawn he would wait on the emperor and discharge the imperial commissions imposed on him, after which he returned home once more to his books. A slight repast intervening, he resumed work, in summer lying in the sunshine while he took notes or extracts from what was read to him. True to his maxim that no book was so bad but some information might be got from it, he seized every opportunity of jotting down all that interested him either as reader or auditor. A cold bath, followed by a slender meal and a brief siesta, preceded the next spell of work, at which he continued till *cena*, the Roman dinner, at 3 P.M. Even then he listened to the reading of some book, on which he commented. Such was his life when at court; but at his country seat his studies were uninterrupted—an attendant reading to him even in the bath, or writing to his dictation while he was under the *masseur* or anointer (*aleptas*). On his journeys by land or water his secretary with book and tablets was always at hand. By this lifelong application he amassed materials enough to fill the 160 volumes of manuscript written very small on both sides which, after using them for his *Historia Naturalis* (published 77), he bequeathed to his nephew. His life, uneventful and studious, was quite dramatic in its ending. In 79 he was in command of the Roman fleet stationed off Misenum when the great eruption of Vesuvius was at its height. Eager to witness the phenomenon as closely as possible, he landed at Stabiae

(*Castellamare*). Next day, on the shore, examining whether a contrary sea would allow him to escape, he succumbed to the stifling vapours rolling down the hill.

His *Historia Naturalis* alone of his many writings survives. Under that title the ancients classified everything of natural or non-artificial origin—not only botany, zoology, and mineralogy, but geography, meteorology, and astronomy. Pliny, however, extends even this elastic definition, and adds to his work by digressions on human inventions and institutions, devoting two books to a very valuable, if misplaced, history of fine art. He dedicates the whole to Titus, in a turgid, ill-composed epistle, the low literary level of which is maintained throughout. Nor is his inartistic, sometimes obscure, style redeemed by much scientific faculty in handling his theme. He did not pretend to original research, but the philosophical method which sometimes distinguishes the mere compiler is equally foreign to his pages. His observations, made at second-hand, are presented with no discrimination between the true and the manifestly false, between the probable and the simply marvellous. He can even be convicted of having misunderstood the authorities on whom he relies. But with every deduction made from it as to matter and form, his compilation is a praiseworthy monument of reading at once extensive and minute, and supplies us with information on an immense variety of subjects as to which, but for him, we should have remained in the dark.

The most convenient text for the student is that of Jan and Mayhoff (5 vols. 1892-1909), which embodies the best results of the recensions by Sillig and Detlefsen. The *Chrestomathia Pliniana* (Berlin, 1857) of the great archaeologist Ulrich is particularly valuable for its comments on fine art; while of translations the soundest and most readable is that of Littré, in French, published along with the original Latin (Paris, 1848-50).

Pliny (GAIUS PLINIUS CÆCILIUS SECUNDUS), the Younger, was born at Novum Comum, 62 A.D. His education, after his tenth year, when his father died, was conducted under the eye of his mother, Plinia, of his tutor Virginius Rufus, of whose worth, intellectual and moral, he has left a beautiful memorial, and of his uncle who adopted him. He early displayed high literary aptitude, wrote a Greek tragedy in his fourteenth year, and made such progress under Quintilian that, like his friend Tacitus, he became noted as one of the most accomplished men of his time. His proficiency as an orator enabled him, when not more than eighteen, to plead in the Forum, and brought him much practice, not only at the Centumviral bar, chiefly in will-cases, but also before the senate. Official appointments came to him in quick succession. Then, still young, he served as military tribune in Syria, where he frequented the schools of the Stoic Euphrates, and of Artemidorus; at twenty-five, the earliest possible age, he was *questor Cæsaris*, then prætor, and afterwards consul in 100 A.D., in which year he wrote his laboured panegyric of the Emperor Trajan. In 103 he became pro-prætor of the Provincia Pontica, but vacated the post in two years, and, among other offices, held that of curator of the Tiber, chiefly for the prevention of floods. He married twice; his second wife, Calpurnia, granddaughter of Calpurnius Fabatus, is fondly referred to in one of his most charming letters for the many gifts and accomplishments with which she sweetened his rather invalid life. He died without issue, but in what year is unknown.

It is to his letters that Pliny owes his assured place in literature as one of the masters of the epistolary style. An avowed imitator of Cicero, he has caught much of the charm of his model, while his Latinity is hardly, if at all, inferior in purity and

ease. His meaning, though never obscure, is generally fuller than his expression, and, reading between the lines, we discern the features of a truly lovable man, quite aware of his strong as of his weak points, much given to hospitality, and always pleased to help a less favoured brother, such as Suetonius or Martial. We derive from him not a few of our distinctest impressions of the public and private life of the upper class in the 1st century; above all, it is from his correspondence with Trajan that we get our clearest knowledge of how even the most enlightened of the Romans regarded the then obscure sect of the Christians. It appears that a person acknowledging himself a Christian was liable to punishment, even to death. When under examination, however, no Christian would admit anything further than his practice of meeting with his co-religionists on an appointed day before it was light; singing a hymn to Christ as God (or 'as to a God'—*quasi deo*); and taking an oath which bound him to no crime, but never to commit theft, robbery, adultery, and maleficeance, and never to deny a deposit. Even when put to the torture, two female slaves, said to be deaconesses, confessed nothing more to Pliny, who thereupon consulted the emperor as to how he might stop the spread of what he could only call 'a depraved and extravagant superstition.' Trajan declined to lay down a general rule for dealing with the Christians; he recommended that they should not be sought out on suspicion, but that, if accused and convicted of holding that faith, they should be punished. Accusations unsupported by an accuser were not to be received, while suspected cases were to have an opportunity of clearing themselves by offering prayers to the Roman gods (*diis nostris*).

For text, see Keil (Leip. 1853) and Müller (Breslau, 1903), while a useful selection with a good commentary has been published by Church and Brodribb (1871). Melmoth's translation (1746) is free and eminently readable; Ortery's, of the *Epistles* (1751), is still esteemed; Miss Hutchinson corrects Melmoth (with text, 1915). See Dill, *Roman Society from Nero to Marcus Aurelius* (1905).

Pliocene System. Strata belonging to this system are restricted in Britain to a limited area in Essex, Suffolk, and Norfolk; but a few isolated patches occur also in Cornwall and Kent. They consist of irregular lenticular beds of sands and shelly gravels, &c., which never occur altogether in one place. The whole series probably does not exceed 120 feet in thickness, and comprises the following groups arranged in descending order:

CRUMER FOREST-BED: fresh-water or estuarine silts, clays, and sands, with layers of peat; 10 to 70 feet thick. The fossils are land and fresh-water molluscs, many land-plants, and numerous mammalian remains.

CHILLESFORD BEDS: sands and clays; 6 to 16 feet thick; contain marine shells, some two-thirds of which are existing Arctic species; represented in the north of Norfolk by the **WEYBOURN CRAG**.

NORWICH CRAG: fluvio-marine gravel, sand, and loam; 5 to 10 feet thick. Fossils, chiefly marine molluscs; several land and fresh-water shells; and numerous mammalian remains—hence the name of 'mammaliferous crag' sometimes applied to this group. Of the shells 93 per cent. are living species—14·6 per cent. being northern forms.

RED CRAG: red ferruginous shelly sand, 25 feet thick, but local and inconstant. About 90 per cent. of the numerous shells occurring in this deposit are existing species—10·7 per cent. being northern forms.

ST ERTH BEDS: clays and gravels, near St Erth, Cornwall; many shells, about 40 per cent. being of extinct species.

WHITE OR CORALLINE CRAG: shelly sands and clays; fossils abundant; 84 per cent. of the shells are living species, and of these 5 per cent. are northern forms. Polyzoa (popularly called corals) are numerous, hence the name sometimes applied to this group.

LENHAM BEDS: sands, &c., occupying 'pipes' or hollows in the chalk of the North Downs, some 600 feet above the sea.

On the Continent Pliocene marine deposits are met with in various countries, usually in maritime regions, as at Antwerp and in the west of France in

the Cotentin, Morbihan, and Aquitaine. But it is in the Mediterranean basin that this system attains its greatest development. Thus, at various points along the foot of the Alps in North Italy Pliocene beds appear, and they likewise occur along both sides of the Apennines, forming the sub-Apennine formation; while in Sicily they attain a thickness of 2000 feet. In middle Europe the most important Pliocene strata are the fresh-water beds of the Mayence basin, and the fresh and brackish water beds of the Tertiary basin of Vienna. The calcareous tufas of France and Italy belonging to this system are notable for their plant-remains.

Life of the Period.—The flora of Pliocene times indicates a more temperate climate than that of the preceding Miocene. Many Miocene forms still lived in Europe, but the palms and other characteristic Miocene plants had disappeared. Ivy, platanus, liquidambar, various maples, many walnut trees, elms, hornbeams, magnolia, tulip-tree, Canary laurel, oleander, vine, glyptostrobus, sassafras, and others ranged from Tuscany to the heart of France—such plants as beech, poplar, lime, oak, sassafras, maples, bamboos, vines, &c. growing amongst the mountains of Cantal. The general character of the flora recalls the floras of distant regions—North America, the Canary Islands, eastern Asia, and Japan. The abundant evergreen plants of the period seem to have grown chiefly on the low grounds; at higher elevations pines and deciduous trees were the prevailing forms. The flora of the Norwich Crag shows that towards the close of the period the British area was clothed with a vegetation somewhat similar to that of the present. The molluscan fauna includes an increasing number of living species. In the lower groups of the system the general facies of the shells is southern, but in the upper groups the southern types decrease in importance and are gradually replaced by temperate and northern forms. Amongst land animals we find several survivors from earlier times, such as *Dinotherium* and *Mastodon*, with which co-existed many other pachyderms—elephants, rhinoceroses, hippopotamuses, and tapirs. Herbivorous quadrupeds also abounded—horses, giraffes, and various cervine and bovine forms. Carnivores (panthers, bears, wolves, &c.) were well represented, and apes and monkeys also formed a marked portion of the fauna. The Pliocene beds of Pikermi in Attica, and of India (Siwalik group), have yielded a large number of extinct and living types. At Pikermi occur the remains of many ruminants, amongst which are species of giraffe, *Helladotherium*, and various cervine and bovine forms, together with *Mastodon*, rhinoceros, *Dinotherium*, *hyæna*, and others. The Siwalik beds contain *Hyænarctos*, *Machairodus*, and other Miocene forms, and *Sivatherium* and *Bramatherium*, gigantic four-horned animals allied to antelopes. With these are associated many living genera, such as *Felis*, *Hyæna*, *Canis*, *Bos*, *Bison*, *Capra*, *Ovis*, &c. It may be noted that from the Pliocene of the Upper Missouri region, of North America remains of an abundant mammalian fauna have also been obtained—a fauna which had a strikingly oriental aspect.

In Pliocene times the Mediterranean covered many tracts which are now dry land. The valley of the Po then formed a great arm of the sea which penetrated into the mountain-valleys of the Alps, while Italy and Sicily were largely submerged. Considerable tracts in the maritime districts of southern and western France were likewise under water. The sea also overflowed some part of the south of England (Cornwall and Kent) and encroached upon the low grounds of Belgium and East Anglia. The long arms of the sea, which in the Miocene period had stretched from the Medi-

terranean through France into Switzerland and the valley of the Rhine, had vanished, while fresh-water and saline lakes occupied Transylvania and the Vienna basin, which had been more or less open sea in Miocene times. Much of south-eastern Europe, however, continued submerged—the sea extending through the Aralo-Caspian depression into Asia. One of the most notable events of the Pliocene was the birth of Etna, Vesuvius, and the now extinct volcanoes of Central Italy. In early Pliocene times the climate was mild and genial, but the conditions became less so during the closing stages of the period. This change is evidenced particularly by the increasing number of northern molluscs and the occurrence of ice-floated erratics in the English Pliocene.

Pliosaurus. See PLESIOSAURUS.

Plock (Ger. *Plozk*), a town of Poland, on the right bank of the Vistula, 60 miles NW. of Warsaw. Its principal building is the cathedral, built in the 11th century. One of the oldest towns in Poland, Plock was the capital of ancient Masovia, and was severely ravaged by the heathen Prussians, the Lithuanians, and the Swedes. Pop. 25,800 (many Jews).

Ploiesti, a town of Rumania, 37 miles by rail N. of Bucharest, with petroleum-refineries and a large trade in wool; pop. 60,000.

Plombières, a spa in the French department of Vosges, 14 miles S. of Epinal, sprang into fashion through the favour of Napoleon III., though the virtues of its waters were known ever since the times of the Romans. There are nearly thirty springs, ranging in temperature from 66° to 150° F.

Plotinus, the most original and important philosopher of the Neoplatonic school, was born at Lycopolis in Egypt in 205 A.D., and studied philosophy under Ammonius Saccas. In 242 he joined Gordianus' expedition to Persia, in order to study the philosophy of India and Persia; but the emperor being murdered in Mesopotamia, he returned hurriedly to Antioch, whence, in 244, he went to Rome. His lectures here were attended not only by crowds of eager youths, but men and women of the highest circles flocked to hear him. Not only Neopythagorean and Neoplatonic wisdom, but asceticism and the charm of a purely contemplative life were the themes on which he, in ever new variations, and with an extraordinary depth and brilliancy, held forth; and such was the impression his earnestness made upon his hearers that some of them really gave up their fortune to the poor, set their slaves free, and devoted themselves to a life of study and ascetic piety. It is hardly surprising to find that his contemporaries coupled with his rare virtues the gift of working miracles. Sixty years old, he thought of realising Plato's 'Republic,' by founding an aristocratical and communistic commonwealth; and the Emperor Gallienus was ready to grant a site in Campania for his 'Platonopolis,' but he died near Minturnæ in 270. Although he began to write very late in life, he yet left fifty-four books of very different size and contents to the editorial care of his pupil Porphyry, who arranged them in six principal divisions, each subdivided again into nine books or *Enneads*.

Plotinus' system was based chiefly on Plato's, combined with Neopythagoreanism and the oriental theory of Emanation—i.e. the constant transmission of powers from the Absolute to the Creation, through several agencies, the first of which is 'Pure Intelligence,' whence flows the 'Soul of the World,' whence, again, the souls of 'men' and 'animals,' and finally 'matter' itself. Men thus belong to two worlds, that of the senses and that of Pure Intelligence. It depends upon ourselves, however,

to which of the two worlds we direct our thoughts most and belong to finally. The ordinary virtues, as justice, moderation, valour, and the like, are only the beginning and very first preparation for our elevation into the spiritual realm; purification is a further step, to which we attain partly through mathematics and dialectic; and the abandonment of all earthly interests for those of intellectual meditation is the nearest approach to the goal. The higher our soul rises in this sphere of intellect, the deeper it sinks into the ocean of the good and the pure, until at last its union with God is complete, and it is no longer thought but vision and the ecstasy which pervades it. These are a few snatches of Plotinus' philosophical rhapsodies, to which may be added his mysterious belief in a kind of metempsychosis, by which souls not sufficiently purified during life return after death, and inhabit, according to their bent, men, animals, and even plants. He further held somewhat fantastic views as to gods and demons, and professed faith in astrology and magic. His was the last attempt by the ancient world to solve the great problems not by ratiocination, but through introspective mysticism; and his mode of thought had very unmistakable influence on early Christian philosophy, modern theosophy, and various German idealistic systems.

See NEOPLATONISM and works there cited; Inge's *Philosophy of Plotinus* (1913); Stephen M'Kenney's translation (1917 *et seq.*); and Caird's *Evolution of Greek Philosophy* (1904).

Plots must be distinguished on the one hand from Assassinations (q.v.) and on the other from Rebellions (q.v.). They involve the elements of secrecy and conspiracy, but have not always political assassination for their object, nor do those who carry them through, or attempt to do so, put arms in the hands of a great number of men. The subjoined list only professes to give a selection of the more noteworthy plots of history, intended to supplement the lists given under ASSASSINATION and REBELLION. Details of most of them will be found under separate articles.

Catiline's Conspiracy, 63 B.C.
 Quirini-Tiepolo in Venice, 1310.
 Marino Falieri's Plot in Venice, 1355.
 Plot of Fieschi against Andrea Doria at Genoa, 1547.
 Raid of Ruthven in Scotland, 1582.
 Babington's Plot against Elizabeth, 1586.
 Death of Prince Demetrius in Russia, 1601.
 Gowrie Conspiracy in Scotland, 1600.
 Gunpowder Plot in England, 1605.
 Titus Oates' pretended Popish Plot, 1678.
 Meal-tub Plot, 1679.

Rye-house Plot against Charles II., 1683.
 Assassination Plot to kill William III. of England, 1696.
 Plot of Catharine against Peter III. of Russia 1762.
 Colonel Despard's Plot against George III., 1802.
 Plot of Cadoudal and Pichegru against Napoleon, 1802.
 Malet's Plot against Napoleon, 1812.
 Cato Street Conspiracy, 1820.
 Orsini's attempt upon Napoleon III., 1858.
 Numerous Nihilist plots in Russia from 1881.
 Abduction of Alexander of Bulgaria, 1886.

Plough. The first in order and importance of agricultural operations is the breaking up of the soil, and the implement employed most largely for this purpose is the *plough*. The general form of the plough is known to every one, and to the unobservant eye it appears to be a very simple and even primitive tool; nevertheless, much mechanical skill and ingenuity have been expended in perfectly adapting it to its work. It is a combination of instruments (fig. 1) fastened to a beam, GBL; the *coulter*, K, is an iron knife-blade, for cutting the sod vertically; the *share*, CFD, which is merely a socket fitted on and not fastened to the body of the plough, has a sharp point, C, and a projecting horizontal edge, CO, on its right-hand side, its part of the work being to separate the under surface of the sod from the subsoil; by means of the *mould-board*, H, the slice, now wholly

separated from the firm ground, is raised up and turned over by the forward motion of the plough; and the *stilt*s, or handles, one of which, BL, is a continuation of the beam, the other, M, being fastened partly to the former by rods, and partly

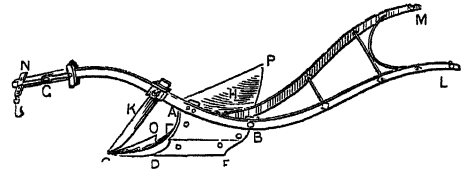


Fig. 1.

to the lower portion of the framework (fig. 2, which also shows the point of the plough with the share removed), are for the purpose of guiding the implement. The front part of the beam is formed with an upward curve; at its extremity is placed

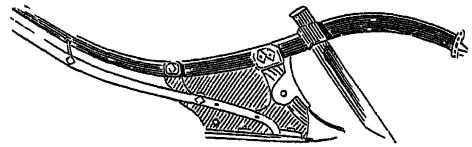


Fig. 2.

the *bridle*, N, to which the horses are attached by means of swing-trees and chains or traces, and the object of which is to enable the workman to elevate or depress the line of draught, or move it to the right hand or the left, as may be found necessary. The left sides of the coulter, share, and framework ADEB should evidently be in the same vertical plane. The form of the mould-board is of the utmost importance, and has chiefly attracted the attention of agricultural machinists since the time when improvements on the plough were first projected. Its office being to raise and turn the sod, it is necessary that the surface should slope upwards and outwards from the front, so as to apply a pressure in both directions, and, accordingly, the surface is so shaped that from the point of the share, where it is horizontal, it gradually curves upwards, till, at the extremity, P, it inclines over away from the body of the plough. The gradual change produced on the position of the furrow-slice is seen in fig. 3, where ABCD on the left-hand side

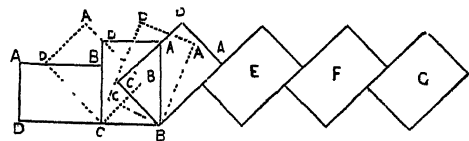


Fig. 3.

represents the slice untouched by the plough, AD being the line of section by the coulter, DC by the share, BC the open side from which the previous furrow (E) to the right hand side has been separated, and the four successive rectangles, ABCD to the right, illustrate the successive changes of position of the furrow as the mould-board is pushed forward under and on its left side, till it is finally left, as represented in ABCD, on the right hand; E, F, G are furrows which have previously been laid in their proper position. The modern plough is wholly formed of iron, and in nearly all the English and several of the Scotch and Irish made ploughs wheels are attached at or

near the front end of the beam, a contrivance which renders the implement more steady in its motion, more easily managed, and capable of doing better work in the hands of an inferior workman. The usual dimensions of the furrow-slice in lea or hay-stubble are 8 or 9 inches in breadth by 6 in depth, and in land for green crop 10 or 11 inches in breadth, and 7 to 9 in depth. Shallower ploughing is not unfrequently adopted, especially on thin soils, and in various parts of England. Nor is it uncommon to plough stubble-land 10 inches or more in depth.

Other kinds of ploughs are used for special purposes, such as *trench-ploughs*, which are made on the same principle as the common plough, but larger and stronger, so as to bring up a portion of the subsoil to the surface; *subsoil ploughs*, some patterns of which have no mould-board, and merely stir and break up the subsoil, thus facilitating drainage; *double mould-board ploughs*, which are merely common ploughs with a mould-board on each side, and are employed for drilling turnip or potato land, for water-furrowing, and for earthing up potatoes; *turn-wrest ploughs*, which have the mould-board so arranged that in going in both directions the furrow is turned to the side; American *Chill ploughs*, which are exceptionally light in draught, go over the ground rapidly, and break up the surface soil more finely than the ordinary plough; the *double-furrow plough*, which turns two furrows at one operation, and which, although used on many farms, has not become so popular as was at one time expected. Of each of these ploughs there are many varieties, each maker having generally some peculiar views regarding the form and proportion of some parts of the instrument. For those who wish to study minutely the best form of plough it will be necessary to consult works on agriculture and agricultural implements.

The operation of ploughing can only be briefly referred to. Wherever the soil has been efficiently drained the ridges can be made wider and ploughed on the flat, high ridges being no longer necessary for carrying off the water. It is found in practice that the fewer the open furrows the better, particularly when the land is intended for a grain crop which is to be sown by drill or broadcast with machinery, and when the crop is to be cut with a binder, as is now almost universally the case. It is curious to notice how one improvement in farm practice leads on to another. The most common mode of ploughing with horses is now simply by casting the soil two ridges in and the next two out, beginning always with the two ridges where last time was left the open furrow.

The process of feering or commencing a ridge differs according to the state of the land to be turned over. If there exists an old furrow or hollow, as is generally the case in lea, two shallow furrows are turned, the one against the other, and so on; along each side of this commencement the plough moves, adding furrow after furrow, and increasing in depth until the third or fourth round is reached. This constitutes what is technically called the gathering system. In newly-cleaned land, or where a hollow does not appear to turn the first furrows into, two furrows are thrown out and then turned lightly in. The most common system, however, is what is known as *casting or clearing*. That is, after one feering is accomplished, another is made at the other side of the ridge, and furrow after furrow is turned towards the inside of each of these feerings until the whole ridge is ploughed, and then in the centre is formed the *finish* or *mids*—a furrow or trench into which the feering is turned the next time the land is ploughed.

The plough is one of the most ancient of imple-

ments, and is mentioned in the Old Testament at a very early period, iron shares being also incidentally noticed more than seven centuries B.C. Sir E. B. Tylor has in his *Anthropology* clearly shown how the plough arose by gradual development out of the hoe, and that out of the pick or hatchet.

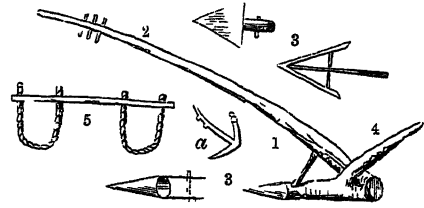


Fig. 4.

1, Plough still used in Asia Minor; 2, its pole, where the oxen are attached; 3, shares of various forms; 4, the tail or handle; 5, the yoke; a, early Greek plough.

The fields of Sweden were formerly tilled with the 'hack,' of which specimens were still seen in the 19th century. The hack was simply a 'stake of spruce-fir with a bough sticking out at the lower end cut short and pointed.' This implement was gradually made heavier, and dragged by men through the ground, so as to make a simple furrow. Next it 'was made in two pieces, with a handle for the ploughman and a pole for the men to drag by, the share was shod with an iron point, and at last a pair of cows or mares were yoked on instead of the men.' The development of the Egyptian plough was similar.

The ancient Egyptian plough was wholly of wood, and in some instances consisted of little more than a pointed stick, which was forced into the ground as it was drawn forward; though there seem to have been ploughs with handles, and with metal socks. The earliest form of the Greek plough, the *autogyon* (fig. 4, a), was merely the trunk of a small tree, which had two branches opposite to each other, one branch forming the share and the other the handle, while the trunk formed the pole or beam. The more improved form, the *pēkton*, in use among the Greeks, was not substantially different from the modern form in use in some parts of Asia Minor (fig. 4). The

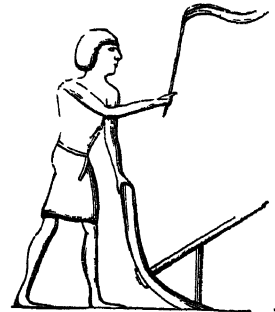


Fig. 5.

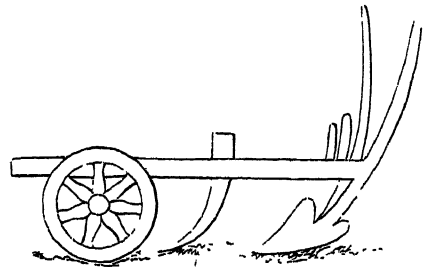


Fig. 6.

ancient Egyptian plough in one of its early stages is represented in fig. 5. The Romans, an essentially practical nation, largely improved on the

plough, adding to it the coulter and mould-board, and occasionally attaching wheels to the beam to prevent the share from going too deep into the earth (fig. 6). The plough was almost unknown among the American aborigines, though Prescott describes a mode of ploughing practised among the Peruvians, which consisted in the dragging forward of a sharp-pointed stake by six or eight men, its sharp point, which was in front, being kept down in the ground by the pressure of the foot of another man who directed it. The ancient heavy plough dragged by eight oxen was still in use in Aberdeenshire well into the 18th century. In Britain the most important amendments on the plough are not two centuries old, and some of them were doubtless borrowed from the careful agriculture of Holland. England took the lead in improvement, followed some time later by Scotland, in which the chief improvers were James Small (the inventor of the Scottish *swing* plough), Wilkie, Gray, and Sellar. In England the improvers have chiefly been Ransome of Ipswich (the patentee in 1785 of the cast-iron share), Howard of Bedford, Hornsby of Grantham, and Busby of Bedale, the last of whom gained a medal for his mould-boards at the Great Exhibition of

the furrow-slice, decreasing friction, and saving labour to the ploughman, who has a seat on the implement; the disadvantage is the much greater cost of this kind of plough, and the cumbersome size. The Double Michigan plough has a small paring plough on the beam in front of the other; the small plough pares off the surface and throws it into the previous furrow, and the large one completely buries it under a heavy furrow-slice. Reversible ploughs, like the Oneonta Clipper, have the share and mould-board so that they can be easily changed from one side to the other; these are also called swivel ploughs or side-hill ploughs.

Steam-ploughing.—It has been alleged that the cultivation of the land by steam had been contemplated as far back as the 17th century. So long ago as 1618 David Ramsey and Thomas Wildgosse took out letters-patent for engines and machinery to plough the ground without the aid of oxen or horses, and the attempt has been made to show that steam was the motive power intended to be employed; but, as the first patent was taken out nearly forty years before the Marquis of Worcester described the steam-engine in his *Century of Inventions*, the grounds for such an opinion do not seem quite satisfactory. In 1769,

however, after the steam-engine had been applied to other purposes, there was lodged in the Patent Office a specification for a new machine or engine, to plough, harrow, and do every other branch of husbandry, without the aid of horses. The patentee was Francis Moore; and so confident was he of the merits of his plan that he sold all his own

horses, and persuaded his friends to do the same; 'because the price of that noble and useful animal will be so affected by the new invention that its value will not be one-fourth of what it is at present.' Moore, like many who followed in his wake, was much too sanguine. The truth is that even yet steam-power has only to a very small extent supplanted horse labour in the cultivation of the soil. Early English patentees were Pratt in 1810, and

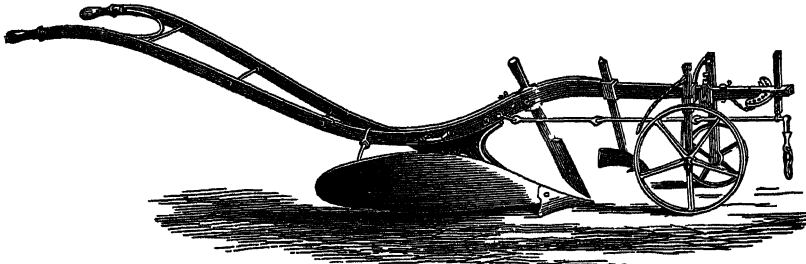


Fig. 7.—Ransome's Wheel Plough.

1851. Ransome's wheel-plough has long finely-made mould-board, rather short broad share, straight coulter, and with the two wheels on level land can almost move unattended. Ancient types, however, still survive; the East Anglian plough has only one (wooden) stilt, and is very heavy, but makes good work. There are many specially American types of plough. In the 'Sulky' plough wheels support the weight of the plough and of

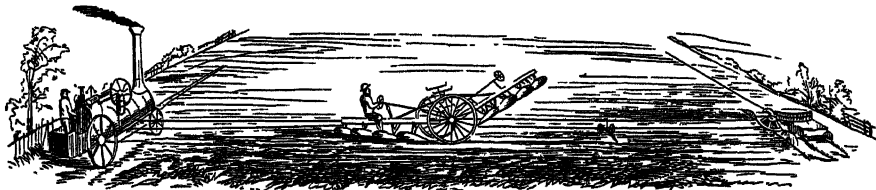


Fig. 8.—Fowler's Anchor, Engine, and Plough at work.

Heathcote in 1832. But the first steam cultivating apparatus which gave anything like satisfactory promise of success was that for which Messrs Fiskien of Stamfordham, Newcastle-upon-Tyne, took out a patent in 1855. Mr Fowler of Leeds, and Messrs Howard of Bedford, and others followed with apparatuses of various patterns. The different inventions brought into notice from time to time have included plans for engines travelling over the surface of the ground, drawing ploughs or other cultivating implements along with them; engines working on tramways and

drawing implements after them; engines moving along opposite headlands, and working implements between them by means of wire-ropes, and stationary engines driving implements also by means of wire-ropes. Only two of these systems got beyond the experimental stage. These are what are called the direct and round-about—the former where the pull of the implement is directly to and from the engine, or between two engines, one at each end of the furrow; and the latter where the implement is drawn at right angles. The best known of the apparatuses now in use are

those made by Fowler, Howard, and Barford and Perkins, of Peterborough.

The ploughs used in the various systems are very similar in construction, some taking four and others six furrows at each time. Fowler's apparatus is shown at work in figs. 8 and 9.

It has to be noted, however, that, with all the ingenuity and capital expended on the perfecting of the appliances, steam-power has not been employed in the cultivation of the soil anything like so advantageously or extensively as was at one time expected by the advocates of the practice. The great agricultural depression following the disastrous year of 1879 gave the system its first serious check. The injury unwittingly done to large extents of land by excessively deep ploughing—

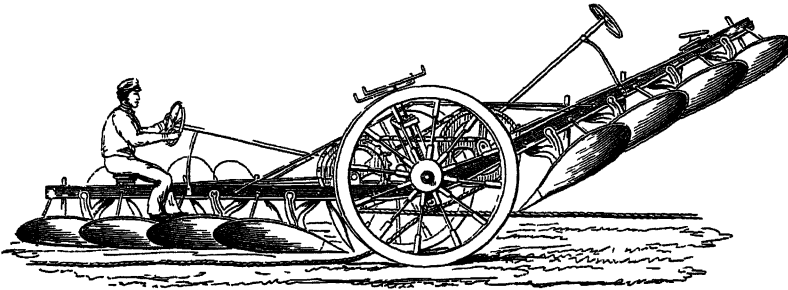


Fig. 9.—Fowler's Plough.

by burying the good soil and bringing bad material to the surface—also tended to discredit steam-cultivation. It has as a rule been found in practice that moderate ploughing and deep stirring are preferable to deep ploughing, and steam-power is now more largely employed in stirring and harrowing the soil than in turning it over in furrows. Upon extensive farms, where the fields are large and conveniently shaped, steam-tillage may be pursued with excellent results if the farmer is careful to adapt the operations to the particular character of the soil. In recent years great progress has been made in the adaptation of oil-tractors to ploughing and other operations of cultivation. The tractors vary from 15 to 40 horse-power, and draw two, three, or four-furrow ploughs. Many of the tractor-plough combinations now available do excellent work.

See J. R. Bond, *Farm Implements and Machinery* (1925); *Standard Encyclopedia of Modern Agriculture* (1911); also works on agriculture by Fream, Webb, and Wrightson.

Ploughgate, in the law of Scotland, is an expression denoting a quantity of land of the extent of 100 acres Scots. See **CARUGATE**.

Plough-Monday, or **FLOW-MONDAY**, the Monday after Twelfth Day, and termination of the Christmas holidays, when, according to the old usage, the plough should be set to work again. On Plough-Monday ploughmen were wont to drag a plough from door to door, begging money for the usual antics and ruder festivities.

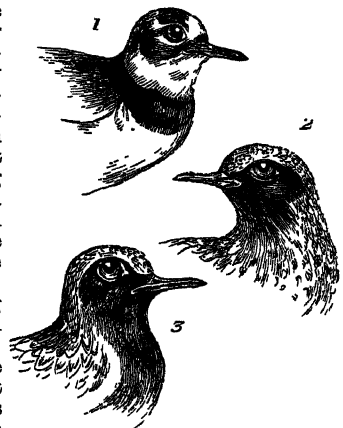
Plover, a name given to numerous species of birds belonging to several genera of the family Charadriadæ. They have a straight compressed bill, but the upper jaw is slightly inflated and slightly bent at the point; the nasal groove extends about two-thirds of the length of the bill, the nostrils are longitudinally cleft near the base; the legs, which are not very long, are naked a little above the tarsal joint; with one exception there is no hind-toe; the wings are rather long and pointed, the first quill-feather is the longest. The species are numerous, and are found

in every quarter of the globe; many of them are birds of passage. They chiefly frequent low, moist grounds, where they congregate in large flocks, and feed on worms, molluscs, insects, &c.; but some of them visit mountainous regions in the breeding season. They fly with great strength and rapidity, and run with much swiftness. The flesh and eggs of many of them are esteemed delicacies. A common British species is the Golden Plover (*Charadrius pluvialis*), a handsome bird, of a blackish colour, speckled with yellow at the tips and edges of the feathers; the throat, breast, and belly black in summer, whitish in winter. The golden plover is a bird of passage, visiting in summer the northern parts of Europe, of the west of Asia, and of North America, and

migrating to the south in winter. It is known in most parts of Europe, and is common in many districts of Britain, breeding in the northern counties. Great numbers frequent the sandy pastures and shores of the Hebrides and of the Orkney and Shetland Islands. It makes an antless nest, little more than a slight depression in the ground, and lays four eggs. The parent birds show great anxiety

for the protection of their young, and use various stratagems to divert the attention of an enemy. The golden plover exhibits great restlessness on the approach of wet and stormy weather, whence

its specific name *pluvialis*. The Ringed Plover (*Agialitis hiaticula*), locally called Stone-hatch or Sand-lark, a much smaller bird, not so long as a song thrush, is found at almost all seasons on the shores of the British Islands, frequenting sandy and shingly flats, from which the sea retires at ebb-tide. It is often to be seen also on the banks of large rivers, and not unfre-



1, Ringed Plover; 2, Gray Plover; 3, Golden Plover.

quently by lakes and ponds. It is found in most of the northern parts of Europe and Asia, and in Iceland and Greenland. It is grayish brown above, whitish beneath, with a collar of white round the neck, and below it a black—in winter a brown—collar; the head marked with black and white, a white bar on the wing. Very similar, but smaller, and with an incomplete collar, is the Kentish Plover (*Æ. cantiana*); and also similar in form and habits is the smallest of the British species, the Little Ringed Plover (*Æ. curonica*). Both of these are rare in Britain. The Gray Plover (*Squatarola helvetica*), a species somewhat larger than the golden plover, is distinguished by black axillaries, white tail-coverts, and the presence of a hind-toe. North America has a number of species

of plovers, such as the Kildeer Plover (*Æ. vociferus*), abundant on the great western prairies, and not unfrequent in the Atlantic states. It utters, when approached by man, a querulous or plaintive cry, like the lapwing, the Green Plover. See DOTTEREL, and LAPWING; and for the so-called Stilt Plover, see STILT.

Plover's eggs are sold in enormous quantities in London and other large towns, and command an extraordinary price, eighteen shillings a dozen or even more, being sometimes given for them, and the cost is seldom less than threepence or sixpence per egg. These are supposed all to be plover's eggs, or, really, lapwing's eggs; but doubtless the eggs of many other birds are substituted, those of the red-shank being very similar in appearance and flavour. Rook's eggs are too decidedly unlike the plover's to be put in their place. Some sea-birds' eggs are occasionally passed off under the name; and it is said that eggs outwardly unlike plover's have been skilfully painted by hand in order to deceive. Scotland, Ireland, and Holland are all laid under contribution to produce the tens of thousands of dozens of genuine plover's eggs which it is computed are annually consumed in London.

Plum, the fruit of several trees of the genus *Prunus* (family Rosaceæ), especially of *P. domestica*. By long cultivation various garden forms have been produced, but it is impossible to trace the line of descent in every case. Blackthorn, or Sloe (q.v.), and the Bullace (q.v.) are both British plants. The Wild Plum (*P. communis* or *P. domestica*) also occurs, but is not indigenous. Some would group all three as varieties of one species. The Mussel and the Wine Sour, which are used in cooking and in confectionery, are regarded as primary varieties of the wild plum. The cultivated varieties of the plum are very numerous; there are larger and smaller kinds, but their value in the dessert is reckoned by their sweetness and flavour rather than by their size. Thus, the Green Gage, a kind with only moderate-sized fruit, is the most esteemed of all. It is the *Reine Claude* of the French, and the *Regina Claudio* of the Italians. *Magnum Bonum*, a very large white variety, though one of the handsomest, is accounted only of second-rate quality. *Prunes* are the dried fruit of certain kinds of plum. The finest of all the French prunes are made at Brignole in Provence of the varieties of plum called *Perdrigon blanc* and *Perdrigon violet*, which are hence named *Pruneaux de Brignole* or *Brignoles*. The manner of converting these plums into prunes is by drying in a slow oven. The fruit is allowed to remain on the tree till it is so ripe that a little shaking would cause it to fall. They are then carefully picked and spread out in the sun on sieves made of lath or wickerwork till they become soft. Afterwards they are put in a spent oven, and shut up close in it for twenty-four hours, and then taken out. The oven is again heated, somewhat warmer than before, and the plums returned to it till the following day, when they are taken out and turned by slightly shaking the sieve. Again the oven is heated, rather warmer than before, and the fruit returned to it for twenty-four hours, and so on till the operation of drying is finished, a point which only experience can nicely determine. Prunes of inferior quality are made from the fruit of the *Petit Damas*, and from the *Quetsche*, the latter being made in Germany. From this also is distilled a kind of brandy. In Bosnia and Herzegovina vast quantities of prunes are produced in a good season. Prunes are nutritious and laxative, and stewed in water are excellent diet in case of costiveness and during convalescence from fevers and inflammatory complaints. They impart their laxative quality to the water in

which they have been stewed. The plum is grown in orchards as standard and bush trees, or in the case of the choicer varieties trained to walls. It is not fastidious as to soil, but the finest fruit is produced on strong but well-drained loam. The superior kinds are propagated chiefly by budding and by grafting, the inferior by layers or by cuttings of the roots, the latter being a common method in rearing Damsons in some parts; but the quickest and best method of increasing all is by budding. The wood of the plum-tree is hard and fine-grained, and is used in cabinet-work and in turnery. The Kashmir Plum, cultivated in Kashmir and Bokhara, is identical with *P. insititia*. The Cherry Plum, or Myrobalan Plum (*P. divaricata*), is a bush very similar to the sloe, with pendulous globular red fruit. It is of oriental origin, but is often cultivated for its fruit on the continent of Europe. In Britain it seldom produces fruit. *P. maritima* is a shrub, indigenous to sandy soils on the seacoast of North America from Massachusetts to Alabama. It has a dark-purple agreeable fruit, about the size of a pigeon's egg. Other native American species are *P. angustifolia*, the Chickasaw Plum, a shrub or small tree of the southern states; *P. americana*, a bushy tree ranging from Canada to Georgia; and *P. glandulosa*, of Texas, which is less than a foot high, and has crooked thorny branches. The genus *Prunus* has about 130 species (50 in China). See also APRICOT, CHERRY, PEACH.

The Cocoa Plum or Icaco of the West Indies is the fruit of *Chrysobalanus Icaco*, a tree of the family Rosaceæ, sub-family Chrysobalanoideæ. The fruit resembles a plum, has a sweet although slightly austere taste, and is eaten both raw and preserved. The fruit of *Parinari excelsum*, another of the Chrysobalanoideæ, is called the Gray Plum in Sierra Leone.—The term plum is used loosely for the Date Plum (q.v.); and plum or plumb was a word once current for £100,000.

Plumage. See BIRD, and FEATHERS.

Plumbaginaceæ, or PLUMBAGINÆ, a family of dicotyledons, herbaceous or half-shrubby, to which belong about 300 known species, chiefly found on the seashores and in the salt marshes of temperate regions. Some are found also in elevated regions in all zones. Many have flowers of great beauty, and are therefore favourites in gardens. Some are occasionally used in medicine as tonics and astringents; others, being exceedingly acrid, as vesicants, particularly species of *Plumbago*. Thrift (q.v.) or Sea-pink is the most familiar British example of the family. Sea-lavender (*Statice Limonium*), an inhabitant of the coasts of England and (rather rarely) of Scotland, common, however, on the western coasts of Europe, the Mediterranean, and western Asia, appearing also on the seashore of South America and of the Carolinas, and there known by the name 'Marsh Rosemary,' is extremely bitter and astringent. Its most abundant principle is tannic acid, of which it contains 12·4 per cent. Along with this it gives a peculiar gum and extractive volatile oil, resin, caoutchouc, colouring matter, lignin, and various salts.

Plumbago. See BLACK-LEAD, PLUMBAGINACEÆ.

Plumbism, or LEAD-POISONING. See LEAD.

Plume-bird, a term sometimes given to the Epimachidæ or Long-tailed Birds of Paradise (q.v.).

Plumer, HERBERT CHARLES ONSLOW PLUMER, BARON, born 13th March 1857, served in Sudan (1884) and South Africa. In the Great War he commanded the Fifth Army Corps in France (January–May 1915), the Second Army (1915–17),

the Expeditionary Force in Italy (1917-18), and in the closing stages of the war the Second Army again. He was made governor of Malta, field marshal, and a baron in 1919, high commissioner for Palestine in 1925. See WAR (GREAT).

Plummer's Pills. See GUAIACUM.

Plumptre, EDWARD HAYES, was born in London, 6th August 1821, and educated privately and at University College, Oxford, graduating with a double first-class in 1844. The same year he was elected fellow of Brasenose College. He became chaplain at King's College, London, in 1847, and afterwards professor of New Testament Exegesis there. In 1863 he was given a prebend of St Paul's, and from 1875 to 1877 he was principal of Queen's College, Harley Street. He was select preacher at both universities, Boyle Lecturer in 1866-67, and one of the Old Testament Company for the Revision of the Bible. In 1869 he was presented to the rectory of Pluckley in Kent, which four years after he exchanged for the vicarage of Bickley, and in 1881 he was installed Dean of Wells. He died 1st February 1891. In *The Spirits in Prison* (1884) he spoke out eloquently his belief in the 'wider hope' and an intermediate state of probation. He published several volumes of sermons and studies, contributed to various commentaries, to Smith's Dictionaries, and to periodicals. His name is also widely known by his admirable verse translations of *Sophocles* (1865), *Æschylus* (1868), and the *Commedia* of Dante in the original metres (1886); as well as by several volumes of original verse. His *Life and Letters of Bishop Ken* (1886) is less happy.

Plum-pudding. This national English dish is an example of the happy results of the law of evolution. The 'plumb-porridge' which delighted our ancestors has been drained and dried and squeezed into the moulds of civilisation, and few will doubt the 'survival of the fittest' among its ingredients. It is not known when the change from porridge to pudding actually took place. In *Hudibras* we find a mention of 'minced pies and plumb-porridge.' Addison in the *Tatler* speaks of both as the 'first parts of the dinner,' and in the *Spectator*, No. 269, plumb-porridge is mentioned as eaten on Christmas Day. Southey in his *Omniana*, vol. i. p. 7, quotes a recipe for plum-pudding as given in French by the Chevalier d'Arvieux, who in 1658 made a voyage in an English forty-gun ship. This pudding was directed to be boiled in meat broth, and when dished up to be covered with grated cheese. In the earlier collections of recipes we find nothing of the kind, unless a hint of plum-porridge be discerned in the mixture called *Rape*, a *posset* of 'raissins of corans' with 'swet wyne' and 'crustes of bred.' A recipe for this is given in *A Noble Boke off Cookery* (ed. Napier, p. 109), which must have been written out in the 15th century, but was then probably copied from one of a much earlier date.

Plumstead. See ERITH.

Plumularia, a genus of Hydrozoa (q.v.), typical of the family Plumulariidae, which includes about a fourth of all the hydroid zoophytes.

Plumule. See SEED.

Pluralism. Persons in power have often added to their wealth and consequence by holding several appointments; but such pluralism is forbidden by the constitutional practice of many modern states. In England a minister who holds two political offices (e.g. those of First Lord of the Treasury and Chancellor of the Exchequer) receives only half the salary of the second. Pluralism in the church has been held unlawful from the earliest times, and is forbidden by many ancient councils,

as Chalcedon (451 A.D.), 2d Nicæa (787 A.D.). This prohibition, however, was not regarded as absolute; canonists distinguish 'compatible' and 'incompatible' benefices or dignities. Two benefices may be incompatible in three ways—(1) if each requires residence; (2) if the duties of both fall to be discharged at one and the same time; or (3) if the revenue of either fully suffices for the becoming maintenance of the incumbent. In other cases benefices or dignities are considered compatible, and with the due dispensation, granted by the pope, may be held by the same person. In England the law of the church has been made more stringent by acts of parliament passed in 1837, 1850, and 1885. The effect of these acts seems to be that no person can now hold two benefices unless the churches are within two miles of each other and one of them is not worth more than £200 a year. A benefice of 3,000 population is not to be held along with a benefice of 500 population. In order to hold two benefices a clergyman must obtain a dispensation from the Archbishop of Canterbury. Acceptance of a second preferment, except in the cases provided for in the acts, will vacate any preferment previously held. In Scotland it is contrary to the statute of 1581 for a minister of the Established Church to hold two or more charges, and the rule has been regularly enforced in the case of two pastoral charges. In the case of ministers appointed professors before or after an appointment to a pastoral charge, a resignation is now necessary of one of the offices within a certain time after the appointment.—Pluralism, in philosophy, is opposed to absolutism and monism, and insists on the reality of finite individuals. It may either content itself with accepting a plurality, of self-existent conscious beings as the ultimate fact of the universe, asserting the impossibility of including them in any higher unity; or with Professor Ward attempt to reunite pluralism with creation and theism. William James was a conspicuous exponent of pluralism. See LEIBNIZ.

Plush (Fr. *peluche*), a variety of cloth woven like velvet, but differing from it in having a longer and more open pile. Formerly this pile was of goat's hair or worsted, but now it is largely made of silk, with a cotton backing, and sometimes the whole fabric is of silk. Silk plush is the material used for the outside of gentlemen's 'silk' hats, and is called hatter's plush. It is also worked in coloured silks for articles of ladies' attire and for covering furniture; but plush is used *par excellence* for livery knee-breeches.

Plutarch (*Ploutarchos*), a prolific writer of the Græco-Roman period, was born about 46 A.D. at Chæroneia in Boeotia, where his family was one of good standing. Nothing is known of his personal history but what may be gathered from his own writings. His higher education was commenced at Athens under the academic philosopher Ammonius in 66, the year of the Emperor Nero's progress through Greece. He paid more than one visit to Rome, the then metropolis of the world—on the first occasion in the reign of Vespasian as *chargé d'affaires* of his native town. There he enjoyed the friendship of several men of mark, such as Gaius Sossius Senecio, who was four times consul, while he devoted himself to a course of study and gave public lectures in philosophy, so that he had but little leisure left for learning the Latin language, and never attained a full knowledge of its niceties and idioms or a correct notion of Roman institutions. The story that he became Trajan's preceptor, and was raised by that emperor to the consulship is a legend of doubtful credit. Life at Rome, however, was not altogether to his taste; he preferred the quiet of his native place,

and there he spent all his mature life until his death about 120, discharging the civil and religious duties which fell to his station, liberally disbursing his stores of learning, and offering himself as a sort of spiritual guide and physician of the soul to those who needed moral hygiene and desired to rule their lives by some higher standard in a corrupt and effete age, when the old faiths were dead and the objects of modern life as yet below the horizon. The extant writings of Plutarch fall into two principal classes—(a) his historical works, (b) those which are grouped under the general head of *Opera Moralia* (ἠθικά). To the former belong his *Parallel Lives*—the work by which he is best known. These contain a gallery of portraits of the great characters of the ages preceding his own. They were published in successive books, each pair forming one book (*biblion*), a Greek and Roman, with some resemblance between their respective careers, being chosen for the subject of each. The forty-six extant *Lives* were contained in twenty-two books, probably in the following sequence (that in which they are usually arranged being purely arbitrary): (2) *Sertorius—Eumenes*, (3) *Cimon—Lucullus*, (4) *Lysander—Sulla*, (5) *Demosthenes—Cicero*, (6) *Agis and Cleomenes—Gracchi*, (7) *Pelopidas—Marcellus*, (8) *Phocion—Cato mi.*, (9) *Aristides—Cato ma.*, (10) *Pericles—Fabius Maximus*, (11) *Nicias—Crassus*, (12) *Dion—Brutus*, (13) *Timoleon—Emilius Paulus*, (14) *Philopœmen—Titus Flaminius*, (15) *Themistocles—Camillus*, (16) *Alexander—Cæsar*, (17) *Agésilas—Pompeius*, (18) *Pyrrhus—Marius*, (19) *Solon—Valerius Publicola*, (20) *Demetrius—Antonius*, (21) *Alcibiades—Coriolanus*, (22) *Theseus—Romulus*, (23) *Lycurgus—Numa*. The first series, which includes (2) to (9), was written at the suggestion of some personal friends. The biographies in this series partake more of a historical than of an ethical character. The second, (10) to (19), was composed for the writer's own satisfaction and moral improvement; the third, (20) and (21), professed to teach virtue by painting its opposite; the fourth, (22) and (23), dealt with prehistoric characters. The single biographies of *Aratus*, *Artaxerxes*, *Galba*, and *Otho* do not come under the category of *Parallel Lives*. The sequels which come after most of the *Lives*, giving a detailed comparison (*synkrisis*) of each warrior, statesman, legislator, or hero, as the case may be, and of the exact points of resemblance between them, hardly accord with the design of Plutarch, and are therefore regarded as spurious by some critics.

Plutarch's biographies are not merely popular compilations, but monuments of great literary value for the precious materials which they contain, based as they are upon lost records. The author adheres throughout to his professed purpose—viz. portraiture of character; he either omits or briefly touches upon the most famous actions or events which distinguish the career of each subject of his biography, holding that these do not show a man's virtues or failings so well as some trifling incident, word, or jest. 'C'est la vérité morale,' says Gréard, 'non la vérité historique, qu'il poursuit; l'une n'est pour lui que le moyen, l'autre est le but.' For this reason the *Parallel Lives* are and will remain the book of all ages, for no book of classical antiquity has had more influence upon the leading men of the world, so that Plutarch may almost be called the interpreter of Greece and Rome to modern Europe. They form indeed a complement to the other and less known half of his writings—the *Morals*—a collection of short treatises, sixty or more (though certainly not all from Plutarch's hand), upon various subjects—*Ethics*, *Politics*, *History*, *Health*, *Facetics*, *Love-stories*, and *Philosophy*. The last comprise

dissertations *On the nature of the unseen world and spiritual beings*, *On the creation and government of the Universe*, *On the human soul*, and similar speculations, classed by the ancients under the head of *Theosophy*. 'The treatise upon *Isis and Osiris* in this series,' says C. W. King, who revised Holland's translation in 1882–88, is 'the only complete account of the religion of Egypt that has come down to us—written too by one who had been initiated in its deepest mysteries. The three treatises upon the *Oracles* also are of the highest value, and that on *Superstition* is one of the most eloquent and closely reasoned compositions of antiquity.' Some of the essays, especially those *On Brotherly Love*, *On gradual advance in virtue*, *On the benefit to be got out of enemies*, breathe quite a Christian spirit, although the writer probably never heard of Christianity or its divine founder. One of the most interesting is that *On the apparent delays in divine justice*; another, *On the conduct proper to young men at Lectures*, which is partly moral, partly social in its tone. The nine books of his *Symposiaca* or Table-talk on a variety of topics exhibit him in the light of the most amiable and genial of boon companions, who appreciated good conversation; while his dialogue *Gryllus* reveals a remarkable sense of humour.

Though not a profound thinker, Plutarch was a man of rare gifts, and occupies quite a unique place in literature as the encyclopædist of antiquity. He was not master of any science, but whatever was noticeable in natural, moral, or metaphysical science did not come amiss to him, and he had a universal sympathy with genius and nobility of character. As a moralist he is, as Professor Mahaffy well describes him, the spokesman of the better life that still survived in the Greek world in the 'Martinmas summer' of its history; not the exponent of any system, and only occasionally an opponent, as in the *Dialogue against Colotes*, the disciple of Epicurus, and that *Against the Stoic first conceptions*, but a man of practical views and sober judgment, a chief example of the illumination of the intellect by the power of morals. His kindly sympathy and tender-heartedness, a leading feature in his character, is well shown in his *Consolation addressed to Apollonius on the early death of his son*, and the beautiful *Letter to his wife on the death of their only daughter*. As a stylist he is picturesque, realistic and varied; his chief fault is a tendency to diffuseness and redundancy of expression. He does not, like his contemporary Lucian, affect the Attic purity and clearness of diction, and he is too fond of crowding his sentences; but occasionally he rises into eloquence, and he is almost always happy in the novelty of his illustrations and similes and the point of his anecdotes.

The best editions of Plutarch's entire works are those of J. J. Reiske (12 vols. 1774–79) and Dübner-Döhner in Didot's *Bibliotheca* (5 vols. 1846–55). The best text of the *Lives* is that of Sintenis in the Teubner series (5 vols. 1874–81); of the *Moralia*, that of D. Wyttenbach (15 vols. Oxford, 1795–1830; unfinished), and that in the Teubner series by G. N. Bernardakis (6 vols. 1888–95). There are translations of the *Lives* in English by the brothers Langhorne and by Dryden and others (the latter re-edited by A. H. Clough, 5 vols. 1874)—neither so scholar-like and correct as the French of Jacques Amyot (Paris, 1559), from which Sir Thomas North's version (1579; new ed. by Wyndham, 6 vols. 1895 *et seq.*) was made; also (with text) by B. Perrin (11 vols. 1914 *et seq.*), and of the *Roman Lives* by G. Long. A translation of the *Moralia* by several hands was revised by W. W. Goodwin (1874–78). See Trenchard's lectures and Octave Gréard's study; Oakesmith's *Religion of Plutarch* (1902); Dill's *Roman Society from Nero to Marcus Aurelius* (1905); Mahaffy's *Silver Age of the Greek World* (1911); Miss Westaway's *Educational Theory of Plutarch* (1922); and H. J. Rose's translation, &c., of *The Roman Questions* (1924).

Pluto (Gr. *Ploutón*, from *ploutein*, 'to be rich'), originally only a surname of Hades, as the giver or possessor of riches is, in the mythology of Greece, the third son of Kronos and Rhea, and the brother of Zeus and Poseidon. On the tripartite division of the universe he obtained the sovereignty of the under-world—the realm of darkness and ghostly shades, where he sits enthroned as a 'subterranean Zeus'—to use the expression of Homer, and rules the spirits of the dead. His dwelling-place, however, is not far from the surface of the earth. Pluto is inexorable in disposition, not to be moved either by prayers or flatteries. He is borne on a car, drawn by four black steeds, whom he guides with golden reins. His helmet makes him invisible. According to some scholars, his name of *Hades* is from a priv., and *idein*, 'to see;' although others, with less probability, derive Hades from *hadō* or *chadō*, 'I receive or embrace,' and translate the word the 'all-receiver.' In Homer Hades never means a place, but always a person. Moreover, it is to be noticed that the poet does not divide the realm of the shades into two separate regions. All the souls of the dead—good and bad alike—mingle together. Subsequently, however, when the ethical conception of future retribution became more widely developed, the kingdom of the dead was divided into Elysium (q.v.), the abode of the good, and Tartarus (q.v.), the place of the wicked. This change also exercised an important influence on the conception of Pluto. The ruler of the under-world not only acquired additional power and majesty, but the very idea of his character was essentially modified. He was now regarded as a beneficent deity, who held the keys of the earth in his hand, and possessed its metallic treasures (whence his new name *Pluto* or *Plutus*), and who blessed the year with fruits, for out of the darknesses underground come all the riches and swelling fullness of the soil. Hence, in later times, mortals prayed to him before proceeding to dig for the wealth hidden in the bowels of the earth.

Pluto married Persephone (Proserpina), the daughter of Demeter (Ceres), after carrying her off from the plains of Enna. He assisted his brothers—according to the mythological story—in their wars against the Titans, and received from the Cyclopes, as a reward for delivering them from Tartarus, the helmet that makes him invisible, which he lent to Hermes (Mercury) in the aforesaid war, to Perseus in his combat with the Gorgons, and which ultimately came to Meriones. The Erinyes and Charon obey his behests. He sits in judgment on every open and secret act, and is assisted by three subordinate judges, Æacus, Minos, and Rhadamanthus. At Elis alone was there a formal cult of Pluto, though in many places in Greece he was worshipped conjointly with Demeter and Korē. Among trees and flowers the cypress, boxwood, narcissus, and maidenhair were sacred to him; black rams and ewes were sacrificed to him amid the shadows of night, and his priests had their brows garlanded with cypress wreaths. In works of art he resembles his brothers Zeus and Poseidon; only his hair hangs down somewhat wildly and fiercely over his brow, and his appearance, though majestic, as becomes so mighty a god, has something gloomy and terrible about it.—The Plutonian theory in Geology, otherwise called Vulcanist or Huttonian, was opposed to the Neptunist or Wernerian. See GEOLOGY and HUTTON; and for the Plutonic rocks, see IGNEOUS ROCKS.

Pluviometer. See RAIN-GAUGE.

Plymouth, one of the most famous of English seaports, an ancient parliamentary, municipal, and county borough, and an important naval base, lies

in the extreme south-western corner of Devonshire, 230 miles by rail (216 by road) WSW. of London, 128 SW. of Bristol, and 44 SW. of Exeter. It occupies the northern shore of Plymouth Sound (see below), immediately at the mouth of the Plym. The remaining space between it and the Hamoaze, the estuary of the Tamar, is occupied by the smaller town of Stonehouse, while still farther to the west, along the Hamoaze itself, stretches the third of the 'Three Towns,' Devonport. Since 1914, however, Devonport and Stonehouse have formed part of Plymouth. Plymouth itself is the chief seat of commerce, trade, and manufacture, and within the 19th century displayed an enterprise which gave it a high place among provincial centres. The site is



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a very fine one. Between the two natural inlet harbours of Sutton Pool and Mill Bay stretches the bold rocky ridge of the Plymouth Hoe, the eastern end of which is occupied by a citadel built by Charles II. Northward the ground rises in a series of long hills, along which the town stretches until it passes into a suburban hill of singular attractiveness. From the Hoe there are magnificent views both seaward and landward. On the Hoe, now laid out with grassy slopes and a promenade, the captains of the fleet which assembled to meet the Armada whiled away the time, according to tradition, by playing a game of bowls; and here stand a tercentenary memorial to the Armada heroes (1890), a statue (1884) of Sir Francis Drake (one of Boehm's finest works), the upper portion of Smeaton's Eddystone lighthouse, rebuilt here in 1882-84, and the Royal Naval War Memorial (1924). Old Plymouth—a dingy, unattractive set of narrow streets, chiefly clustered round the shores of Sutton Pool—is gradually disappearing, and the town now has miles of excellent thoroughfares and many handsome buildings, chief among them a noble Gothic guildhall (1874), with a series of stained-glass windows depicting episodes in the town's history. The principal antiquity is the fine 15th-century church of St Andrew, Perpendicular in style, and restored in 1874-75 by Sir Gilbert Scott; Charles Church, built with interruptions between 1640 and 1656, is a singularly good example of post-Reformation Gothic; the church of Stoke Damerel has an ancient tower (1490); while the Roman Catholic cathedral is an effective Early English edifice (1858). The Cottonian collection of sketches by the leading Continental masters is

at the Municipal Museum (1910), which also has important natural history and entomological collections; there is a good local museum at the Athenæum. There are numerous charitable institutions and hospitals. The Marine Biological Laboratory (1888), on Citadel Hill, is an important research centre. The town is served by the Great Western and the Southern Railway. In Millbay are the Great Western Docks, the property of the Great Western Dock Company, which are capable of taking the largest merchant-vessels. Sutton Pool, the ancient tidal harbour of Plymouth, in addition to a large general trade, is the seat of the fisheries of the port, which are very important. Manufactures, mainly chemical, are carried on—at Cattedown chiefly. There is a large foreign and a very extensive coasting trade, and the port is used by lines of passenger and mail steamers to almost every quarter of the globe. The chief government establishments are at Devonport—the South Yard (Royal Devonport Dockyard), established there by William III. in 1689; the North Yard (Keyham Steam Yard), founded at Morice Town in 1844; the Gun Wharf (1718), the Royal Naval Barracks (1886), Royal Naval College, a military hospital. Stonehouse, once called Hepeston, has a naval hospital, marine barracks, and the Royal William Victualling Yard, containing a naval ordnance depot. There is some trade in timber.

Though only a fishing-village at the Conquest, under the name of Sutton, i.e. South Town, Plymouth (so called since its incorporation in 1439 by Henry VI.) has for centuries played a leading part in nautical life. It was the favourite port of the Black Prince; the chief Elizabethan rendezvous of Drake, Hawkins, Grenville, Raleigh, and their fellows; the final port of departure of the *Mayflower* with the Pilgrim Fathers. In the civil wars it sided with the parliament, successfully enduring sieges and blockades for over four years, and it was also the first town to declare for William of Orange. In the great French war it rivalled Portsmouth in naval activities. Throughout its history the town has been several times sacked by coast marauders. Among its more distinguished natives are Sir John Hawkins, Sir Richard Hawkins, Sir Thomas Edmonds, Joseph Glanville, R. S. Hawker, Lord Monkswell, Sir W. Snow Harris, F.R.S., W. Elford Leach, F.R.S., with Northcote, Haydon, S. Prout, Sir C. Eastlake, P.R.A., and S. Hart, the artists. Plymouth (comprising the three parliamentary divisions of Drake, Sutton, and Devonport) returns three members to parliament. Pop. (1801) 43,194; (1871) 70,091; (1891) 88,931; (1911) 112,030; (1921) 209,857.

PLYMOUTH SOUND, on the south-west of Devonshire, near the entrance of the English Channel, is one of the famous roadsteads of the world. It is a deep inlet, into which the river Tamar falls from the west, and the river Plym from the east. The extreme seaward boundaries of the bay, from which the Sound, properly so called, opens, are Rame Head (mentioned in Ptolemy) and Stoke Point, not far within which a third river, the Yealm, debouches. The Sound, however, is practically bounded southward by a line drawn from Penlee to Wembury Points, and northward by the Plymouth Hoe. Within these limits its width varies from 2½ to 3 miles, while its landward depth is about 3. Immediately within Penlee Point, on the western side, is Cawsand Bay, formerly one of the chief anchorages of the port and navy, but so exposed to the south-easterly gales that it was at times very dangerous. Vessels anchored in the Sound itself were so open to the full fury of the south-westers that in 1812 the construction of the Plymouth Breakwater was begun (see **BREAK-WATER**). About half a mile from the Hoe is a little islet, originally called St Nicholas Island,

but now more commonly Drake's Island. A formidable stone fort has also been built on an artificial island immediately within the breakwater; while on either shore there are extensive forts and batteries—at Bovisand and Stamford on the east, and at Picklecombe, Maker, and Tregantle on the west. The estuary of the Plym is called the Cattewater, and is a capacious and important inner mercantile anchorage, opening from the Sound eastward, and protected by the Batten breakwater. The estuary of the Tamar is called the Hamoaze, and from the spot at which it enters the Sound between Devil's Point and Mount Edgumbe to Saltash is nearly 4 miles in length—a still more valuable and thoroughly protected anchorage for vessels of the largest size, and occupied by men-of-war. In the Channel, 14 miles off the Sound, is the dangerous Reef of Eddystone (q.v.), indicated since 1698 by lighthouses, and now rather a directing post to the port than a danger. Plymouth Sound is exceedingly beautiful, and has even been considered worthy of rivalry with the Bay of Naples. On its western shore is Mount Edgumbe, the delightful seat of the Earl of Mount Edgumbe, traditionally said to have been selected by Medina Sidonia as his share of the English spoil. Rame Head, crowned by the ruins of a mediæval chapel, is one of the most picturesque headlands on the coast; and the estuary of the Yealm, with the peaked Mewstone at its mouth, is full of romantic beauty.

Plymouth, (1) capital of Plymouth county, Massachusetts, on Plymouth Bay, 37 miles by rail SE. of Boston, is famous as the landing-place of the Pilgrim Fathers (q.v.). Plymouth Rock is a granite boulder at the water's edge on which they landed. It is covered by a handsome granite canopy, and there is also a national monument (1858-89) to the pilgrims; the pedestal, also of granite, stands on a hill overlooking the landing-place, and is 46 feet high, surmounted by a central figure of Faith, 36 feet high, with four immense stone figures representing Morality, Education, Freedom, and Law around the base. In Pilgrim Hall (1824-25) are preserved many relics of the first settlement of the country. The town manufactures cordage, woollens, nails, tacks. It is popular as a summer resort. Pop. 13,000.—(2) A mining town of Pennsylvania, on the Susquehanna River, 20 miles by rail SW. of Scranton. Pop. 16,500, largely foreigners.—(3) The capital of Montserrat (q.v.).

Plymouth Brethren, a name given by others to a body of Christians which since 1830 has extended itself throughout the British dominions and in some parts of the continent of Europe, particularly among the Protestants of France, Switzerland, and Italy, and also in the United States of America. It originated in a reaction against exclusive High Church principles, as maintained in the Church of England, with everything of a kindred nature in other churches, and against a dead formalism associated with 'unevangelical' doctrine. Some of the first members of the new religious communities formed in Plymouth and elsewhere were retired Anglo-Indian officers, men of unquestionable zeal and piety; but these communities began to appear almost simultaneously in a number of places. Their origin is, however, very much to be ascribed to the labours and influence of John Nelson Darby (1800-82), from whom the Plymouth Brethren on the continent of Europe are very generally known as *Darbyites*. Darby was a barrister, who under deeply religious impressions became a clergyman of the Church of England, and served as a curate in Wicklow; but in 1827 he left the Church of England from conscientious scruples, and became an evangelist unconnected with any church. In

this character he laboured both in England and on the continent of Europe, preaching in French, English, and German. It was in 1830 that he founded at Plymouth the congregation whence comes the name usually given to the communion; the Dublin assembly dates from the same year. He also gave utterance to his opinions in numerous pamphlets, in a quarterly periodical, and a long series of theological works. His tenets, and those of the Brethren in general, are strictly Calvinistic: original sin and predestination, the efficacy of Christ's sacrifice, the merit of His obedience, the power of His intercession, the gracious operations of the Holy Spirit in regeneration and sanctification are prominent points. Pre-Millenarian views are generally entertained by the Brethren; and they usually practise the baptism of believers without regard to previous infant baptism. Among a section household baptism has come to be practised. They partake of the Lord's Supper every Sunday, or 'first day of the week.' They utterly reject the rite of confirmation. Their most distinctive peculiarity, when contrasted with other Calvinistic churches, is their complete rejection of ecclesiastical organisation. They suppose the whole Christian body in the world to have declined from truth and duty, like Israel of old, and therefore to have been 'corporately rejected of God,' and believe that the church consists of all true believers in the Lord Jesus to whatever denomination they may belong—holding uniformly that no unbeliever or unregenerate person ought to be recognised as in the church of God. They refuse to recognise any humanly devised form of church government, or any official or salaried ministry; they insist on the privilege and responsibility of every individual to minister according to his gift and ability, in order to the edification of the whole. Practically the number of those fitted publicly to teach or minister the Word of God is very limited, and those who are not fitted for such ministry are not encouraged and sometimes restrained.

They distinguish widely between pastors, teachers and exhorters, whose ministry is to the church, and evangelists, whose ministry of the gospel is toward the world. Whilst disowning human qualifications and ordination as generally practised, and condemning wholly as unscriptural the distinction of 'clergy and laity,' they hold that it is right to own such evangelists, pastors, and teachers as Christ the Head of the Church has bestowed and the Holy Spirit has qualified. Such as devote themselves wholly to the work of the gospel are supported by voluntary and unsolicited contributions. In their assemblies there are frequent pauses, and liberty therefore for any member to lead in prayer or praise or to exhort or teach as he may judge to be for edification, guided by spiritually enlightened understanding of what is fitting and in harmony with what has gone before. Women are not allowed to take public part in the assembly. Persons proved to have been guilty of the sins mentioned in 1 Cor. v. 11 are excluded from the fellowship, as well as those who deny foundation truths of Christian doctrine, until evidence of repentance satisfactory to all is forthcoming. The Plymouth Brethren reject every distinctive appellation but that of Christians, although a special denomination is found necessary to designate them; no one not holding their views could remain associated with them. A schism took place among them in consequence of doctrines preached at Plymouth concerning the human nature of Christ; Darby vigorously opposing what he deemed a dangerous error, and he and his adherents utterly separating from the fellowship of those who maintained it, or refused to condemn it, and also from all who, even

though personally clear of the error, refused to endorse the extreme form of separation demanded by Darby. The Darbyite section since Darby's death has been more than once divided about various questions of doctrine and discipline.

See the works of Darby, Kelly, C. H. Mackintosh, and J. G. Bellett; and books for or against the doctrines of the Brethren by Trotter (1856), Groves (1867), Reid (1875), Miller (1879), Teulon (1883), Neatby (1901).

Piżeń. See PILSEN.

Pneumatic Despatch, the name given to a method of sending written documents, chiefly telegraphic despatches, through a comparatively narrow tube by means of compressed air and by a partial vacuum. Early in the 19th century Mr Medhurst proposed to construct a railway on this principle with carriages moving through an air-tight tunnel (see MURDOCK). But Mr Latimer Clark, C.E., was the first to carry out a plan for the transmission of telegrams by pneumatic power. In 1853 he got a tube laid between the central station of the International Telegraph Company and the Stock Exchange, London, through which a carrier containing despatches was propelled by a current of air produced by connecting the tube with a vacuum holder. An improvement on this was made in 1858 by Mr Varley, C.E., who introduced compressed air for the outward and retained the vacuum method for the inward traffic. This method is still in use.

The essentials of a pneumatic despatch are the exhausting and compressing pumps worked by a steam-engine or electric motor; a metal tube of copper or brass inside buildings and of lead for street tubes, where it is protected by being carried in cast-iron pipes; a small carrier of gutta-percha or other material to contain the despatches; and a suitable arrangement of valves at the stations for connecting the tube or tubes with the compressed air or vacuum mains. It has been found by experience that with heavy traffic, such as that at the telegraphic department of the London Post-office, a lead, brass, or copper pipe $1\frac{1}{2}$ or $2\frac{1}{2}$ inches in internal diameter is a convenient size. The method of working is this: At the central station end of the tube there is a double sluice valve, and when the carrier is inserted into the message chamber (the widened end of the pipe) the lower slide of the valve is drawn so as to close the mouth of the pipe, but on the rod of the slide there is a stop which actuates a lever and rack, and this opens the upper slide in front of the carrier. At the same time, by a separate arrangement, a valve is opened to admit compressed air, which forces the carrier forward. When its arrival at the other end of the tube is signalled electrically, the slide is moved so as to cut off the air from the pressure main, and then the chamber at the mouth of the pipe is ready for another carrier. From the distant end of the pipe the carrier is drawn or sucked to the central station by making a connection at that station with the vacuum main instead of the pressure main. Carriers are introduced into the tube through an opening normally covered by a sleeve, which slides along the tube to open or close the slot; this arrangement, which is used on hand-worked systems, is called a 'feed-slide.' On power-installations 'door despatch' terminals and 'funnel despatch' terminals are used, and in the latter the carrier must always be entered in an upward direction to prevent the intrusion of foreign matter with the air entering the tube. The usual form of receiving apparatus is called a flap terminal. It consists of an enlargement in the tube, which must be vertical at this point, one side of which consists of a light aluminium door hinged at its upper end to open outwards, and provided with a soft leather seating. The air is drawn through this chamber and the vacuum is sufficient to keep the door closed, but on

the descent of a carrier a curved grid within the chamber guides it so that it strikes the door, and is carried out into the wire cage which surrounds the apparatus, the door closing automatically under the control of a light spring.

At street tube-stations for sending or receiving, the double-slide switch is used. This consists of a pair of parallel sector-plates joined by two lengths of tube, A and B, each capable of accommodating a carrier in a vertical position. This framework moves radially about a vertical pivot (situated behind the service-pipe) between two plates, to which the ends of the service-pipe are attached in such a way that either A or B may be at will moved into position between the two ends of the service-pipe, without loss of air, by means of a lever. If the handle is at rest toward the right, a carrier arriving falls into the tube A, and is observed through the small window; the handle being moved toward the left, the tube A moves to an opening in the lower plate, through which the carrier will fall. If it is desired to send a carrier it is placed in tube B through a funnel-hole in upper plate, after which connection is established between B and the tube in the same way by moving the lever to the left from its position of rest. Various other types of terminals are in use according to the service required. For a distance of 1000 yards with a 2½-inch tube the time of transit is one minute when the air pressure is 10 lb. per square inch or with an equivalent effective vacuum of 6½ lb. per square inch. With the air pressure and vacuum usually employed, a speed of from 25 to 35 miles per hour is attained in tubes not exceeding a mile in length. A higher pressure is, however, sometimes used. The speed varies inversely as the square root of the length of the tube. The pneumatic service of the British post-office has been gradually increasing until the system, which in 1854 was represented in London by one 6 horse-power engine working a single tube of a few hundred yards in length, comprised in 1925 in London alone over 64 miles of tubes working between more than 75 stations, while in that year nearly all pumps had been converted to be driven by electrical power. The newspaper offices in most of our large towns have pneumatic despatches in connection with the telegraphic instrument rooms of their respective post-offices, beside which large numbers of 'house' systems exist in local and central telegraph offices. Many department stores also have pneumatic systems for sending bills and cash to the central pay desk and returning them. In Paris and some other towns on the Continent, instead of several tubes radiating from a central to outlying stations, one tube or tubes alongside each other from the central telegraph office form a continuous circular line with intermediate stations, and several carriers linked together are sent at one time. In some of these continental pneumatic despatches the pipes are of iron instead of lead, and there are other differences of detail. Berlin has an extensive installation. In the United States great progress has been made in the use of pneumatic power for post-office work. Mr B. C. Batcheller, an American engineer, invented an improved system which, from its completeness and simplicity, gives promise of very extended use in future. It consists of double tubes of wrought iron running parallel to each other. At the central station a steam-engine of 25 horse-power for every mile of tube compresses the air and forces it into one of the tubes, along which it rushes, returning by the other, a constant current being kept up. Cylinders of steel weighing about 13 lb., and having a capacity of about 800 cubic inches, are loaded with the letters, or whatever is to be sent, and, by an ingenious arrangement, introduced into the tube without

interrupting the current. They are propelled at the rate of the current, and on arrival at the terminus are delivered into an air-chamber which stops them, also without interrupting the current, which returns by the other tube. At intermediate stations another ingenious device delivers cylinders, specially fitted for each station, at the proper places. The system was first tried in Philadelphia in 1893, the tubes used being 6 inches in diameter. One of the lines, 1 mile in length, was traversed in 35 seconds. In Boston 8-inch tubes were used, and carried over 360,000 letters per day between the post-office and the railway station. New York post-office has three sets of tubes: one to the Grand Central Station (¾ miles), with 3 intermediate stations, carries 6000 lb. of letters daily at the rate of 7 minutes each way. In 1900, by sanction of the authorities, Mr Batcheller formulated a complete scheme for London. Its use for small parcels as well as letters and telegrams might do much to relieve the congested traffic in the streets.

It has been several times proposed to utilise the pneumatic tube for passenger traffic, and a piece of railway of this kind was laid down in the Crystal Palace grounds in 1865 by Mr Rammel. It consisted of a single line of rails in a tunnel 600 yards in length, along which a carriage carried passengers. Motion was given by alternate blowing and suction; but it was little more than an experiment, and was not permanent. Electricity has proved a much more useful power than air for this purpose.

Pneumatic power is capable of application in many other directions than the despatch of telegrams and papers, &c. It is extensively used in working tools of all kinds for riveting, hoisting, drilling, metal-cutting, hammering, airlift-pumping, spray-painting, &c.; and it is in many cases superseding steam and rivalling electricity (see COMPRESSED-AIR MOTOR). In railway work it is used for actuating the brakes on the trains either as air pressure, as in the Westinghouse, or otherwise in the vacuum brake, and several British railways have now introduced pneumatic signalling, either entirely pneumatic or in combination with electricity, as electro-pneumatic methods of working their signals, which have been successfully used in many American lines. The motive-power is compressed air contained in an underground pipe, the pressure of which, by means of pistons, is made to work signals at any reasonable distance. The action is quicker; fewer signalmen are required; the complicated system of rods and levers will be dispensed with; the new apparatus is not so apt to get out of order as the old, and will be much cheaper to maintain. See also AIR-ENGINE.

Pneumatic Gun. See AIR-GUN, CANNON.

Pneumatics is a name, not very much used now, for the science that discusses the properties of gaseous fluids. It is therefore a branch of Hydrodynamics (q.v.) in the modern acceptance of that term. See also ATMOSPHERE, BAROMETER, GAS, SOUND, VISCOSITY, WAVE, WIND.

Pneumatic Trough. See TROUGH (PNEUMATIC).

Pneumogastric Nerve. See NERVOUS SYSTEM, and DIGESTION.

Pneumonia, or Inflammation of the Lungs, is the name applied (with the necessary qualification) to a number of distinct pathological conditions. The catarrhal inflammation of Bronchitis (q.v.) may extend to the alveoli of the lungs, producing scattered patches of *catarrhal pneumonia*. The inflammatory changes occurring in consumption; those found in *interstitial pneumonia*, or *cirrhus* of the lungs; in a few cases of syphilis; in wounds and injuries of the chest; in pyæmia; in the last stage of many exhausting diseases, are all types of

pneumonia. But the most important form, to which the present discussion will be restricted, is that variously called *acute*, *lobar*, or *croupous pneumonia*, and is one of the most striking and definite of familiar diseases.

The changes occurring in an affected portion of lung are described in four stages. (1) *Congestion*: the lung-tissue still contains air, though less than in health, and is gorged with blood. (2) *Red hepatization*: the lung-tissue is solid like liver (hence the name), and is much more friable than in health; it still contains much blood, but no air, as the vesicles are completely filled with firm exudation, consisting of fibrous material, mixed with leucocytes and red blood-corpuscles. (3) *Gray hepatization*: the tissue is still more friable and of a grayish colour, containing now little blood or blood pigment; the exudation has become much softer, as the fibrous material has been altered, and oozes in part from the cut surface as a purulent fluid. It is doubtful whether recovery can take place when this third stage has been reached. (4) *Resolution*: the fibrous material exuded into the air spaces is re-absorbed, and the lung again becomes filled with air. When the surface of the lung is affected, *Pleurisy* (q.v.) is always present as well as pneumonia.

The inflammation seldom attacks the whole of both lungs at once; the right is more often affected than the left, and the lower part than the upper. A whole lobe, or a large part of it, usually suffers; sometimes more than one.

The disease generally begins suddenly with a severe rigor or shivering-fit, and the temperature rises rapidly—usually to 102°–105° F. The pulse and respirations are both quickened, but the latter much more in proportion than in most other diseases, a most important indication of the nature of the case: instead of the usual ratio (about 4 pulse-beats to 1 respiration), the proportion becomes 3 or 2 to 1. All the usual signs of fever are present; but the patient's face presents a characteristic dusky flush; there is frequently severe pain in the affected part of the chest, and usually more or less cough, painful, but short, and suppressed as far as possible. In most cases after a few days the spit becomes very viscid and tenacious, and assumes a rusty tinge; this appearance is almost sufficient by itself to show the nature of the disease; but spit as well as cough may be absent altogether. The physical signs of the disease are very distinct. There is dullness on percussion over the affected area; and on auscultation marked and very characteristic changes in the breath-sounds. But if the inflammatory process happen not to reach a portion of the lung in contact with the chest-wall it may be impossible to detect anything abnormal.

It is always a serious disease; but the great majority of cases do recover. The circumstances which make it most alarming are the presence of other disease, especially of the heart or kidneys; previous habits of intemperance; occurrence in epidemic form; and advanced age, as it is much less fatal in youth and middle life than after the age of sixty. Yet sometimes even cases apparently far from hopeful ultimately do well.

In favourable cases the fever usually terminates very rapidly—by *crisis*, as it is termed; in a few hours the temperature falls five or seven degrees, and the patient's discomfort becomes correspondingly relieved. In a very large proportion of cases this takes place between the sixth and the eighth day; but it may occur earlier, or it may be delayed to the fourteenth. After this has taken place the exudation in the affected portion of lung is gradually expectorated and absorbed, and as a rule perfect recovery takes place.

In a considerable number of cases pneumonia

seems to be brought on by exposure to cold or wet. But in the majority no such cause can be traced. Only in very exceptional instances does it seem to be infectious; but epidemics on a small scale are of not infrequent occurrence, and sometimes assume large proportions. These facts, among others, have led to the classification of acute pneumonia not with local inflammations, but with specific fevers; and the inflammation in the lung has much the same relation to the disease as the ulcers in the intestines to typhoid fever, or the inflamed throat to scarlet fever. In 1882 Friedländer found an organism in the lungs in pneumonia; and later the pneumococcus, which is almost invariably present in the sputum from cases of uncomplicated pneumonia, was described by Frænkel. But the disease also occurs during other illnesses, like typhoid fever, and may then be caused by the organisms associated with the original malady. As already mentioned, pneumonia has a special tendency to develop in the course of severe epidemics of influenza, and is then apt to be of a very fatal type.

The recognised treatment of pneumonia passed through curiously varied phases during the 19th century. Free and repeated bleedings, with extensive use of mercury, in vogue during the earlier decades, were superseded about the middle of the century by equally extensive administration of alcoholic stimulants. But it was gradually discovered that many cases recover perfectly with no other treatment than careful nursing; and the usual practice in recent times has been to assign to drugs only a subordinate place. Rest in bed in the recumbent position; a plentiful supply of fluid nourishment; light poultices, or a thick layer of cotton-wool, over the affected part, are often all that is necessary in a young and healthy subject. Severe pain may be combated by mustard poultices, blistering, or ice-bags; or it may require anodynes for its relief; sleeplessness, excessive rise of temperature, troublesome cough, or aggravation of any other symptom may require special treatment. The danger most to be feared in this disease, however, is generally weakness of the heart; and to patients of feeble constitution or advanced age stimulants—digitalis, strychnine, alcohol, &c.—are usually administered, often in large and frequent doses. Inhalation of oxygen often gives great relief, especially in cases accompanied by blueness of the face and lips.

Po (anc. *Eridanus* and *Padus*), the largest river of Italy, rises on Monte Viso, one of the Cottian Alps, at an altitude of 6405 feet, close to the French frontier. It flows eastward for upwards of 20 miles, when, arriving before Saluzzo, it emerges from its rocky defiles and enters upon the plain. From Saluzzo it flows north-north-east past Turin to Chivasso; there it changes its course toward the east, in which direction it flows to its embouchure in the Adriatic. Upwards of 55 miles from its mouth, above Ferrara, it begins to form its delta, 60 miles wide from north to south. The delta is growing rapidly in area. Ravenna, a city once on the seashore, now stands 4 miles inland. The Po receives from the left the Ticino, Adda, Mincio, and other streams, and from the right the Trebbia and others. It has an entire length of 360 miles, and drains an area of nearly 28,900 sq. m. Below Piacenza its stream has from pre-Roman days been embanked—in some places with double embankments; and the bed is now high above the plain. It has always been difficult to cross, owing to its width and, still more, the great volume of its waters; hence the strategic and commercial importance of such places as Piacenza and Turin, where the easiest fords are.

Poaceæ. See GRASSES, PASTURE.

Poaching, though not strictly a legal term, has so long been appropriated in popular speech to describe a well-known offence that it is now usually adopted in legal works. It means trespassing on another's lands in pursuit of game; and it is likewise extended to the cognate offence of unlawfully fishing in another's waters.

(1) *As to Poaching Game*.—The general law as to who is entitled to game, and in what circumstances, is stated under the head **GAME-LAWS**. In England there are a Day Poaching Act and a Night Poaching Act, imposing penalties on poachers. By the Day Poaching Act, 1831, whoever unlawfully goes upon lands not his own to pursue or kill Game (q.v.), rabbits, woodcocks, snipes, quails, or land-rails is liable to a penalty of £2. Any person whatever, whether interested in the lands or not, may institute the proceedings for the punishment of the poacher; and the informer is entitled to half the penalty, the other half going to the poor of the parish. When a poacher is found trespassing on lands in search of game the person entitled to the game there, or the tenant, or a gamekeeper or servant of either may demand the poacher's name and place of abode, and if it is refused may arrest such poacher, and take him before a justice of the peace; but the poacher must be taken within twelve hours before the justice, otherwise he is entitled to go at large. In such a case a penalty of £5 may be inflicted. If game be found on the poacher at the time he is caught, and it appear to have been newly caught, the party who is entitled to arrest him is entitled to seize the game also. If the poacher when convicted do not pay the penalty within the time fixed by the justices, he may be committed to the house of correction for a period not exceeding two calendar months. The party may appeal against his conviction to the Court of Quarter Sessions; but he must either remain in custody in the interval, or give security for the costs. The offence of poaching is punished more severely when five or more go out together, and in such case each is liable to a penalty of £5. Moreover, if any of these five or more persons, acting in concert, be armed with a gun, and use violence, each is liable to an additional penalty of £5. By the Night Poaching Act, 1828, which applies to the United Kingdom, it is provided that any person by night—i.e. between the first hour after sunset and the first hour before sunrise—unlawfully trespassing in search of game shall for a first offence be committed by the justices to the house of correction for a period not exceeding three months; for a second offence shall be committed for a period not exceeding six months, the convicted person being in each case liable to a further term of imprisonment on failure to give securities at the end of his sentence; and for a third offence shall be guilty of a misdemeanour, and be liable to penal servitude or two years' imprisonment. In case such night-poachers are found on the lands and in the act, the owner or occupier of the land or his servants may arrest the poachers, and take them before justices. If the night-poacher, when arrested, use firearms, sticks, or offensive weapons, he shall be guilty of a misdemeanour, and be punishable by penal servitude or two years' imprisonment. In case of three or more night-poachers being armed with guns, bludgeons, or other offensive weapons, each is guilty of a misdemeanour, and is liable to penal servitude or imprisonment for three years. The provisions of the Night Poaching Act were, by the amending Act of 1844, extended to public roads and highways, it having been found that the original act was evaded, and the risk of murder greatly increased by poachers frequenting such places.

Under the former law it was, as already men-

tioned, incompetent for any person except the owner or occupier of the lands or their servants to apprehend the poacher, and even this could be done only when the poacher was caught in the act on the lands; and hence even constables had no power to seize the poacher, though seen to be coming from such lands. But by the Poaching Prevention Act, 1862, which applies to the United Kingdom, if a constable meets a suspected poacher in any public place, whom he has reason to suspect of coming from land where he has been poaching, and of having in his possession game unlawfully got, or a gun or net, such constable may stop and search the poacher; and if game, or implements for taking game, be found on him, may seize and detain them, and summon the poacher before the justices. When before the justices, if it be proved by circumstantial evidence or otherwise that such game was procured by poaching, or that the implements were used for poaching, the poacher may be fined in a penalty of £5, besides forfeiture of the game, and guns, nets, and other implements which he may have so used. The constable may also stop and search any cart in which he suspects there may be such game or implements. The person convicted may appeal, if he chooses, to the next Quarter Sessions, or, in certain cases, to the Court of King's Bench. A conviction can be obtained only in cases of actual seizure of game or implements, but for a conviction it is not necessary that the poacher should be seen actually committing the offence. Poaching hares or rabbits by night in any warren or breeding-ground is a misdemeanour under the Larceny Consolidation Act, 1861. This act does not apply to Scotland.

As game is in the category of wild animals, in England the poacher is entitled to keep the game unless it was both started and caught on the same person's lands. But, as stated above, game may be taken from a poacher if the demand is made at the time on the land or on fresh pursuit.

The law of Scotland as to poachers does not materially differ from that of England, and the Night-poaching Acts apply to Scotland. The Scots Day Trespass Act, 1832, closely agrees with the English Act. In Scotland game is the property of the captor, and accordingly where there is no statutory forfeiture the offender is entitled to retain game found in his possession. It is not necessary under the Scots Day Trespass Act for the seizure of game in the possession of a poacher that the game should have been recently killed. On conviction of a third offence of night-poaching in Scotland before the High Court of Justiciary the offender is liable to penal servitude. In Ireland the law as to poaching is not identical with the law of England, but substantially the provisions are the same.

The law of the United Kingdom has often been described as too severe against poachers, inasmuch as most of the penalties, except in Ireland, are cumulative. But it is answered that poaching is in reality only stealing under a milder name, game being as much the fruit of the soil, dependent upon the care and protection of the owner or occupier, as apples or turnips, and that the transition from habitual poaching to stealing is not only easy, but inevitable. Present-day poaching is seldom picturesque, and is generally sordid, and too often it is associated with other forms of crime. See the article upon **GAME-LAWS**. The administration of the law by justices, many of whom preserve game, is also objected to. As regards Scotland this objection was removed by the Game Laws Amendment Act, 1877, under which all summary prosecutions for poaching must be conducted before the sheriff or his substitute.

See Oke, *Game Laws* (5th ed. 1912); Warry, *Game Laws*; Forbes Irvine, *Game Laws of Scotland*; Tait,

Game Laws of Scotland; A. Porter, *The Gamekeeper's Manual* (3d ed. 1907); Row, *Guide to the Game Laws*; Nolan, *Law of Sporting Rights*; Kent, *The Fish and Game Laws of the State of New York*; articles 'Animals' and 'Fish and Game' in *Cyclopædia of Law of Procedure* (New York, 1901-5); and, for other sides of the subject, R. Jefferies, *The Gamekeeper at Home* (1878) and *The Amateur Poacher* (1880); John Watson, *Poachers and Poaching* (1891); O. Jones, *Ten Years of Gamekeeping* (1909); O. Jones and M. Woodward, *A Gamekeeper's Note Book* (1910).

(2) *Poaching Fish* is the unlawfully entering on another's fishery in order to catch fish. *Salmon-poaching* will be found treated under the head of SALMON. The law of fisheries is not uniform in the United Kingdom. In England the general rule is that any one of the public may fish freely in the sea and in all navigable rivers as far as the tide flows; and where he can fish he can catch salmon as well as every other kind of fish. But there is an exception to this generality, which consists in this, that as the crown could before Magna Charta (which took away such right) legally grant a several or exclusive fishery in the sea or a tidal river to an individual, and as this was, in point of fact, often granted, it follows that it is not uncommon to find, even at the present day, an individual, generally the lord of an adjacent manor, still claiming a several fishery in these places. If he can prove that he has exercised this exclusive right as far back as one or two centuries it will be inferred that his right dates from before Magna Charta, and it will therefore be sustained. When such is the case the public have no right to fish even in a tidal river or the sea at the specified places, the sole fishery being vested in this individual owner. In streams not tidal the rule is that each riparian owner—i.e. the owner of the lands on the bank of the stream—has a right to a several or exclusive fishery up to the middle line of the stream. If he is owner on both sides of the stream then he has the exclusive fishery in the whole of the stream, so far as his lands extend. As to ponds, whoever is owner of the soil is the owner of a several fishery therein. As to lakes, it is not clearly ascertained how the fishery is to be divided between the owners of the lands abutting thereon; but much will depend on the title to the lands and the subsequent user. As a general rule, there is no such thing as a right in the public to fish anywhere except in a tidal river or the sea, and that is subject to the exception of an individual claiming a several fishery, as before mentioned. It is often supposed that if a highway adjoins a private stream any one may fish in the stream or angle there; but this is a delusion. Nobody is entitled to use a highway for the purpose of fishing or pursuing game, the use of the highway, so far as the public are concerned, being confined to the purposes of travelling or transport. The general rule as to all several—i.e. exclusive—fisheries is that whoever poaches the fish commits an offence, for which he may be summoned before justices and fined £5, over and above the value of the fish taken; and if the fishery where he poaches is adjoining the dwelling-house of the owner of the fishery it is a still higher offence, for it is then an indictable misdemeanour. The Fish-poaching Code of England is contained in the Larceny Act, 1861. It is immaterial what kind of fish is caught by poachers, and how they are caught. But a milder punishment is awarded to the poaching angler, for even though he poach in a fishery adjoining the owner's dwelling-house he incurs only a penalty of £5; and where the fishery does not adjoin a dwelling-house he incurs a penalty of only £2. Whenever a fish-poacher, other than an angler, is caught in the act of poaching he may be at once apprehended, not only by the owner of the fishery, but by anybody; but this

can only be done while he is on the spot or near it, for if he escape to the highway or to other lands before being arrested he cannot then be apprehended, but can only be summoned before justices in the usual way. In this respect a privilege is given to anglers, for in no case can these be arrested, if angling during the daytime; they can only be summoned for the offence. The poacher, when arrested, must be taken within a reasonable time before a justice of the peace, and charged with the offence. In regard to the fish poached the rule is that whoever first catches the fish, whether legally or illegally, is entitled to keep it; so that the poacher, whatever other punishment he may incur, does not lose his fish. With regard, however, to the poaching implements, such as nets, it is provided by an express section of the Larceny Act, 1861, that the owner of the fishery or land where the poacher is caught, or his servant, may demand, and if refused may seize, the net, rod, line, hook, or other implement used for taking the fish, but no other person can seize these. Large powers to arrest are given to water-bailiffs acting under the Fresh-water Fisheries Act, 1923.

The law of Scotland differs considerably from that of England. As regards fish other than salmon the general rule is that the riparian owner is entitled to catch all the fish he can, provided he do not interfere with the superior right of some crown grantee of the salmon-fishery. A person who poaches trout or other fresh-water fish with a net, or by double-rod fishing, or cross-line fishing, or set lines, &c., incurs a penalty of £5, besides forfeiture of the fish caught. And he may be arrested if he is net-fishing, but not if he is fishing in another way. Moreover a mere angler of trout, though a poacher, cannot be arrested nor yet punished by any penalty; though he is liable to an action of interdict. In the case of all poachers of trout (except angling poachers, who can neither be arrested nor yet have their fish or fishing-rod taken from them by force), the owner of the fishery or any person authorised by him may seize the nets, boats, and fishing implements if the poachers are found on the spot. See the Fresh-water Fisheries (Scotland) Acts of 1845, 1860, and 1902; the last enacts a close time for trout in Scotland between 15th October and 28th February (inclusive), imposes a penalty for using explosives to kill fresh-water fish, and further modifies former acts. There is a special code, somewhat more stringent than the ordinary law, applicable to the river Tweed. The Irish law is practically the same as the English.

See Paterson's *Fishery Laws* (new ed. 1873); Oke's *Fishery Laws* (4th ed. 1924); Moore, *History and Law of Fisheries*, and *Handbook of 1923 Fisheries Act*; and, for Scotland, Stewart on *Rights of Fishing* (1869).

Pocahontas, daughter of an Indian chief, Powhatan, born about 1595, figures prominently in the American travels of Captain John Smith (q.v.) in connection with the part she played in the history of the early English colonists in Virginia. The expedition under Captain Bartholomew Gosnold and others had landed in Chesapeake Bay in 1607. The James River was explored, and a settlement formed, but a great drawback was the lack of food-supplies. In one of the expeditions for food, and to explore the Chickahominy, Smith was taken prisoner, brought before the chief Powhatan, and his head laid on a stone preparatory to having his brains beaten out with clubs. At this juncture Pocahontas, then a young girl, 'when no entreaty could prevail, got his head in her arms, and laid her own upon his to save him from death.' She again saved Smith's life in 1609 by informing him of a plot by her father against him. She was brought a prisoner to Jamestown by Captain Argall in

1613. She married an Englishman, John Rolfe, in 1614, is said to have embraced Christianity, and came to England with her husband in 1616. During her residence of seven months in England Smith petitioned Queen Anne on her behalf. Having embarked with her husband for Virginia, she died off Gravesend in March 1617. She left one son, and a branch of the Randolphs and several other Virginia families claim descent from her (Robertson and Brock, *Pocahontas and her Descendants*, Richm. 1887). Charles Deane, in his notes to his reprint of Smith's *True Relation* (1866), first started doubts as to Smith's veracity in connection with the Pocahontas incident, and this scepticism has been shared by other writers.

Pochard (*Fuligula*), a genus of diving ducks which are marine during the greater part of the year. One of their distinctive structural features is a membranous lobe on the hind toe. The Common Pochard (*F. ferina*) is a winter visitor to Britain, and sometimes breeds by the shores of inland meres. The Red-crested Pochard (*F. rufigula*) is a rare wanderer to Britain; so is the Ferruginous (*F. nyroca*), while the Tufted (*F. cristata*) and the Scaup (*F. marila*) are much commoner, and sometimes breed in suitable inland resorts. Nearly allied to *F. ferina* is an American species (*F. americana*), and the Canvas-back Duck (q.v.) also belongs to this genus.

Pocklington, an urban district in the East Riding of Yorkshire, 13 miles ESE. of York. It has a good Early English church (restored 1850) and a grammar-school (1514; reconstituted 1875), where W. Wilberforce was educated. Pop. 2600.

Pocock, EDWARD, a learned orientalist, was born in 1604, and educated at Corpus Christi College, Oxford, of which he was elected fellow in 1628. He early devoted himself to oriental studies, and sailed for Aleppo in 1630 as chaplain to the English factory, but returned in 1636 to fill Laud's newly-founded Arabic chair at Oxford, and received in 1643 the college living of Childrey. His estimable character and great learning raised up for him during the troubles friends like Selden and Owen. He was appointed to the chair of Hebrew in 1648, but his inability to take the engagement of 1649 deprived him of the salary down to the Restoration. He survived till 1691. Pocock's learning was really remarkable, even apart from all allowances for his time. His *Porta Mosii* (1655)—extracts from Maimonides' Arabic commentary on the Mishna; the Annals of Eutychius (1656), in Arabic and Latin; and an edition of the Arabic history of Barhebraeus (1663), were followed by Commentaries on Michal (1677), Malachi (1677), Hosea (1685), and Joel (1691).

Pococke, RICHARD, 'the Traveller,' was born at Southampton in 1704, and educated there and at Corpus Christi College, Oxford. Precentor successively of Lismore and Waterford, then Archdeacon of Dublin (1745), in 1756 he was consecrated Bishop of Ossory, and had just been translated to Meath, when, on 15th September 1765, while on a visitation, he died very suddenly at Charleville, near Tullamore. His travels, which took up nearly nine years of his life, and in which he must have ridden some 52,000 miles, are described in two folios dealing with his four years' wanderings in Syria, Egypt, and Mesopotamia (1743-45), in a volume on his tours in Scotland (Scottish History Soc., 1887), in two on his tours through England (Camden Soc., 1888-89) and in one on Ireland (edited by J. T. Stokes, 1891)—books that are as dull as they are valuable. Pococke was, moreover, the pioneer of Alpine travel, for in 1741 he led a dozen Englishmen, all strongly armed, to the Vale of Chamouni, whose grateful inhabitants carved his name and

the date on a huge granite boulder close to the Mer de Glace.

Pod. See FRUIT.

Podagra. See GOUT.

Podargus, a genus of birds nearly allied to the true Goatsuckers. They are at home in New Guinea and Australia, are arboreal and nocturnal in their habits, and feed on large insects, which are mostly caught about the trees. Some of them are so sleepy during the day that Gould says they may be occasionally caught by the hand, or one may be shot without waking its neighbour. They make rough nests in the eucalyptus or casuarina trees, lay two eggs of spotless white, and the work of hatching is shared by both sexes. A podargus is usually larger than a goatsucker, and has a wider gape; the oil-gland seems to be absent, and the rump bears two remarkable tufts of small brittle feathers, known as 'powder-down patches.' One of the Australian species, *P. civieri*, disturbs the night by a hoarse cry resembling the syllables *More Pork* or *Mopoke*, by which names it is therefore known in New South Wales.

Podestà (Lat. *potestas*, 'power'), an Italian municipal magistrate, sometimes with supreme administrative and military power, sometimes merely judicial.

Podgoritz (Serb. *Podgorica*), a fortified town of Montenegro, 16 miles E. of Cetinje, ceded by Turkey in 1879; pop. 10,000.

Podiebrad. GEORGE BOCKO of Podiebrad, Bohemian king, was born of a noble family at Podiebrad on 6th April 1420, and became an adherent of the moderate party of the Hussites (see HUSS). When the Catholic barons (1438) carried the election of Albert II. (V. of Austria), Podiebrad allied himself with the Utraquists in Tabor, who offered the sovereignty of Bohemia to Casimir, king of Poland. After forcing Albert to raise the siege of Tabor and retire to Prague, Podiebrad was recognised as the leader of the Utraquists; then he seized upon Prague (1448), and got himself made governor or regent of Bohemia, from 1452 to 1457, for the young king Ladislaus. On the death of Ladislaus, Podiebrad was chosen his successor, and was crowned early in 1458. By skilful management and wise policy he succeeded in allaying the bitternesses of religious zeal, but only for a while. In 1462 he decided to uphold the terms of the *compactata* of Prague (1433); this angered the pope, Pius II., and he was only prevented from excommunicating Podiebrad through the special intervention of the emperor. The next pope, however, Paul II., did in 1466 promulgate against him the ban of excommunication. Matthias Corvinus of Hungary was the only prince who took the field to enforce it; but him Podiebrad surrounded at Wilamow (1469) and forced into a truce. Nevertheless Matthias was crowned king by the Catholic barons at Olmütz immediately afterwards. Podiebrad died on 22d March 1471, having already made arrangements whereby a Polish prince should succeed him.

Podkarpatská Rus, or CARPATHIAN RUTHENIA, a district on the southern slopes of the Carpathians with part of the Theiss valley, detached from north-eastern Hungary in 1920 to form the autonomous easternmost province of Czechoslovakia. Area, 4886 sq. m.; pop. (1921) 606,568, of whom more than half were Ruthenians, one-sixth Magyars, and only 20,000 Czechs and Slovaks. The capital is Uzhorod (Ungvar); pop. 20,000.

Podocarpus, in respect of diversity of foliage and geographical distribution the most interesting genus of Taxaceæ. It is found in southern Asia, Formosa, Japan, Australia and Tasmania, New

Zealand, New Caledonia, Fiji, New Guinea, Madagascar, South Africa, East Africa, West Africa, Brazil, Bolivia and Argentina, Peru to Costa Rica, Guatemala, West Indies. A few species pass over from one of these regions to another, but, as a rule, each harbours a special section of the genus. In Tanganyika and on Mount Kenya they form nearly homogeneous forests; elsewhere an element in mixed forests.

Podolia, or KAMENETZ, a government (abolished 1925) of Ukraine, north of Bessarabia, and bordering on the former Austrian frontier. Area, 16,224 sq. m.; population, 3,478,000, the majority of whom are Russians. The surface is a tableland, strewn with hills; nearly three-fourths is either arable or available for pasturage.

Podophyllum, a genus of plants of the family Berberidaceæ, comprising several species found in north temperate countries. The genus *Podophyllum* has three sepals, six to nine petals, twelve to eighteen stamens, a broad round stigma seated almost on the top of the ovary, and a many-seeded berry. *P. peltatum* is a perennial plant, common in North America, growing in moist woods and on the shady banks of streams, and is known as *May-apple*, because it flowers and ripens its fruit very early in summer; also as *Hog-apple* and *Wild Lemon*. The rhizome sends up each year a shoot bearing two peltate leaves, about five inches across, and a solitary drooping white



Leaf, Flower, and Fruit of *Podophyllum peltatum*.

flower. The fruit may be eaten, but is not agreeable. All the other parts are actively cathartic. Another species (*P. Emodi*) is a native of the Himalayas, and has the same medicinal properties (recognised in the British Pharmacopœia since 1914), but in 1889 was shown to yield three times as much of the valuable resin as the American plant.

PODOPHYLLIN is the resin obtained by means of rectified spirit from the rhizome. In the British Pharmacopœia the rhizome is official, but is only used to prepare the resin (*Podophylli Resina*). The latter is an active purgative, and seems to have the power of relieving the liver by exciting copious bilious discharges. The dose is 16 to 66 milligrams; its action is slow, generally taking about eight hours. It is apt to gripe, and hence is usually given along with carminatives, or in small doses combined with other purgatives.

Podostemaceæ, a family of dicotyledons growing in rapids and waterfalls of tropical rivers. The vegetative organs are very varied, and in great part take the form of a thallus, resembling a seaweed or lichen rather than a flowering plant. This thallus may be shoot or root in nature. The dorsiventrality is remarkable.

Podura. See SPRING-TAILS.

Poe, EDGAR ALLAN, poet, critic, and romancer,

was born 19th January 1809 at Boston, where his parents spent three years as actors. His mother, Elizabeth Arnold, was a young English actress; his father, David Poe, a player of loose habits, the runaway son of a revolutionary veteran at Baltimore. Orphaned at Richmond in his third year, Edgar was adopted by John Allan, a wealthy and childless tobacco-exporter, who hailed from Ayrshire, Scotland. In 1815 the family went to England, and the boy was sent to school at Stoke Newington. From their return in 1820 till 1825 he attended a classical school at Richmond. The year 1826 was spent at the University of Virginia. Incensed by his gambling debts (over 2000 dollars, it is said), his patron cut short his academic career, whereupon Poe ran away to Boston. Here he published *Tamerlane and other Poems*, by a Bostonian, 1827, a pamphlet of 40 pages (reprinted in London, 1884). Under the new pressure of poverty he enlisted, 26th May 1827, as Edgar A. Perry, giving his age as twenty-two. He served, apparently without fault, in the First Artillery at Forts Independence, Moultrie, and Monroe, and rose to be sergeant-major, 1st January 1829. He now effected a reconciliation with Mr Allan, who procured his discharge, 15th April, and after a year's delay his admission to West Point. Meantime his second volume, *Al Arvaaf, Tamerlane, and Minor Poems*, appeared with his name at Baltimore, 1829, 71 pages. He entered the Military Academy, 1st July 1830, recording his age as nineteen. Discipline and constraint did not suit him, and by deliberate neglect of duty he caused his dismissal, 7th March 1831. Having quarrelled violently once more with his foster-father (who had married again), he was thrown finally on his own resources, which were probably confined to cadet subscriptions to his *Poems*. The volume appeared as a 'second edition' (it was really a third) in New York, 1831, 124 pages, and contained *Israfel*, his earliest poem of value, and *To Helen*, in a first draft.

Of his life in Baltimore during the next two years few records remain. Nearly the first earnings of his pen consisted in the \$100 prize won by *A MS. found in a Bottle*, in October 1833. He declined an invitation to dinner 'for reasons of the most humiliating nature—my personal appearance.' John P. Kennedy befriended him, and even, by the testimony of both, saved him from starvation. From this time he lived with his aunt, Mrs Clemm, and wrote for the *Saturday Visitor*. His connection with the *Southern Literary Messenger* began with its publication of his tale *Berenice* in March 1835; a few months later he went to Richmond as its assistant-editor. The Clemms soon joined him, and on May 16, 1836, he married his cousin Virginia, who was then not fourteen, though a friend swore that she was 'of the full age of twenty-one.' For more than a year he worked hard and usefully on the *Messenger*, which printed many of his tales, criticisms, and poems, gaining great repute thereby. But Poe was 'irregular, eccentric, and querulous,' and these qualities, with the aid of stimulants, cost him more than one place. He left Richmond in 1837, and after a year or less in New York, of which the chief apparent fruit was *The Narrative of Arthur Gordon Pym* (1838; 198 pages), in the summer of 1838 established himself (if he could be said at any time to be established) in Philadelphia.

Here he prepared *The Conchologist's First Book* (1839), the matter of which was taken from Cuvier, Wyatt, and Brown; procured at length the publication, without profit to himself, of *Tales of the Grotesque and Arabesque* (2 vols. 1840); was connected with Burton's *Gentleman's Magazine* (1839); projected in 1840 the *Penn Magazine*, which

came to nothing, and in 1843 *The Stylus*, which he never gave up the hope of starting; and for a year (1842-43) edited *Graham's Magazine*, then in the forefront of American literature. Long periods of sobriety and patient though ill-required labour would be interspersed with fits of reckless indulgence and months of desperate poverty. His wife's dangerous illness, caused by the rupture of a blood-vessel while singing, unnerved him, and weakened his always slight power of self-direction. A second prize of \$100, won in 1843 by his wonderful story *The Gold Bug*, again saved the little household from starvation or near it.

In April 1844 he removed to New York, and from October to March following assisted Willis on *The Evening Mirror*. Here *The Raven* appeared, January 29, 1845, and won immediate fame. For a few months he was associated with C. F. Briggs in the *Broadway Journal*, which became notorious by his assaults on Longfellow as a plagiarist. In this year he published a volume of *Tales*, and *The Raven and other Poems*. In the spring of 1846 he occupied the famous cottage at Fordham. Here, January 30, 1847, in deepest poverty, Virginia Poe died, an attractive and pathetic figure, retaining her fragile and childish beauty to the last; she was but twenty-four. Her mother was more than a mother to the poet, and his home life drew out what was best in his nature, and afforded such measure as he attained of happiness.

Except for *The Bells*, *The Domain of Arnheim*, the wild psycho-astronomic 'prose poem' *Eureka* (1848), and a few minor pieces, the brief remainder of his life might to advantage be forgotten. Unable to stand alone, he sought vainly, and with an eagerness that approached insanity, to replace what he had lost. He was no libertine; his writings and his life were chaste; with women he was deferential, tender, chivalrous. He idealised them on the smallest provocation, and in these latter years he could not keep his imaginings in their proper place. Mrs Whitman was not the only object of his homage, and his frantic appeals to her, strangely intermingled with bar-room potations and an attempt at suicide (November 1848), were but the most striking and pitiable indications of a mind unhinged. Two months later he was deep in pen-work, and wrote to his 'Annie' that he was 'so, so happy,' with 'how great a burden taken off' his heart. In the spring Mrs Clemm wrote to the same 'Annie,' 'I thought he would die several times. I wish we were both in our graves.'

Starting southward, June 30, he had an attack of delirium tremens in Philadelphia. Recovering, his ticket was furnished by friends who considered it unsafe to trust him with money. He spent over two months in Richmond, lecturing there and at Norfolk, and receiving many attentions. A physician warned him that 'another such indulgence would probably prove fatal.' He became engaged to a lady of means, and about September 30 left Richmond, intending to wind up his affairs in the north and return for his wedding in October. On the 3d of October he was found in a wretched condition at a voting-place in Baltimore and removed to a hospital, where, after expressing the most poignant remorse, he died, October 7, 1849.

Poe's character has been the subject of much heated controversy. It was malignantly vilified by R. W. Griswold, whom he had chosen as his biographer and literary executor, in a *Memoir* prefixed to vol. iii. of his collected works (1850), but since suppressed. After all allowance made for the infirmities of a sensitive spirit, bearing an inherited taint and bowed down by 'unmerciful disaster,' the fact remains that he was the main author of his misfortunes. His splendid intellect

seemed to lack certain qualities bestowed on common men. The 'Imp of the Perverse' was always at his heels. At forty he was no better nor worse than at seventeen, except that his constitution was undermined by excesses. He wrote to Lowell in 1844, 'My life has been *whim*, impulse, passion, a longing for solitude, a scorn of all things present.' The kindly Briggs, after months of daily intimacy, called him 'characterless' and 'utterly deficient of high motive.' He was more diligent in defeating his own ends than in seeking them, in making enemies than in keeping friends. Except Willis, he quarrelled with all his employers and associates. The direst necessity could teach him prudence only by fits and starts. He was not responsible, reliable, respectable—at least, never for two years together. He worshipped Beauty, caring little for her elder sister Truth; from youth he falsified the facts and dates of his own life, so that his history became a puzzle to be solved by slow and painful labours. Profoundly unmoral, morbid and hectic in his moods, he could bear neither prosperity nor adversity; 'any motion would upset him, and his worst falls were after successes, or with success just in sight.' A mixture of the seraph and the tramp, he oscillated between the skies and the gutter, gravitating gradually downwards, because he had no god but self. Ambition, aspiration, self-respect, and the strongest love of which he was capable—his only real love, for his devoted child-wife—could not keep him from the brandy and opium which he knew to be his poisons.

As to his genius there is little room for question. Weird, wild, fantastic, almost ghoulish (judged by its results), finding its joy in gloom and its chief inspiration in memories or imaginations of dead women, dwelling by choice and habit on themes of ruin and desolation, on the awful, the horrible, even the foul, it was yet most genuine and notable; if not of the highest order, among the most picturesque and striking gifts ever vouchsafed to man. His ratiocinative powers were marvellously displayed in some of his tales of Parisian murders, which were highly praised and widely circulated in France. At home during his lifetime his amazing tales were strangely neglected, and he was known chiefly as a critic. In this capacity he perhaps deserved less praise, and certainly less blame, than has befallen him. Occasionally misled by hatred or friendship, he was usually honest, independent, and fearless—even reckless. But his proper work was poetry and imaginative prose. His parade of scholarship rested on the slightest foundation. Of humour he had no particle, and some of his tales are poor stuff: such sold more readily than his best. His verses are often strained, artificial, full of mannerisms; 'everything is subordinate to sound.' In these, and in the more personal of his tales, wherein great wit and madness mingle, he was 'the poet of a single mood.' He will be long remembered for a few poems and many masterpieces of brief, powerful, and most peculiar fiction. In his own walk he stands unsurpassed if not alone, with a halo of mystery, gloom, and terror about him.

Apart from earlier sketches, and Mrs Whitman's *Poe and his Critics* (1860), his life has been written by J. H. Ingram (1880), R. H. Stoddart (1876), E. L. Didier (1877), W. F. Gill (1877), Stedman (1881), G. E. Woodberry (1885, 1909). There are French studies of Poe by Baudelaire (1856), Lauvrière (1904, 1911), and Maublanc (1925). Poe's *Works* were edited by Stedman and Woodberry (10 vols. 1914), J. A. Harrison (17 vols. 1902-3), J. H. Whitty (1917); the *Poems* by K. Campbell (1917); his *Letters* to his foster-father, by Mrs Stanard (1925).

Poerio, CARLO, Italian patriot, was born on the 10th of December 1803, son of a Neapolitan lawyer who had suffered imprisonment and exile in the cause of liberty. He accompanied his

father into exile, but on his return became an advocate at Naples. He was repeatedly imprisoned for his services to the liberal cause; and in 1848 he organised the famous demonstration of the 27th January, which was destined to produce the constitution of the 10th February. Under it he was successively nominated director of Police and minister of Public Instruction; but he soon resigned, and was appointed deputy for Naples to the parliament. On the 19th July 1849 he was arrested, charged with being a member of a secret society, 'the Italian Unity,' and condemned to irons. With fifteen others he was confined in one small chamber in the island-prison of Nisida. Diplomatic protests from various governments—Mr Gladstone's was declared by Garibaldi to have sounded the first trumpet-call of Italian liberty—and eloquent denunciations of the royal tyranny moved Ferdinand II. at last in 1858 to ship sixty-six prisoners to America. They persuaded the captain to land them at Cork, and Poerio returned by London to Turin. There he became a member of the parliament, and in 1861 its vice-president. He died at Florence, 28th April 1867.—The elder brother ALESSANDRO (1802-48), who fell in battle for the liberation of Venice, shared his father's exile, studied in Germany, settled in Florence, and devoted his life mainly to poetry and patriotism. His poems, which contain some of the most stirring Italian songs of freedom, have been repeatedly published.

See Vannucci, *I Martiri della Libertà Italiana* (Milan, 1880); and a monograph on Alessandro Poerio by Imbriani (Naples, 1884).

Poet Laureate. See LAUREATE.

Poetry is that one of the fine arts which employs rhythmical language as the medium of its expression. The present form of the word is due to the old French noun *poetérie*, but both are derived from the Greek *ποιεῖν*, 'to make.' A poet was *ποιητής*, 'a maker or composer,' and poetry *ποίησις*, 'the act of making or forming.' A poem was *ποίημα*, 'a thing made and finished.' Into all these expressions there entered the sense of artistic fashioning, and poetry from the first was felt to be, like sculpture, painting, or music, the work of a creative craftsman. As we cannot conceive of sculpture without something carved or modelled, or of painting without something painted, so poetry cannot, in the first instance, be conceived without the coincident idea of language rhythmically arranged. If this idea be absent the term must be used allusively or figuratively, as its counterparts often and legitimately are in the cases of those other arts. But to the primitive conception of poetry rhythm is absolutely necessary. In other words, it is only by a license, and in a sense which is unscientific, that we can speak of anything which is not composed in verse as poetry. To this rule, however, there are some conventional exceptions which will presently be mentioned.

Verse, therefore, is the essential vehicle of poetry, and on the varieties of versification the external form of any given poetical product depends. That species of rhythm on which verse is founded is the law of regularly recurring succession of articulate sounds. Verse was defined by Edwin Guest as 'a succession of articulate sounds regulated by a rhythm so definite that we can readily foresee the results which follow from its application.' The definiteness, repetition, and formal character of verse-rhythm distinguish it from that laxer and more undulating rhythm which gives charm to fine prose. The difference is one not of amount but of kind. All good verse must be severely regulated, and must obey the laws of its own prosody. The rhythm of prose, on the contrary, must, in order to be good of its species,

be unrecurrent. No greater fault can be committed in prose than the intentional or even accidental introduction of passages which can be read as verse—that is, as recurrent rhythm. Poetry, therefore, in the English sense of the term, is, in its external form, an arrangement of syllables into verses or staves, distinguished by the rhythmical accidents of quantity and accent, and effected by the law of succession.

This definition of the external form of poetry, however, is not sufficient, and to complete it is admittedly so extremely difficult as almost to defy expression. In defining the term *poetry*, nevertheless, as an English word, the lexicographers have probably been too much rather than too little affected by the necessity of including a spiritual meaning. Hardly any one has attempted to say what poetry is without mingling the figurative with the exact sense, or at least without making the definition apply to none but good and original poetry. In speaking of sculpture and painting we do not necessarily exclude all experiments in those arts which are not successful; but poetry, in English, has come to mean something which excludes unsuccessful effort in rhythmical expression. Hence a certain confusion between the external and the internal, between a craft and an ecstasy. It would be well, perhaps, to bring the term back to its more exact meaning, but it is too late to hope to do this. Poetry must continue to mean not merely language arranged in rhythmical sequence, but verse which is also inspired by imagination, and which attains a measure of perfection in that degree at which it aims. The degree may be a low one, but if the aim is fulfilled, and the rhythmical laws are followed, the work produced must not be refused the title of poetry. The word, indeed, is capable of much expansion. Any man who has written what the world accepts as a *poësis*, a finished composition in verse, is allowed the name of 'poet,' and his other rhythmical experiments, even though many of them are unsuccessful, are broadly defined as 'poetry.' The presence of high imagination, and of a brilliant propriety of language, are presupposed in all that is called poetry, but the word must be extended to much that is not very lofty nor very skilful if we are not to slip into pedantry in its use. Wordsworth at one time was of opinion that the only strict antithesis to Prose was Metre; but it is simpler, as well as more exact, to understand by poetry metrical composition, not troubling ourselves more than is absolutely necessary in its definition about the quality of high imagination. This latter is essential indeed to the best poetry, but not to all poetry in the colloquial use of that term.

In some languages, and particularly in French, *rime* or *rhyme* is an essential part of the form of poetry. In other languages, as in ancient Greek and Latin, *rime* does not exist. In English poetry final *rime*, though not essential, is extremely common, and is the necessary ornament of the main classes of lyrical composition. *Rime* is a correspondence of sound between syllables which occur at regular intervals, and in final *rime* that recurrence always takes place at the end of a verse. It may be single, double, or even triple. Propriety and vigour in *rime* are so important a portion of the art of poetry that *rime* cannot be overlooked in the briefest survey. Where *rime* is not rejected altogether, as in blank verse (and in some strophic measures of doubtful value), it forms a main ornament of English verse-composition, and some of the most beautiful effects which poetry produces are due to the skilful arrangement of these recurrent sounds. It is only a poet of great resource and infinite accomplish-

ment who can safely dispense with this fortunate regulation of rime. To one who knows his business it offers no real restraint, but rather a support and an encouragement. As Dryden has excellently said, 'That which most regulates the fancy and gives the judgment its busiest employment is like to bring forth the richest and clearest thoughts.'

It is a popular error that the necessity of finding a rime checks the inspiration of a poet, and that he would be more fortunate if he could contrive to do without it. The universal testimony of the poets themselves does not support this notion. The best writers of verse have been unanimous in declaring that the more distinct and spontaneous are the visions which present themselves to the brain for verse-expression the more rapidly and inevitably do the rimes occur in logical sequence, the proper word fitting into its proper place with as little conscious brain-effort as the proper tone or the proper form does in the work of the painter or the sculptor. If this be so, and it seems impossible to doubt it, the difficulty which the unskilful versifier finds in riming is but another safeguard to protect us from incompetence. For those readers who declare that rime gives them no enjoyment, and is only an interruption of the sense, we can but pray that ears may be added to them.

The recognised species of poetical composition are numerous, and are exceedingly difficult to distinguish from one another, because two or more of them may frequently be found existing side by side in the same specimen. Three principal divisions are, however, supposed to include all the minor classes of poetry under general headings. These are lyrical, epical, and dramatic poetry. In the original sense all poetry was Lyrical—that is to say, was composed to be sung to a musical accompaniment, and could not be conceived except in relation to music. But at a very early period this work of song was divided into two parts, that which was regulated by the air, and that which was expressed in recitative. In the former manner were sung all the poems which were inspired by the passions, which reflected moods individual to the poet, or which were devoted to religious aspiration. In the second manner were chanted matters of narration, statements of fact, didactic, hortatory, and philosophical disquisition. The poems on an air remained lyrical poetry proper, and continued to be more or less fitted to be sung to a musical accompaniment. The poems in recitative became what is vaguely known as Epic poetry, with its attendant classes, the Satire, the Epistle, the Tale, and the Fable. From all these the musical accompaniment soon fell away. In some eastern countries, however, narrative poetry is still, when publicly recited, accompanied by a monotonous music on a stringed instrument.

Dramatic poetry has retained, in its principal branches of Tragedy and Comedy, still less of the singing quality than epical poetry. In many cases drama has thrown off the restraints of versification altogether, and is now included in the general category of poetry partly because of its traditional form, and partly because its imaginative character still links it to lyrical and epical work. The origin of drama, however, was wholly lyrical. It was out of the dithyrambic song in honour of Dionysus that tragedy sprang. The litany was chanted by a chorus that danced as it sang, and in the process of time a single personage began to break away from the chorus at intervals, and either to express aspirations of his own, or to narrate stories of the god, or to incite the chorus to fresh exertions. Comedy had a similar beginning, and by degrees not one but two and then many actors confronted the chorus and drew it into conversation. The

development of this new form of poetry was very rapid; it gained variety and a recognised code of forms within a very short time, and we now possess in the tragedies of Æschylus a body of ancient dramatic poetry still capable, as recent experiment has shown, of satisfying the demands of a modern playgoer. Here the purely lyric element, in spite of the prominence of the chorus, is already minimised in favour of the development of personal action and character, so that the subsequent transition to the form of the most modern prose tragedy is really very unessential. All the principles of dramatic poetry may be comprised in an essay on the *Agamemnon*.

Into these three elements, then, the Song, the Statement, and the Drama, all poetry that is not of a primitive nature is capable of being resolved. That which was primitive—and of this we have to conjecture more than we can prove—was probably Song alone. But, while we divide poetry into these three elements, it is not possible to make the same easy division of poetical literature. Here are found, indeed, the three great classes, but, as has been already said, they are constantly detected existing side by side in one and the same composition. The more elaborate the species of poetry the more likely are we to find upon analysis that the classes are confounded in it. In the Song we still preserve the simplest form of poem. This is a short piece in regular recurrent rhythm, expressing with the utmost conciseness a single enthusiastic and intense personal emotion, which it pours forth without deviation at a breath. When the spontaneous outburst is over the song naturally closes.

No other species of poetry is so simple as this. The Ode, which is often regarded not merely as a lofty form of lyric, but as the typical form *par excellence*, introduces a complexity. Too long and elaborate to be sung spontaneously, it verges upon drama in calling to its aid a chorus and an antichorus of singers; upon epic by its excursions into narrative and didactic reflection. The ode, in which we include its funeral form the Elegy, remains, however, truly lyrical in its necessary dependence upon melody. Not a line of it but presupposes a musical interpretation. The traditional fixed forms suggest the accompaniment of music to a far less degree. The Sonnet, for instance, with its dignified arrangement of full lines, admitting very slight modification of form, is singularly ill-fitted to be sung. It offers no musical variety, whereas its very beauties, and in particular those subtle harmonies which are secured by a proper attention to the structure of its quatrains and tercets, would not merely gain nothing, but would lose much by being set to music. Yet we can imagine even the sonnet chanted to some simple conventional melody, unobtrusive enough not to conceal its intellectual beauties nor that vein of reflective and pensive narration which links it to the epical order; and we must continue to regard the sonnet as essentially lyrical, notwithstanding its complexity and monotony. Not less than the song, the sonnet requires to consist of the spontaneous expression of a single intense emotion. What is true of the sonnet is true of the other traditional forms, some of which, as, for instance, the Rondeau, approach the song more closely, while others, as, for example, the grandiose Chant Royal, take their place on the further side of the sonnet, between the ode and the latter.

If in the divisions of lyrical poetry we find the other two classes occasionally present, the counterpart is still more true when we turn to a similar examination of epic and dramatic poetry. In the first case we possess an exquisite form, less successfully cultivated in England than in Italy, the *Terza Rima*, in which the lyrical and the epic forms

co-exist to an almost equal degree. Here it is impossible to say whether the art of narrative or the art of song predominates. Even in the pure epic neither the lyrical nor the dramatic element is omitted. Whenever a burst of enthusiasm or passion seizes the narrator he passes without transition into lyric; whenever from describing his personages he proceeds to a record of their conversation, he suddenly transforms his epic into drama. Indeed, the rank of the various sections of the epic order of poetry may almost be determined by the opportunity they give for an admixture of the others. The Epistle is one of the least lyrical sections of all poetry; it may, however, contain an element of the dramatic. Satire, when it comprises no admixture of narrative, is apt to fall very low in the poetic scale. If its passion be enthusiastic and genuine it may attain to a certain lyrical afflatus; but there is little of the instinct of song in mere rage and disdain. Pure satire is commonly sustained solely by its executive ability, and is one of those species of literature which prove the necessity of giving to poetry a definition depending in the first instance not on its truth or beauty as 'a criticism of life,' but on its rhythmical structure.

Drama, as existing in modern Europe, has lost much of the external appearance of poetry. The distinction which admits a comedy in prose within the order of poetical literature and yet excludes a novel seems an arbitrary one. But it can be accounted for on traditional grounds. The novel has always been, from the days of the later Greeks, written in prose, and properly so, for it is independent of regulated form. Comedy, on the other hand, has but very lately, and still not completely, escaped from the bonds of verse. Rhythmical form is still largely used for tragedy, although the tendency in each of the great sections of drama is to dispense with a restraint which adds to the reader's pleasure, but in a much less degree to the spectator's. In other divisions of dramatic literature verse and even rime are still essential. In Opera, which is a combination of song with a conventional species of drama, both are necessary; and Pastoral imperatively demands for its graceful convention the ornament of metre. Dialogue, a dramatic form, may be combined even with an epic species as a medium for giving information or exhortation. Hastily looked at, however, drama appears in its modern aspects to be divorced more and more completely from the sister branches of poetry. It is therefore important to insist on the fact that the great poetical principle of unity in variety rules here as it does in those compositions which seem more completely under its sway. Without a lyrical element holding the parts of a drama together, balancing them, and supplying them with the necessary fire and harmony, the humblest play cannot maintain its existence. It is this more or less concealed dependence upon fixed laws of form which must always distinguish dramatic literature from the varieties of prose fiction. As long as it obeys these laws it holds its place in the order of poetry, although it may have abandoned its rhythmical shape. If it throws off these fortunate restraints it either perishes altogether or it becomes a mere variety of the prose novel.

In the incessant discussion which takes place as to the nature of poetry, the real aspect of the question is too frequently obscured by a confusion between Poetry, as a craft practised by artists, and the Poetical, as a metaphysical conception. The latter, which has been analysed with extraordinary minuteness by the Germans, and in particular by Goethe and by Hegel, is not necessarily combined with any of the external forms of poetical literature. This distinction, admirably laid down by

Diotima in the *Symposium* of Plato, has been generally forgotten by those who have endeavoured to sentimentalise the art and to confuse our ideas of it by such vague and futile definitions as the well-known formula 'Poetry is impassioned truth.' It seems almost waste of words to point out that while the best poetry must be impassioned and must be true, in accordance with Aristotle's dictum that the superiority of poetry consists 'in its possessing a higher truth and a higher seriousness,' yet that no definition which confines itself to moral or sentimental attributes can be adequate to distinguish an art which consists of the making of a certain definite thing in a certain definite form.

In short, and in spite of the extreme unwillingness of the metaphysician to acknowledge it, we must insist that the idea of poetry cannot be divorced from the incident of 'making,' whether we call it with Wordsworth 'impassioned expression' or employ the broader and simpler word 'execution.' Until the passion and the truth are fused into actual speech, and until that speech takes a rhythmical form, those elements may be as 'poetical' as you please, but they do not form poetry. None of the wild words of Ruskin deserve an immortality of repudiation more thoroughly than the following phrase, which is always on the lips of those who write laxly and nebulously about the poetic art. 'No weight nor mass nor beauty of execution can outweigh one grain or fragment of thought,' says Ruskin. If this were true, half of the noblest poetry in the world would cease to possess any value. Thought may and often does accompany the expression of the poetic art, but it is not essential to it in the sense in which Ruskin uses the word, as an original act of the intellectual faculty. The few poets, indeed, who have aimed at producing 'chains of valuable thoughts' have rarely succeeded in doing more than giving tuneful expression to thought reflected from other and more ratiocinative minds. Even when a poet, such as Coleridge, has been eminently deductive and argumentative in his prose, he has generally been sensuous and simple in his verse. In the peculiar sense in which Ruskin uses the word 'execution,' as directly distinguished from 'thought,' the work of the great poets has seldom possessed the latter quality in any notable degree.

It is desirable to define what is meant by 'execution,' for on this depends our whole conception of the practice of poetry as an art. It is not confined to an observance of the technical laws of this form of composition, to a correct and beautiful use of rhythm, of stanzaic form, of rime, and of that 'variety in unity' in which the charm of verse consists. All this is part of poetical execution, and an extremely important part. In most cases it may be said to be an indispensable part. But it is not all. Execution in poetry, as in the other fine arts, is the mechanical performance by which the effect desired is produced in the most perfect and most characteristic manner, so as in the happiest combination to illustrate the nature of the art itself and the individuality of the artist. As the medium in which the poet works is language, execution in his case is the arrangement of the best words in the best order, the best order being, in all but a few anomalous cases, a rhythmical one. The technical laws of verse, however, deal only with 'the best order.' There remain, as a part of execution, 'the best words.' This section of the definition covers all the intellectual property, the moral passion, the verbal felicity, the myriad charms and graces, of which 'the best order' is but the vehicle. It is part of a poet's technical work, part of his business as a 'maker,' to produce this manifold perfection of regulated language, and all these beauties of expression

and feeling cannot be rudely divided from that 'execution' of which they are an inherent feature. The bad poet may have the intellect of Locke or of Spinoza; he will learn by the total neglect of his verses that in poetry no weight nor mass of thought can outweigh one grain of executive skill.

It would, nevertheless, be a grave error to insist so emphatically on the importance of the outward form of poetry as to encourage neglect of its inward character. In a definition of poetry it has been deemed needful to dwell here on the fact that it is primarily an art and subjected to definite laws. But, as Joubert has said, 'the lyre is a winged instrument,' and the closest attention to its constructive mechanism will not give it the power of flight if inspiration be lacking. The vivid pleasure produced by the best poetry is due in large measure to the merits of its execution—its music, the splendour of its images, the harmony and felicity of its arrangement of language. But there is something beyond and above this 'complex feeling of delight'; there is a spiritual emotion which is the spontaneous result of close attention to great poetry, and which is created in the soul only by verse that is of the highest value. This emotion is founded on the Aristotelian qualities of 'the higher truth' and 'the higher seriousness,' and is inseparable from, though not to be confounded with, the mere physical delight in lovely sounds and marshalled groups of images. In this exquisite passion of poetry there is something supernatural, which evades analysis. It combines the experience of life with the hope of immortality, and fuses what has been felt and witnessed into what has only been, and can only be, imagined. The literature of all countries and of all ages has proved that this subtle and divine emotion is produced in its most direct form by the art of language rhythmically arranged, and to this art is given the name of Poetry.

The prose fragment called the *Poetics* of Aristotle is the earliest and most important treatise on the art of poetry which has come down to us from antiquity. What is commonly known as Horace's 'Art of Poetry' gives us the views of an admirable Latin writer on verse and on the poet. In 1527 Vida published his Latin poem, *Ars Poetica*, which exercised a great authority, and was by many students preferred to Horace. Of more modern interest is Scaliger's treatise, *Poetices Libri Septem* (1561). The first manual of modern Italian prosody was Girolamo Muzio's *Arte Poetica* (1551). In the England of Elizabeth we have three important treatises on the art, *An Apology for Poetry* (1595), by Sir Philip Sidney; *A Discourse of English Poetry* (1586), by W. Webbe; and *The Art of English Poesy* (1589), by George Puttenham. In France the first important treatise on the subject was the *Art Poétique Française* (1604), by Vauquelin de la Fresnaye. Nicolas Boileau, 'the Lawgiver of Parnassus,' wrote an *Art Poétique*. Among French works of the 18th century the most important are *Traité de la Prosodie Française* (1736), by Olivet, and *Réflexions sur la Poésie* (1752), by Louis Racine. Dryden's *Essay on Dramatic Poetry* belongs to 1669. Among modern works must be cited that portion of Hegel's *Ästhetik*. The *Petit Traité de Poésie Française* is greatly to be recommended. Guest's *History of English Rhythms* (1838) long remained the principal authority on English verse, but it has been completely superseded by Mr G. Saintsbury's *History of English Prosody* (1906-8, 3 vols.). Mr Robert Bridges, the Poet Laureate, has published some valuable treatises on the subject; and the work of Mr T. S. Omond (*English Metrists*, 1907) and of Mr W. J. Stone must be mentioned.

See also in this work ENGLISH LITERATURE, the sections on literature in the articles on the several countries, and the articles BALLAD, BLANK VERSE, DIDACTIC POETRY, DRAMA, ELEGY, EPIC POETRY, EPIGRAM, GNOME, HYMN, LYRIC, METRE, ODE, PASTORAL, REYME, SATIRE, SONNET. There are separate articles on all the best-known poets.

Pogge (*Agonus cataphractus*), a small fish, not uncommon on British coasts, also known as *Armed Bullhead*, *Lyrie*, *Pluck*, and *Noble*. It is related to the Bullhead (q.v.). The body, about 6 inches long, is cuirassed by large scales; the head is very broad, and the mouth is very small. Notwithstanding its uncouth appearance, it is good to eat.

Poggendorf, JOHANN CHRISTIAN, a German physicist, was born at Hamburg, 29th December 1796. He studied pharmacy, chemistry, and physics, and was professor of Physics at Berlin from 1834 till his death. In 1839 he was made a member of the Berlin Academy of Sciences. His chief discoveries were in connection with electricity and galvanism; he also invented a multiplying galvanometer for measuring the calorific action of currents. From 1824 he edited the *Annalen der Physik und Chemie*, better known as *Poggendorf's Annalen*, an important organ for the history of the physical sciences. Besides helping Liebig and Wöhler to prepare the *Dictionnaire de Chimie* (1837-51), he wrote *Lebenslinien zu einer Geschichte der exacten Wissenschaften* (1853), *Biographisch-literarisches Wörterbuch zur Geschichte der exacten Wissenschaften* (2 vols. 1857-63), and *Geschichte der Physik* (1879). He died 24th January 1877.

Poggio Bracciolini, often, but probably wrongly, called GIANFRANCESCO, a famous Italian humanist, was born in 1380 at Terranuova in Florence. He was the son, not of a notary but of an apothecary Guccio, and only assumed the name of Bracciolini late in life. He studied Latin under John of Ravenna, and Greek under Manuel Chrysoloras, and early gained the notice of the Florentine scholars for his skill in copying MSS. About 1403 he became a secretary to the Roman curia; but, though the fifty years of his service covered a period of remarkable importance, he seems to have taken no interest whatever in the movement of church affairs, but to have been devoted heart and soul to the resuscitation of classical learning. In the course of his duties at the Council of Constance (1414-18) he explored the Swiss and Swabian convents for MSS., and later in his wider travels to England and elsewhere he never lost sight of the dearest interest of his life. He was able to recover MSS. of Quintilian, Ammianus Marcellinus, Lucretius, Silius Italicus, Vitruvius, and many other Roman authors. In 1453 he retired to Florence, and next year succeeded Carlo Aretino as chancellor and historiographer to the republic. Here he died in 1459. His writings include *Letters*; moral essays *On Nobility*, *On the Infelicity of Princes*, *On Marriage in Old Age* (he himself in 1435 took to wife a girl of eighteen), and the like; a rhetorical Latin *History of Florence*, in imitation of Livy; a series of unclean and unscrupulous polemical invectives against contemporaries, especially Filelfo and Valla; and a poor translation into Latin of Xenophon's *Cyropædia*. But his most famous book is the *Liber Facietiarum*, a collection of humorous and not too decent stories and jests, written in fair Latin, and full of merry railery at the expense of the monks and secular clergy. The book has some importance in the study of the diffusion and development of folk-tales, and here Poggio takes a place with Straparola, Morlini, Boccaccio, Sacchetti, and Bandello, between the latter *conteurs* who have borrowed or worked up their stories on the one hand, and such earlier storehouses as the *Exempla*, the *Disciplina Clericalis*, the *Aurea Legenda*, the *Gesta Romanorum*, and the *Fabliaux* on the other. A good edition (Fr. trans. and text) is that of Isidore Liseux (Paris, 1878).

See the *Life* and *Letters* by Dr Walser (Leipzig, 1916 *et seq.*); also Voigt's *Wiederbelebung des klassischen Alterthums*, Symonds's *Renaissance in Italy*, and Sandys's *Classical Scholarship*.

Pogrom (*Russian*, 'devastation,' 'riot'), a word used, especially in the British press, with particular reference to massacres of Jews in Russia, Poland, and Eastern Europe.

Poincaré, JULES HENRI, mathematician, physicist, and philosopher, was born at Nancy, 29th April 1854. He entered the École Polytechnique in 1873, and became an engineer in the mining service two years later. Soon afterwards he taught at Caen, and from 1881 he was a professor in the faculty of science of Paris, exchanging the chair of mathematical physics and calculus of probabilities in 1896 for that of celestial mechanics. A member of the Académie des Sciences from 1887, and of the Académie Française from 1908, he died 17th July 1912, universally recognised as one of the greatest mathematicians of his age. See *Henri Poincaré: l'œuvre scientifique, l'œuvre philosophique* (1914) by various authors, and *Life by Lebon* (1912).

Poincaré, RAYMOND, French president and premier, was born 20th August 1860 at Bar-le-Duc, a cousin of the mathematician. Educated at Bar-le-Duc and at Paris University, he won a reputation at the bar, especially in patent and trade-mark cases, and had engaged in legal journalism and served in the department of agriculture before he was elected deputy for the department of Meuse in 1887. He was minister of public instruction and of finance in various ministries between 1893 and 1906. In the interval in his political life that followed, M. Poincaré published *Idées contemporaines* (1906) and *Questions et figures politiques* (1907), and was made a member of the Académie in 1909. He had been a senator from 1903. In 1912-13, as premier and foreign minister, and thereafter as an unusually self-assertive president of the republic, he followed a strongly national policy, drawing close to Russia. What part his Russian visit of 1914 had in bringing about the Great War is disputed. The war itself was fought from beginning to end under his guidance. Premier again in 1922-24, he made it his policy to wring from Germany the utmost penalty of defeat, severely straining the entente with Britain. He was responsible for the French occupation of the Ruhr basin in 1923. He took office again in 1926.

Poinciana, a small genus of Leguminosæ (Cæsalpinioides), tropical trees, of which *P. regia* (the flamboyant tree) is cultivated for the sake of its flame-coloured flowers.

Poinding (same root as Eng. *pound*), in the law of Scotland, means the seizing and selling of a debtor's goods under process of law, or under the warrant of a heritable security, in order to pay the debt. It is either real or personal. Real poinding is the attaching of goods or moveables on the land over which some heritable security exists. It is one mode in which heritable security is made effectual. Thus, the superior of lands can point the ground to obtain payment of his feu-duties; and the holder of a heritable bond can do the same in order to recover his debt. Personal poinding is the mode in which a decree of the court is made effectual by the messenger or bailiff seizing the moveables of the debtor. It may not proceed until the debtor has been charged to pay the debt and the days of charge have elapsed. The debtor's goods being pointed, they are appraised or valued, and the messenger reports his execution to the sheriff, or other judge ordinary, who grants warrant to sell the goods by public roup after advertisements. The net amount of the sale is paid over to the creditor, or, if no purchaser bid for them, they are delivered to the creditor at the appraised value. There is also another kind of poinding, called a poinding of stray cattle, which takes place whenever the cattle of a stranger trespass on lands, in

which case the owner or occupier of the lands can seize them at his own hand, without judicial warrant, and keep them as a security until the damage done by the cattle is paid to the owner of the land. The pointer must, however, take care to keep the cattle in a proper place, and feed them. In England the word poinding is not used, the corresponding term being Distress (q.v.).

Poinsettia, a genus of Euphorbiaceæ (q.v.), better included in Euphorbia. The name is given to the Mexican shrub *Euphorbia pulcherrima*, introduced into the horticulture of other lands by Joel Roberts Poinsett (1779-1851), U.S. minister to Mexico. It is remarkable for the large and conspicuous vermilion bracts below its yellowish flowers.

Point de Galle. See GALLE.

Pointe-à-Pitre, the principal town and port, though not the capital, of Guadeloupe (q.v.), on the south-west side of Grande-Terre. It is fortified, and has some sugar-boiling. Pop. 23,000.

Pointed Architecture. See GOTHIC.

Pointer, a breed introduced from Spain about the middle of the 18th century. The Spanish pointer was a larger and much slower dog than the modern English pointer, rather wanting in stamina, and inclined to 'knock up' with a hard day's work; but, if not hurried, was possessed of wonderful nose and powers of scent. As shooting became more common, and guns approached nearer to perfection, the Spanish pointer was found to be too slow and soft. With the object of removing these defects, crosses with the greyhound to improve the speed, and with the bulldog to get courage, were tried, but with little success, until about the beginning of the 19th century the well-known Colonel Thornton tried a cross with the lighter variety of foxhound. He soon succeeded in breeding a light and active dog, capable of ranging at a fast pace for a considerable time, and though possibly not with the nose of the old Spanish pointer, yet with sufficient for the purpose. Other breeders followed suit, and a distinct strain known as the English Pointer was soon established. By careful selection the hound tendency to hunt a foot-scent was eradicated, or nearly so, while some of the speed and staying powers of the hound were retained. The act of 'pointing' when the game is first scented was at first carefully taught, but gradually became instinctive. until now well-bred puppies of a few months old may be seen pointing at any object which excites them. In general appearance the pointer somewhat resembles the foxhound, though he is a lighter and more active dog, with a finer coat. The head of the pointer should be fairly large, with an intelligent expression; a small eye or too much lip greatly detracts from the appearance. The shoulders should be sloping and powerful, as the dog has often to stop suddenly on a 'point' when at full speed. The body should be built on graceful and racing lines, chest not too wide, but very deep, feet round and compact. Liver and white, and lemon and white, are the popular colours, as they are easily seen in heather or turnips, but whole black or liver has many admirers. Owing to the changed conditions of agriculture, the pointer is not now used so extensively for partridge shooting, but is still used for grouse. In hot weather, where water is scarce, the pointer has a great advantage over the setter, but succumbs sooner to cold and wet. Seldom kept as a companion, he is not very intelligent, but he is easily kept in command, and is generally good-tempered.

Pointillism, a development of Impressionism (q.v.), is a laborious method of painting, in which the colours are placed side by side in spherical *points* (not *spots*) on the canvas. The shadows,

cast by each pin-point of colour, perceptibly darken the tone of the picture. Pointillism, used occasionally by Seurat, Signac, Pissarro, and Van Gogh, has not stood the test of time.

Poiré, EMMANUEL. See CARAN D'ACHE.

Poison is commonly defined to be a substance which, when administered in small quantity, is capable of acting deleteriously on the body; but this definition is obviously too restricted, for it would exclude numerous substances which are only poisonous when administered in large doses, as the salts of lead, antimony, &c.; hence the quantity required to kill must not enter into the definition. A good practical definition of a poison is 'any substance or matter which, when introduced into the body in any way, can destroy life by its own inherent qualities without acting mechanically.' This definition includes poisonous solids, liquids, and gases of definite chemical composition, the products of decomposition or of bacterial organisms, and the virus of contagious diseases. The last mentioned produce the symptoms of the various infectious and contagious diseases, and are not included in treatises on poisons. The others are classified sometimes according to their source, as mineral, vegetable, and animal; or more conveniently according to their action, as *Irritants*, *Narcotics*, and *Narcotico-irritants*.

The *Irritants*, when taken in ordinary doses, speedily occasion intense vomiting and purging and severe abdominal pain. They act chiefly on the stomach and intestines, which they irritate, inflame, and frequently corrode, and may thus occasion ulceration, perforation, or gangrene. Amongst those which possess corrosive properties are the strong mineral acids, caustic alkalies, corrosive sublimate, &c.; whilst among the pure irritants which exert no destructive chemical action on the tissues with which they come in contact may be mentioned cantharides. The *Narcotics* act specially on the brain and spinal cord. Amongst their most common symptoms are giddiness, headache, obscurity of sight or double vision, stupor, loss of power of the voluntary muscles, convulsions, and, finally, complete coma. These poisons have no acrid, burning taste, nor do they usually give rise to vomiting or diarrhoea, and, excepting a slight fullness of the cerebral vessels, they leave no well-marked post-mortem appearance. They are few in number, and none of them belong to the mineral kingdom. The *Narcotico-irritants* have, as their name implies, a mixed action. At varying periods after they have been swallowed they give rise to vomiting and purging, like irritants, and sooner or later produce stupor, coma, paralysis, and convulsions, owing to their effect on the brain and spinal marrow. As familiar examples we may point to monkshood, tobacco, and poisonous mushrooms. Sometimes the more violent of the poisons here classed as irritants are made into a separate group—*Corrosives*; the narcotics are put under the head *Neurotics*; and the *gaseous* poisons are treated as a separate class. See also PROMAINES, PYÆMIA.

Under the head of *Irritant Poisons* may be included (1) Mineral Acids, as sulphuric, nitric, and hydrochloric acids; vegetable acids, and some of their salts, as oxalic acid, binxalate of potash, and tartaric acid (in doses of half an ounce or more); the alkalies, as pearl-ash (carbonate of potash), soap lees (carbonate of soda), ammonia and its sesquicarbonate in strong solution; and metallic compounds, as white arsenic (arsenious acid), yellow arsenic (orpiment), corrosive sublimate, pernitrate and other salts of mercury, acetate of lead (sugar of lead) in doses of an ounce and upwards, sulphate of copper (blue vitriol), subacetate of copper (verdigris), arsenite of copper

(commonly known as *Scheele's green* or *emerald green*, which has been employed under the name of *extract of spinach* for colouring confectionery), tartarated antimony, chloride of antimony (butter of antimony), chloride of zinc (Sir W. Burnett's Fluid), nitrate of silver (lunar caustic), sulphate of iron (copperas or green vitriol), and bichromate of potash; (2) Vegetable Substances—viz. colocyath and gamboge in large doses, savin, croton-oil, elaterium, &c.; and (3) Animal Substances, such as cantharides, to which must be added the occasional cases in which certain fish and molluscs, usually quite innocuous, act as irritant poisons. The *Narcotic Poisons* include opium, hydrocyanic (or prussic) acid, cyanide of potassium, henbane, alcohol, ether, chloral, and chloroform. The *Narcotico-irritant Poisons* include nux vomica, meadow saffron (*Colchicum*), white hellebore, foxglove, common hemlock, water hemlock (*Cicuta virosa*), water-dropwort (*Enanthe crocata*), fool's-parsley, thorn-apple, monkshood or aconite, deadly nightshade, tobacco, Indian tobacco (*Lobelia inflata*), the bark and seeds of the common laburnum, the leaves of the yew-tree, and certain kinds of fungi.

The cases in which there are antidotes qualified to neutralise chemically the action of the poison are few in number. For the *mineral acids* chalk or magnesia in water must be used, with the view of neutralising them, after which milk should be given freely. The *alkalies* and their *carbonates* must be neutralised by vinegar and water, or lemon-juice mixed with water, after which milk should be given. For *oxalic acid* the antidote is chalk or magnesia in water, by which an insoluble oxalate of lime or magnesia is formed. For *arsenic* the hydrated peroxide of iron has been regarded as an antidote, but its efficacy is doubtful. Vomiting should be excited by the administration of sulphate of zinc in warm water, and, after the stomach has been well cleared out, demulcent fluids, such as flour and water or milk, should be given. *Corrosive sublimate* combines with albumen (white of egg), and forms an insoluble inert mass; *nitrate of silver* is neutralised by chloride of sodium (common salt) dissolved in water; *tartarated antimony* is to a great degree rendered inert by the administration of tannin; and *acetate of lead* is rendered inert by the administration of sulphate of magnesia, which converts it into an insoluble sulphate of lead. In all cases of suspected poisoning, in which the nature of the poison is not known, the safest course is at once to produce vomiting by sulphate of zinc, or in its absence by a dessert-spoonful of flour of mustard suspended in tepid water, and to continue the vomiting till all the contents of the stomach are discharged, after which milk should be given freely.

Most of the known gases have a poisonous action when inhaled into the lungs; in these cases death may be due simply to suffocation or to a specific action of the gas. *Carbonic Acid* (q.v.), although seldom employed as an instrument of murder, is a frequent cause of accidental death. It is established by numerous experiments that air containing more than *one-tenth* of its volume of carbonic acid will, if inhaled, destroy life in man and the higher animals; when diluted with two or more volumes of air it can be breathed, and produces symptoms of vertigo and somnolency, and so great a loss of muscular power that the individual, if in an erect or sitting position, falls as if struck to the ground. The respiration, which at first is difficult and stertorous, becomes suspended. The action of the heart is at first violent, but soon ceases, sensibility is lost, and the person now falls into a comatose or death-like state. Those who have been resuscitated usually feel pain in the head and general soreness of the body for some days, and in

a few severe cases paralysis of the muscles of the face has remained. The patient must, of course, be at once removed from the poisonous atmosphere, after which artificial respiration should be had recourse to. If the skin is warm cold water may be poured on the head and spine; while if the surface be cold a warm bath should be employed. When respiration is re-established venesection will often relieve the congestion of the vessels of the brain. The inhalation of oxygen gas is said to have been of service in these cases. *Carbonic oxide* is also an active poison, and is present in coal-gas and in charcoal fumes. Both carbonic acid and carbonic oxide act as powerful narcotics. The fatal power of ordinary coal-gas as an asphyxiant and irritant is probably due to the carbonic oxide present; the post-mortem appearances are very similar in cases of poisoning by coal-gas and by carbonic oxide. *Sulphuretted hydrogen*, which occurs abundantly in foul drains, sewers, cesspools, &c., is a gaseous poison whose effects are often noticed. Nothing certain is known of the smallest proportion of this gas required to destroy human life; but air containing only $\frac{1}{100}$ th of its volume of this gas will destroy a dog; and when the gas exists in the proportion of $\frac{1}{100}$ th it will kill a horse. During the construction of the Thames Tunnel the men engaged in the work suffered severely from the presence of this gas, which was probably derived from the action of the water on the iron pyrites in the clay, and which issued in sudden bursts from the walls. By respiring this atmosphere the strongest and most robust men were in the course of a few months reduced to an extreme state of exhaustion, and several died. The symptoms with which they were first affected were giddiness, sickness, and general debility; they became emaciated, and fell into a state of low fever accompanied by delirium. In this case the dilution was extreme; when the gas is breathed in a more concentrated form the person speedily falls, apparently lifeless. It appears to act as a narcotic poison when concentrated, but like a narcotico-irritant when much diluted with air. The action of the vapour of *sulphide of ammonium*, which is also commonly present in cesspools, &c., is probably much the same as that of sulphuretted hydrogen. Many of the gases which are only found as products of the laboratory are in the highest degree poisonous, as arseniuretted hydrogen; but as few persons run the risk of inspiring them it is unnecessary to enter into details.

In point of Law, the use of poison to kill or injure a human being or certain animals renders the poisoner amenable to the criminal courts. With regard to the sale of poisons, the legislature found it necessary to put some restrictions on one description—viz. arsenic—in order to prevent persons obtaining it with facility, and in such a manner as to avoid detection. The Act 14 and 15 Vict. chap. 13, requires every person who sells arsenic to enter in his books the date and quantity and purpose of its use, and later acts apply this rule to other poisons. It is not to be sold to one who is unknown to the vendor unless in presence of a witness who is known, and whose place of abode is recorded in the book. The arsenic must also be mixed with soot or indigo, in the proportion of $\frac{1}{4}$ oz. of soot or indigo to the lb. All the boxes, bottles, &c. must be labelled 'Poison.' Those who offend as to arsenic incur a penalty of £20; but in prescriptions poisons may be used in the ordinary way by duly qualified medical practitioners. As to the restriction on the sale of other poisons, see CHEMISTS AND DRUGGISTS. The offences committed by those who administer poisons to mankind are as follows: Whoever causes death by poison commits murder, for the means are immaterial if the death was caused by such

means with a felonious intent. Where death is not caused, nevertheless whoever administers poison, or causes it to be administered to any person, with intent to commit murder is guilty of felony, and is liable to penal servitude for life, or for not less than three years. Moreover, whoever attempts to administer poison, or other destructive thing, to any person with intent to commit murder is guilty of felony, and is punishable in the same way. These offences are committed whether the poison administered or attempted to be administered, does injury or not; and it is a sufficient committing of the offence if the poison is put in such a place that a party was likely, and was intended to take it. Moreover, even though murder was not intended, but merely an intent to endanger life or inflict grievous bodily harm, still the offence is felony, and is punishable by penal servitude varying from three to ten years. There is also a similar punishment for the attempt to administer any stupefying drug. Not only is it a crime to administer or attempt to administer poison to human beings, but if cattle are maliciously killed by poison the offence is felony, punishable by penal servitude of from three to fourteen years. So to kill by poison any dog, bird, beast, or other animal, ordinarily kept in a state of confinement, is an offence punishable by justices of the peace with imprisonment for six months, or a fine of £20 over and above the injury done. If any person lay poison on lands to kill game he incurs a penalty of £10. Moreover, by the Protection of Animals Acts, whoever sells or offers to sell grain or seed which has been rendered poisonous except for *bona fide* use in agriculture incurs a penalty of £10. Whoever puts upon any land or building any poison, or any fluid or edible matter (not being sown seed or grain) which has been rendered poisonous, incurs a like penalty.

SECRET POISONING is a mode of taking away life by poisons so slow in their operation that the gradual sinking of the victims under their influence closely resembles the effects of disease or the ordinary decay of nature. It has been practised in all ages, and several undoubted and numerous supposed instances of it are mentioned by Greek and Roman writers. The prevailing ignorance of pathology and chemistry enabled crimes to be carried out with impunity with poisons which would be readily detected at the present day; and for similar reasons many deaths were ascribed to poison that were doubtless due to natural causes. It is impossible to attach much credence to stories such as that Henry VI. was killed by a pair of poisoned gloves, or that victims were simply got rid of by inducing them to smell a poisoned rose. And it is wholly incredible that in pre-scientific days treacherous friends and hidden enemies had access to secret and mysterious methods of poisoning beyond power of detection that are denied to scientific investigators in days when we are acquainted with ten times as many and ten times as subtle poisons. In secret poisoning various preparations of arsenic seem to have been most frequently used. In the 17th century this atrocious practice became of specially frequent occurrence; and from this time it rapidly increased, spread over western Europe like an epidemic, and became gradually a regular branch of education among those who professed a knowledge of chemistry, magic, or astrology. These persons regarded the knowledge of the mode of preparing secret poisons as of the highest importance, and many of them realised large sums by the sale of their preparations, and occasionally of the secret of their composition. It was in Italy and France that this art was chiefly practised and brought to the highest perfection; but it seems

also to have prevailed in England to a considerable extent, for in 1531 the poisoning of seventeen persons, two of whom died, by the Bishop of Rochester's cook led to the passing of an act which declared the employment of secret poisons to be high-treason, and sentenced those who were found guilty of it to be boiled to death. This act was repealed in 1547.

The only undoubted instance of this crime which appears prominently in English history is the murder of Sir Thomas Overbury (q.v.) by the divorced Countess of Essex and others. Prince Henry was falsely supposed to have been poisoned by his father James I. (1612); and James's own death was similarly ascribed to nefarious practices on the part of Buckingham, nay, even of Charles I. (Milton). Undoubtedly such was the popular impression at the time, for Dr Lamb, a conjuror and quack, who was believed to have furnished Buckingham with the poisons, was seized by the angry populace in Wood Street, Cheapside, London, and beaten and stoned to death. But it was in Italy that this mode of poisoning was most prevalent. There, judging from the writings of various authors, it seems to have been looked upon as a not unjustifiable proceeding to get rid of a rival or enemy by poison; and from the time of the Lombard invasion down to the 17th century Italian history teems with instances which sufficiently show that poison was both the favourite weapon of the oppressor and the protection or revenge of the oppressed. The Borgias (q.v.) are generally singled out and held up to the horror and detestation of mankind; but as far as their poisonings are concerned they merely employed this method of destroying their adversaries a little more frequently than their neighbours. To show the popular feeling on this subject we may instance the case mentioned in the *Mémoires* of Henry II., fifth Duke of Guise, of a soldier who was requested to rid the Duke of Gennaro Annesse, one of his opponents in Naples. *Assassination* was the mode proposed to the soldier, but he shrank with horror from the suggestion, stating at the same time that he was quite willing to *poison* Annesse. It was shortly after the date of this story (1648) that secret poisoning became so frequent; and the Catholic clergy, despite the rules of the confessional, felt themselves bound to acquaint Pope Alexander VII. with the extent of the practice. On investigation it was found that young widows were extraordinarily abundant in Rome, and that most of the unhappy marriages were speedily dissolved by the sickness and death of the husband; and further inquiries resulted in the discovery of a secret society of young matrons which met at the house of an old hag, by name Hieronyma Spara, a reputed witch and fortune-teller, who supplied those of them who wished to resent the infidelities of their husbands with a slow poison, clear, tasteless, and limpid, and of strength sufficient to destroy life in the course of a day, week, month, or number of months, as the purchaser preferred. The ladies of Rome had been long acquainted with the 'wonderful elixir' compounded by La Spara; but they kept the secret so well, and made such effectual use of their knowledge, that it was only after several years, during which a large number of unsuspected victims had perished, and even then through a cunning artifice of the police, that the whole proceedings were brought to light. La Spara and thirteen of her companions were hanged, a large number of the culprits were whipped half-naked through the streets of Rome, and some of the highest rank suffered fines and banishment. About half a century afterwards the discovery was made of a similar organisation at Naples, headed by an old

woman of threescore and ten named Toffania, who manufactured a poison similar to that of La Spara, and sold it extensively in Naples under the name of *acquetta*, and even sent it to all parts of Italy under the name of 'Manna of St Nicola of Bari,' giving it the same name as the renowned miraculous oil of St Nicola to elude discovery. This poison, now best known as the 'Acqua Tofana' or 'Acqua di Perugia,' is said by Hahnemann to have been compounded of arsenical neutral salts; while Garelli states that it was crystallised arsenic dissolved in a large quantity of water; but both agree that it produced its effect almost imperceptibly by gradually weakening the appetite and respiratory organs. After having directly or indirectly caused the death of more than 600 persons, Toffania was at length seized, tried, and strangled in 1719. From this time the mania for secret poisoning gradually died away in Italy.

Catharine de' Medici has been frequently charged with wholesale poisoning, and in 1558 four of the Scottish commissioners who had been present at Queen Mary's marriage to the Dauphin were poisoned, it was believed, at Dieppe. But it was about the middle of the 17th century that this horrible practice seems to have become most prevalent in France. Here, too, the agents were married women, and their husbands the victims; and, as in Italy, the extent to which the practice was carried was first made known by the clergy. The government, acting on the information thus obtained, seized and imprisoned in the Bastille two Italians named Exili and Glaser, who were suspected of having been the manufacturers and vendors of the poisons. Glaser died in prison; but Exili, becoming acquainted with another prisoner named St Croix, communicated to him his secret, which the latter made considerable use of after his release, compounding in particular the poison known as 'succession powder,' which subsequently became so celebrated. It was the same St Croix who played such a prominent part in the tragical history of the Marquise de Brinvilliers (q.v.). Penautier, the treasurer of the province of Languedoc, and the Cardinal de Bonzy were both pupils of St Croix, and managed, the one to pave the way for his own advancement, and the other to rid himself of his numerous creditors by the administration of poison; but the great influence of these men and the want of direct evidence barred all proceedings against them. Secret poisoning now became fashionable; the passions of jealousy, revenge, avarice, and even petty spite were all satisfied in the same way, and as a necessary consequence other offences decreased in proportion. The prisons teemed with suspected criminals, and the 'Chambre Ardente' was instituted for the special purpose of trying these offenders. In Paris this trade was chiefly in the hands of two women named Lavoisin and Lavigoreux, who combined with the ostensible occupation of midwife that of fortune-teller, and foretold to wives the decease of their husbands, to needy heirs that of their rich relatives, taking care at the same time to be instrumental in fulfilling their own predictions. Their houses were frequented by numbers of all classes, both from Paris and the provinces, among whom were the celebrated Marshal de Luxembourg (q.v.), the Duchess de Bouillon, and the Countess de Soissons; the two former of these, however, went merely from curiosity. Lavoisin and her confederate were at last discovered, tried, condemned, and burned alive in the Place de Grève, 22d February 1680; and from thirty to fifty of their accomplices were hanged in various cities of France. So common had this atrocious practice been that Madame de Sévigné, in one of her letters, expresses a fear lest the terms

'Frenchman' and 'poisoner' should become synonymous. For two years after the execution of the two Parisian poisoners the crime continued to be largely committed, being fostered by the impunity with which offenders of high rank were allowed to escape; and it was not till more than a hundred persons had died at the stake or on the gallows that the government succeeded in suppressing it. The mania for secret poisoning has not since been revived to the same extent, though isolated instances of its practice have occasionally been discovered, particularly in Hungary, where, within the last half of the 19th century, very extraordinary disclosures were at different times made of the prevalence of this frightful crime among the peasant women. During the times of slavery the Obi men among the negroes in the West Indies were credited with being expert poisoners. They used vegetable poisons obtained from plants, and there can be no doubt were often instrumental in getting rid of tyrannical or otherwise objectionable masters. In Britain famous poisoning trials have been those of W. Palmer (three victims, 1856), Madeleine Smith ('not proven,' 1857), E. W. Pritchard, M.D. (two victims, 1865), Mary Ann Cotton (sixteen victims, 1872), G. H. Lamson, M.D. (1882), P. Cross, M.D. (1887), Mrs Maybrick (1889), H. H. Crippen (1910).

See the articles on ADULTERATION, ASPHYXIANTS, NARCOTICS, LEAD, PYEMIA, PTOMAINES, SNAKES, WOUNDS; the classification of diseases at DISEASE; for poisoned arrows, AROHERY and CURARI; for the more important poisons and their treatment, ACONITE, ARSENIC, HYDROCYANIC ACID, STRYCHNINE, UPAS, &c.; for toxin and anti-toxic methods, and theories therein involved, GERM, BACTERIA, DIPHTHERIA, HYDROPHOBIA, TETANUS, TUBEROLE, &c.—For the Poison Ivy, see SUMACH.

Poisson, SIMÉON-DENIS, was born at Pithiviers, in Loiret, 21st June 1781; and received into the École Polytechnique in 1798, attracted the notice of Lagrange and Laplace, both of whom anticipated for him a brilliant career. In 1802 he became a professor in the Polytechnique; in 1808 a member of the Bureau des Longitudes; in 1809 professor in the Faculty of Sciences; member of the Institute in 1812, &c.; and in 1837 a peer of France. He died 25th April 1840. Poisson's whole life was devoted to the prosecution of scientific research, and the fruits of his pen number about 300 Memoirs, inserted in the publications of the École Polytechnique, of the Academy of Sciences, and other scientific journals. Of the separate treatises published by Poisson the best known is the *Traité de Mécanique* (2 vols. 1833); others were on capillary action, the mathematical theory of heat, the motion of projectiles, and, lastly, the celebrated work *Sur l'Invariabilité des moyens Mouvements des grands Axes Planétaires*. Poisson is fairly considered one of the chief founders of the science of mathematical physics.

Poitiers, the capital of the French department of Vienne, occupies the summit and slopes of a little eminence, round whose base flow the Clain and the Boivre, 61 miles SSW. of Tours. Before the revolution it had an immense number of religious edifices, which even yet are sufficiently numerous. The most interesting are the little Temple de St Jean, originally a baptistery of the 6th or 7th century; the abbey church of St Radegonde, with the saint's cenotaph, much visited by pilgrims; and the noble cathedral of St Pierre (1161–15th century), in which, or in the older edifice that occupied its site, twenty-three councils were held—the first in the 4th, and the last in the 15th century. Other edifices are the Palais-de-Justice (the palace formerly of the Counts of Poitou) and the Hôtel-de-Ville (1876). A university, founded

by Charles VII. in 1431, as now reconstructed has the three faculties of law, of science, and of literature. There are besides a public library, a museum, and several learned societies. Pop. (1872) 28,247; (1891) 34,374; (1921) 37,663. Poitiers, the *Limonum* of the Romans, derives its present name (earlier *Poitiers*) from the Pictavi or Pictones. In and around it are numerous Celtic and Roman remains, a dolmen, baths, some fragments of a huge amphitheatre, &c.; and here in 1882 the remains of a whole Gallo-Roman town were discovered, with temple, baths, and streets, spread over 14 acres. In the vicinity Alaric II., the Visigoth, was defeated and slain by Clovis in 507; and somewhere between Poitiers and Tours Charles Martel won his great victory in 732 over the Saracens under Abd-ur-Rahmán. Later still (on 19th September 1566), 'somewhat to the south-east of Poitiers, Edward the Black Prince, with some 12,000 or 14,000 Englishmen and Gascons, defeated 60,000 of the troops of King John of France, killing 11,000 and taking more than 2000 prisoners, among these the monarch himself and one of his sons. St Hilary (q.v.) was the first bishop of Poitiers, which long was capital of the province of Poitou. From this town the ancient family took its name to which Diana of Poitiers (q.v.) belonged.

Poitou, a former province of south-western France, coincident with the present départements of Deux Sèvres, Vendée, and Vienne. It was divided into Upper and Lower Poitou, and had for its capital Poitiers. Its early history is the same as that of Aquitania (q.v.). Poitou became a possession of the English crown when Eleanor, Countess of Poitou and Duchess of Aquitaine, married (1152) Henry of Anjou (see HENRY II.). Philip Augustus reconquered it in 1205. In 1360 it reverted to England, but nine years later was retaken by Charles V.

Poke (*Phytolacca decandra*), an American branching herb of the Phytolaccaceæ, with racemes of white flowers and deep-purple berries (Inkberries or Pigeonberries). For Indian Poke see HELLEBORE.

Poker, a round game at cards (developed from the older game of brag). Each player has five cards dealt him. A sum called the *ante* is deposited by the oldest hand. The players then look at their hands, each in order after the ante saying whether he will play or pass. If he passes he throws down his cards and stakes nothing. If he plays he has to *chip to fill*—i.e. to stake a sum equal to twice the ante; the amount chipped by the ante, if he plays, or *makes good the ante*, is only equal to his first stake. Each player in rotation may then discard any of his cards and receive from the dealer an equal number of cards from the top of the pack, but no one is obliged to discard any. When all have filled, each player in order must either raise his stake or go out of the game, forfeiting what he has already staked. The *raise* is generally limited, but any less sum than the limit may be staked. Subsequent players must either *see* the raise—i.e. make the sum next staked equal to that of the last raiser—or *go better*—i.e. raise higher, or go out of the game. The raising, seeing, going better, or going out, as the case may be, continues until either all the players but one have gone out (when the one left in takes the pool), or until all the stakes of all the players left in are equal, no one going better. Then a *call* is declared. The player to the left of the one who compelled a call has then to show, face upwards, the best combination he holds which has a poker value. The subsequent players in order either show anything they have better, or throw down their hands. The best poker hand takes the pool.

In case of absolute equality the pool is divided. The value of the hands is as follows, beginning with the best: (1) *Straight flush*, sequence of five cards of the same suit; (2) *Fours*, four cards of the same rank, accompanied by any other card; (3) *Full*, three cards of the same rank, and a pair; (4) *Flush*, five cards of the same suit, not in sequence; (5) *Straight*, sequence of five cards not all of the same suit; (6) *Triplets*, three cards of the same rank, not accompanied by a pair; (7) *Two pairs*; (8) *One pair*; (9) *Highest card*. The cards rank as at whist (ace highest), except in the case of straights, when ace may be highest or lowest—i.e. ace, king, queen, knave, ten, or five, four, three, two, ace form the highest and lowest straights respectively. If more than one player holds a straight flush the sequence headed by the highest card wins; the same as between two straights. Similarly, the highest fours win, or the highest triplets in triplet hands; in the case of fulls, the holder of the highest triplets wins. As between two flushes, the highest card wins; if these tie, the next highest, and so on. If two players each hold two pairs, the highest pair wins; if the two pairs tie, the remaining highest card wins; with one pair, the same. If none of the players remaining in the game hold any of the above combinations, each shows his highest card; if there is a tie, the next highest, and so on. There are numerous varieties in the way of playing, for which treatises on poker should be consulted. The above describes the simplest form of *Draw Poker*.

Poker-drawings, the name given to designs (after well-known pictures generally) burnt into lime-tree or other wood with 'pokers,' which rather resembled plumbers' soldering-irons. The chief 'poker,' 'pyrotechnic,' or 'pyrographic' artists were John Cranch (1751-1823), Smith of Skipton, and Dr Griffiths, the master of University College, for whose chapel he executed an altar-piece after Carlo Dolce. At Knowsley are two poker-drawings ascribed to Salvator Rosa. A similar process, for adorning ships' cabins, table-tops, &c., was patented in 1865.

Pokhurn (*Pokaran*), a town of India, in the Rajput state of Jodhpur, 70 miles NW. of Jodhpur; pop. 4400.

Pola, a city of Istria, now belonging to Italy, and formerly the most important naval station of Austria-Hungary, is situated near the southern extremity of the peninsula of Istria, 105 miles by rail S. of Trieste. The harbour is thoroughly sheltered, deep, and spacious enough to accommodate the largest fleet. The town is protected by forts and batteries, and is overlooked by the citadel, by which it and the bay are commanded. The cathedral dates from the 15th-18th century. Pola is also a shipping port, exporting wood, fish, sand, and building stones, and importing provisions, coal, and bricks. Pop. (1851) 1100; (1900) 45,205, of whom 7700 belonged to the garrison; (1921) 58,582. Founded traditionally by the Colchians who were sent in pursuit of Jason, *Pola became a colony of Rome under Sulla, and was refounded by Augustus under the name of *Pietas Julia*. At the beginning of the 3d century it had 30,000 inhabitants, and was a station of the Roman fleet. It was destroyed in 1267 by its Venetian masters, who had conquered it in 1148; and in 1379 the Genoese, after routing the Venetians in a sea-fight off the town, once more ravaged it. But it only passed from Venice in 1797 to Austria, who chose it as her chief naval harbour in 1848. It contains numerous interesting Roman remains, among them a well-preserved amphitheatre, 450 feet long and 360 broad. Two temples, one dedicated to Rome

and Augustus, a few remains of a theatre, and several ancient gates are also extant.

Polabians, an ancient Slavonic people of the same group as the Poles, occupying the basin of the Lower Elbe. They have long been Germanised, and their language is now extinct. The term is sometimes used in a wider sense for all Slavonic peoples west and north-west of the Oder and the Erzgebirge. See SLAVONIANS.

Polacca, a species of vessel in use in the Mediterranean, with three masts and a jib-boom; the fore- and main-masts being of one piece ('pole-masts'), and the mizzen-mast with a top and top-mast.

Polacca. See POLONAISE.

Poland, a republic of Europe, till 1795 a kingdom, and thereafter till 1918 merely a geographical region of historical and ethnographical import. It lies between Germany and White Russia, between Czechoslovakia and Lithuania. In the south-east it touches the Rumanian territory of Bukovina; in the north-east it sends a broad northward arm to meet Lettland (Latvia); in the north-west a narrower arm reaches between East Prussia and the rest of Germany to the Baltic, where on its scanty seaboard a Polish port is under construction adjoining the free city of Danzig. The area is 149,359 square miles. The population at the census of 1921 for the capital and counties (*województwa*) is shown in the following table:

County.	Area in sq. miles.	Population (Census 1921).
City of Warsaw.....	47	986,046
Warszawa (Warsaw).....	11,273	2,112,406
Łódź.....	7,321	2,250,534
Kielce.....	9,898	2,535,730
Lublin.....	11,985	2,087,907
Białystok.....	12,558	1,803,487
Wilno (Vilna).....	10,927	983,659
Nowogródek.....	8,854	822,106
Wołyń (Volhynia).....	11,652	1,487,907
Polesie.....	16,261	879,925
Poznań (Posen).....	10,232	1,947,057
Pomorze.....	6,802	989,495
Kraków (Cracow).....	6,711	1,990,399
Lwów (Lemberg).....	10,394	2,717,986
Stanisławów (Stanislaus).....	7,065	1,348,580
Tarnopol.....	6,246	1,428,520
Ślask (Silesia).....	1,628	1,125,528
Military forces.....	—	313,452
Total.....	149,359	27,192,674

After Warsaw, the capital, the principal towns are Łódź (452,079), Lemberg or Lwów (219,388), Cracow (181,700), Posen or Poznań (169,793), and Vilna or Wilno (128,954), which the Lithuanians claim. Except on its southern border, where the Tatra (Tatry) and Beskid mountains (parts of the Carpathians) rise above 8000 feet, Poland belongs to the great European plain. It is crossed from south to north by the watershed, of no great height, between the rivers of the Baltic and the Black Sea. The Vistula (Wisła) is its great waterway, and drains nearly half of the country. About a third belongs to the basins of the Dnieper, Dniester, and Danube; the rest to those of the Oder, Niemen, Dwina, and other Baltic streams.

The kingdom of Poland, during the period of its greatest extent, after the addition of the grand-duchy of Lithuania at the close of the 14th century, was subdivided, for purposes of government, into about forty palatinates (Pol. *województwa*), which were mostly governed by hereditary chiefs. The people were divided into two great classes—nobles and serfs. The noble class, which was the privileged and governing class, included the higher nobles, the inferior nobles (a numerous class, corresponding to the knights and gentry of other countries), and the clergy, and numbered in all 200,000; the serfs formed the agricultural labourers,

and were attached to the soil. Their condition is described by all travellers as a very pitiable one. Such trade as the country had was mostly in the hands of the Germans and Jews. The nobles were the proprietors of the soil, and appropriated the larger portion of its products, the serfs being left with a bare maintenance. The former were brave and hospitable, but quarrelsome, and generally preferred their own interests to that of their country; the serfs (originally called *Kmieci*; Lat. *Kmetones*) were sunk in poverty and ignorance.

Under partition the Poles were subject to russiaising and germanising. In Russian Poland the Orthodox Church was upheld by force. Under Austria the Poles of Galicia were better pleased, and were able to prevail over the Ruthenians. Emerging from the Great War with strong nationalist feelings and powerful friends, Poland has been more successful than some of her neighbours in her claims to territory, and her bounds are wider than ethnological considerations might lead one to expect. According to Polish statistics Poles form rather more than two-thirds of the population of the republic, Ruthenians and White Russians are more numerous than Poles in Eastern Galicia, in the territories wrested by war from Russia in 1920, and (with Lithuanians) in the Vilna region seized in the same year. The German population has been reduced to about one-half by emigration; but Germans still number over a million, especially in the towns and in the west. Of Jews there are over 2 millions. They form a fourth of the population of the city of Warsaw. Inequalities have been legally levelled by the constitution of 1921. The land problem was one of the first tasks of the new state, and a number of acts, notably one of 1925, deal with the breaking up of great estates. Meanwhile differences in birthrate are rapidly making Poland more Polish.

Constitution, &c.—The constitution was adopted in 1926. Citizens, male and female, of twenty-one years or more, domiciled in their constituencies, elect a Diet (Seym), and those of thirty a Senate, both for five years, by rules of proportional representation. The two houses together elect a president for seven years. Ministers are responsible to the Diet. In administration and local government there are naturally considerable differences in heritage from Russia, from Prussia, and from Austria, and the presence of national minorities calls for autonomy. A separate Seym has been set up in Silesia; and parliamentary sanction has been given to a like policy in the counties of Lemberg, Stanisławów, and Tarnopol, in each of which power is to be divided between a Polish and a Ruthenian chamber. Some of the other counties have councils. Each has a *wojewoda* (voivode or governor) appointed by the president of the republic. A commission has been appointed to unify the judicial systems. Military service is compulsory. The peace strength of the army is about 250,000. There is a small navy (about 2000 men).

Religion and Education.—The constitution lays it down that 'The Roman Catholic creed being the creed of the majority of the people, shall have a preponderating authority in the state among other religions which shall enjoy equal treatment.' A Concordat with the Vatican in 1924 arranged for reorganisation of the Roman Catholic Church. Poland is divided into five provinces; the archbishop of Gnesen and Posen is primate of all Poland. The Greek-Ruthenian Catholics and the Armenian Catholics have each an archbishop at Lemberg. The Orthodox Church includes about one-fifth of the population. Formerly under the

patriarch of Moscow, it has been autocephalous since 1924. Its metropolitan is at Warsaw. There are five state universities—Warsaw, Cracow, Lemberg, Posen, Vilna; two 'free' or private—Warsaw and Lublin; polytechnics at Warsaw and Lemberg; schools of arts, mining, agriculture, &c.

Industries.—An unusually great proportion of the population lives by agriculture. The soil is mostly a light fertile loam, well adapted for cereals, though here and there occur extensive barren tracts of sand, heath, and swamp, especially in the eastern districts. Much of the fertile soil is rich pasture-land, and much is occupied by forests of pine, beech, birch, oak, &c. Rye, oats, wheat, barley, and other cereals, potatoes, sugar-beet, hemp, timber, honey and wax, cattle, pigs, sheep, and horses, coal, salt, petroleum, natural gas, iron, and some other minerals, constitute the natural riches of the country. The coal is mined chiefly in the Dąbrowa, Cracow, and Silesian fields; salt comes from the mines and springs of Galicia (where Wieliczka is famous) and of Posen. The Eastern Galician oilfield has added to international difficulties. Industries, besides those obviously connected with these products (as oil and sugar refining, paper-making, distillation of potato spirit), include the making of cotton, machinery, various chemicals, glass, lime, and much else.

History.—The Poles are ethnologically a branch of the Slavs (q.v.). The name appears first in history as the designation of a tribe, the Poliani, who dwelt between the Oder and the Vistula, surrounded by the kindred tribes of the Masovii, Kujavii, Chrobates, Silesians, Obotrites, and others. In course of time the name Poliani became predominant. There is no real Polish history till the reign of Mieczysław (962-992); up to the period of this sovereign we have only fables. He became a convert to Christianity, and Poland took rank as one of the political powers of Europe. Mieczysław acknowledged himself to be the feudatory of Otho of Germany. In his time the first Polish bishopric was founded at Posen. He was succeeded by his son Boleslas I. (992-1025), who extended his kingdom beyond the Oder, the Carpathians, and the Dniester. He was recognised as king by the German emperors. After a period of anarchy he was succeeded by his son Casimir (1040-58), whose reign, and that of his warlike son Boleslas II. (1058-1101), although brilliant, were of little real profit to the country. The latter monarch having murdered the Bishop of Cracow with his own hand, Poland was laid under the papal interdict, and the people absolved from their allegiance, whereupon Boleslas fled to Hungary. For two hundred years from this time Poland was only a duchy. Boleslas III., surnamed the 'Wry-mouthed' (1102-39), an energetic monarch, annexed Pomerania.

In the time of Casimir II. (1177-94) we have the senate established, which was formed from the bishops, palatines, and castellans. His death was the signal for a contest among the various claimants for the throne, which was speedily followed, as usual, by a division of the country, and during this disturbance Pomerania emancipated itself from Polish rule. In 1226 the Teutonic Knights were summoned by the Duke of Masovia to aid him against the pagan Prussians; but they soon became as formidable enemies to Poland as the Prussians, and conquered a large part of Podlachia and Lithuania. The Mongols swept over the country in 1241, committing great devastations, and defeated the Poles in a battle at Liegnitz. Many districts of the country were now colonised by Germans, and numbers of Jews took refuge in Poland. The Germans obtained great privileges from the Polish king, and were governed by the *Jus Magdeburgicum*. The reign of Ladislaus Lokietek ('the

Short') is important (1305-33), because in his reign the first Polish diet (1331) was summoned at Checin. In conjunction with Gedymín, Grand-duke of Lithuania, a vigorous war was carried on

king thus possessed but little power beyond what his personal influence gave him.

Sigismund I. (1506-48), also son of Casimir IV., had a long and prosperous reign, Poland being at

that time the dominant country of eastern Europe. Very different opinions have been held about this monarch, some Polish historians praising his government, while Bobrzynski and others consider him to have been a weak man. His court was filled with factions fomented by his wife, Bona Sforza, daughter of the Duke of Milan, a malignant and avaricious woman. The doctrines of the Reformation penetrated to Poland, and were a source of fresh discontents. In a war with Basil, the Grand-duke of Russia, Sigismund lost Smolensk, but he was partly compensated by obtaining lordship over Moldavia. In 1529 Sigismund issued a legal code for Lithu-



against the Teutonic Knights. His son, Casimir the Great (1333-70), increased the prosperity of Poland. Commerce was active, and Danzig and Cracow joined the league of the Hansa. In 1347 was enacted the celebrated Statute of Wislica, the foundation of Polish law; in this reign also Galicia was united to Poland. With Casimir the dynasty of the Piasts became extinct, after a rule of 510 years, according to the old Polish chroniclers. His nephew, Louis, king of Hungary, succeeded him by the will of the deceased monarch and the election of the diet. On his death without male heirs the succession fell to his daughter Jadviga or Hedwig, who was induced by the diet to marry Jagiello, Grand-duke of Lithuania, who founded the dynasty of the Jagellons (q.v.; 1386-1572), and first united Lithuania and Poland, thus doubling the extent, though not the population, of the kingdom. In 1410 the Teutonic Knights were defeated at the battle of Grünwald or Tannenberg. His son, Ladislaus, who was also chosen king of Hungary, fell at Varna in 1444 fighting against the Turks. Casimir, who succeeded, recovered West Prussia from the Teutonic Knights and compelled them to do homage for East Prussia. In 1454 was held the diet of Nieszawa, at which the celebrated statute was enacted which conferred great privileges upon the Polish nobility. The brief reigns of Casimir's two sons were marked only by the increased power of the diet, which had by this time absorbed all but the symbols of supreme authority, and had turned Poland from a monarchy into an oligarchy. The

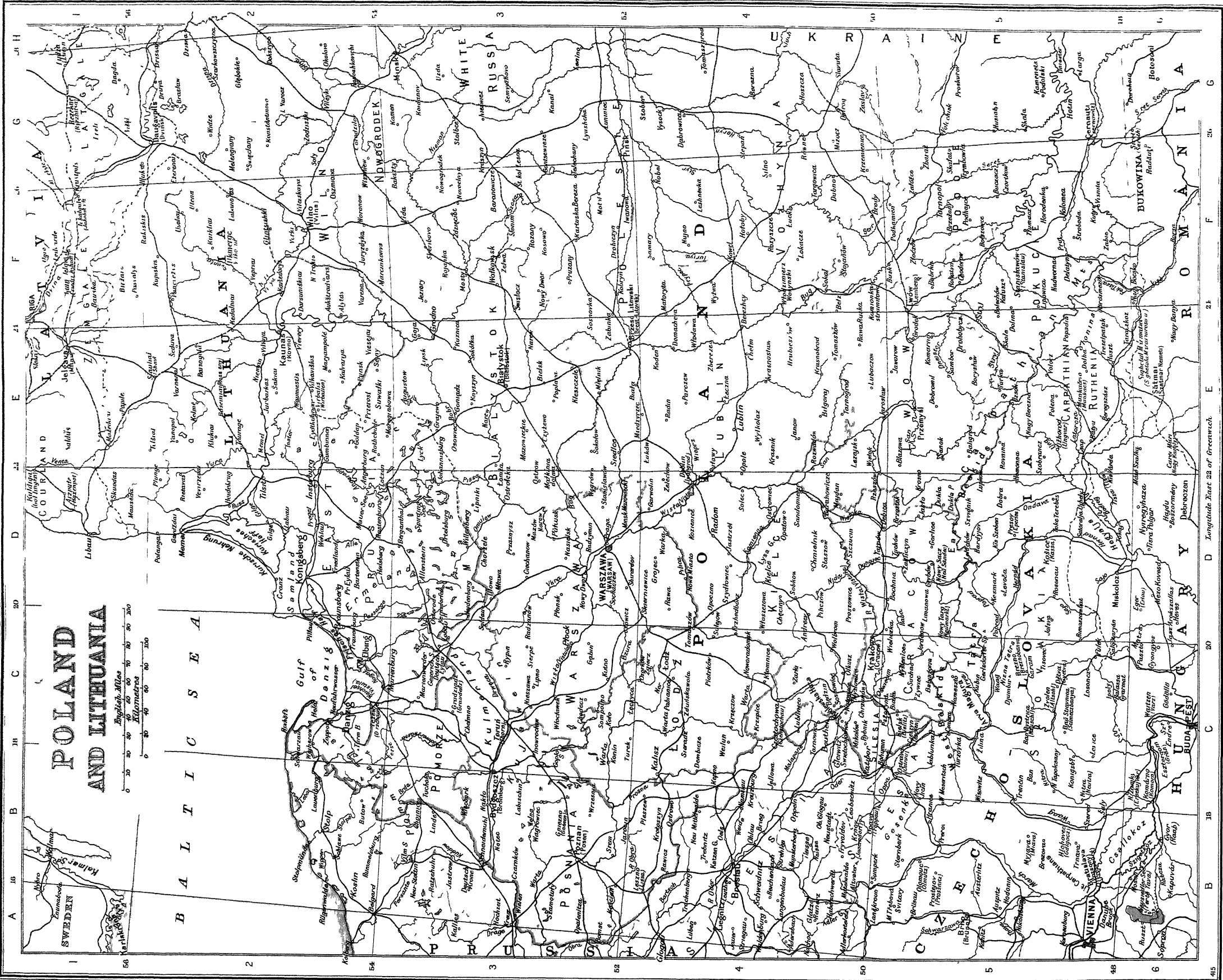
ania in the White-Russian language, which forms an important monument of Polish law. In 1537 occurred the first *rokosz*, or rebellion of the nobility against the kingly authority. Sigismund was about to set out to Wallachia, and was obliged to make several concessions before they would accompany him. In 1548 the king died at the advanced age of eighty-two.

He was succeeded by his son, Sigismund II. (1548-72), otherwise called Sigismund Augustus, but this prince was not elected till a debate had taken place about his marriage. He had secretly espoused as a widower a widow of the great house Radziwill, and the nobles required the union to be annulled, because they fancied that the country would gain more by a foreign alliance. Sigismund, however, carried his point, and his wife was crowned in 1550, but died soon after, not without suspicions of having been poisoned by her mother-in-law, Bona, who in this reign left Poland for her native country, carrying with her a vast amount of treasure. The quarrels between Protestants and Romanists now raged fiercely, and the Reformed faith spread rapidly in Poland. We hear of persons being burned to death for their adhesion to it. Sigismund showed great indecision in the matter. In 1569, by the diet of Lublin, Lithuania was finally joined indissolubly to Poland, and from this time there was to be but one diet for the united realm, and Warsaw, for greater convenience, became the capital. Poland also gained Livonia. In 1572 the king died. In the diet held the year after

POLAND AND LITHUANIA

English Miles
0 10 20 30 40 50 60 70 80 90 100
Kilometres
0 10 20 30 40 50 60 70 80 90 100

B A L T I C S E A



at Warsaw it was enacted that there should be toleration for all religious opinions, but the nobles were still to have power over their serfs in spiritual matters.

The population almost doubled itself, but the nobles became every year more impatient of restraint, and the crown was now virtually elective. The members of the diet, consisting of the palatines and the *posly*, or deputies of the lesser nobility, together with the higher nobility, sat in one chamber. The king had the right of summoning the diet, which only lasted for six weeks, and its decisions were required at a later stage, as we shall see, to be unanimous. This idea of unanimity in voting is thoroughly Slavonic, and is to be found in the old Russian folk-moots. The right of forbidding the passing of any measure was called in Poland the *liberum veto* (in Polish, *nie pozwalam*), and brought all legislation to a standstill. It was employed by many of the corrupt Polish nobles to avoid the detection of their malpractices or to gratify their private malice, and hastened the ruin of the country.

The diet of 1573 elected Henry of Valois (III. of France, q.v.), a worthless man, who fled in the most ludicrous fashion from the country after a reign of about five months, and was succeeded by Stephen Batory (1575-88), voivode of Transylvania, one of Poland's best kings, who carried on war successfully against the Russians, and compelled Ivan IV. to sue for peace; he also organised the Cossacks of the Ukraine into regiments of frontier soldiers. Batory, who had no heirs, was succeeded by Sigismund III. (1586-1632), the son of Catharine, sister of Sigismund II., who had married John Vasa, king of Sweden. He signed the *pacta conventa*, as the agreement between the Poles and their king was named, and an alliance offensive and defensive was made between Poland and Sweden. Constant disputes took place between the king and the diet, and he was a great persecutor of the Dissidents, as the Protestants were called. Sigismund assisted the claims of the false Demetrius, who was assassinated at Moscow in 1606, and we find the Poles afterwards taking that city and causing Ladislaus, the son of Sigismund, to be crowned tsar; but he was soon obliged to resign, and ultimately the family of the Romanovs ascended the throne of Russia in the person of Michael. Sigismund III. died in 1632, and was followed by his sons Ladislaus IV. (1632-48) and John Casimir (1648-68). During the reign of this dynasty Wallachia and Moldavia were taken by the Turks from the Polish protectorate, Livonia was conquered (1605-21) by Sweden, and Brandenburg established itself in complete independence (1657). In 1652 Siciński, the deputy for Upita, first put an end to the diet by the *liberum veto*. The Cossacks had been goaded into rebellion by oppression and religious persecution, as they were members of the Greek Church, and finally went over to Russia in 1654. This occurred in the unfortunate days of John Casimir; and during the same reign Poland was attacked simultaneously by Russia, Sweden, Brandenburg, and the Cossacks; the country was entirely overrun, Warsaw, Wilno, and Lemberg taken, and the king compelled to flee into Silesia. Many of the Polish nobles behaved with great treachery, but the invaders were finally driven out. In 1660 Livonia was ceded to Sweden. In 1667, by the treaty of Andruszowo, the territory beyond the Dnieper was ceded to Russia. John Casimir abdicated in 1668, and retired to France, where he died in 1672.

Michael Wisniowiecki (1668-74), son of a famous general, but a weak and very insignificant man, was elected king—it is said almost against

his own will. He was a mere puppet in the hands of his subjects. A war with Turkey was concluded by the ignominious peace of Buczacz in 1672, by which the town of Kamieniec remained in the hands of the Ottomans. But the senate rejected the treaty; the Polish army was reinforced, and the command given to the celebrated John Sobieski, who routed the Turks at Choczim the following year. Michael died suddenly in 1674. After some dissensions concerning the election of a successor, John Sobieski (q.v., 1674-96) was chosen, but his reign, although adorned by the splendid triumph at Vienna (1683), was productive of little good to his country, chiefly through the continual dissensions of the nobles. As Sobieski's successor the Prince of Conti was legally elected and proclaimed king; but Augustus II. of Saxony, whose cause was supported by the House of Austria, entered Poland at the head of a Saxon army, and succeeded in obtaining the throne. Augustus showed little sympathy with his Polish subjects; he promised to reconquer for Poland her lost provinces, but this promise was chiefly made as an excuse for keeping his Saxon army in the country, in violation of the *pacta conventa*. His war with the Turks restored to Poland part of the Ukraine and the fortress of Kamieniec; but that with Charles XII. brought nothing but misfortune. Cracow was taken in 1702; Augustus was deposed, and Stanislaus Leszczynski, palatine of Posen, elected in his place. All the courts of Europe acknowledged Stanislaus, except that of Peter the Great; and, when the latter defeated Charles at the battle of Pultowa in 1709, Leszczynski was compelled to leave the country, and Augustus returned. In this reign Poland lost Courland, one of its fiefs, which was given by the Empress Anna to Biron, her favourite. Religious fanaticism was also rampant. The Dissidents were very much persecuted, and a riot having taken place in 1724 at Thorn, several of the leading citizens, including the burgomaster, were put to death. In 1733 a law was passed excluding them from all public offices. This same year the contemptible Augustus died. At the instigation of some of his supporters, Stanislaus Leszczynski, who was then residing in Lorraine, was induced to return to Poland and was elected king; but his election was opposed by Austria and Russia, and in his place was chosen Augustus III. (son of the last sovereign), a weak and incapable man. The condition of the country was now deplorable. Towards the end of his reign the more enlightened Poles, seeing the radical defects of the constitution, the want of a strong government, and the dangers of the *liberum veto*, entered into a league for the establishment of a well-organised hereditary monarchy. The conservative party, however, was strong, and relied on Russian influence, while the reformers supported the Jesuits in their exclusion of dissenters from public offices. In 1764 Stanislaus Augustus Poniatowski was elected king, chiefly through the intrigues of the Empress Catharine. Although a man of refined manners, he was weak, and not fitted to serve the country at such a crisis. The reforming, or Czartoryski party (so called because it was headed by a member of this celebrated family), had succeeded in abolishing the *liberum veto*, and effecting many other improvements; but they at the same time more severely oppressed the Dissidents, whom the Russians pretended to protect.

The Confederation of Bar (so called from Bar in Podolia) was now (1768) formed by a few patriots, an army of about 8000 men was assembled, and war declared against Russia. But they were not successful, and a bold attempt to carry off the king also failed. Frederick the Great of Prussia, who had formerly gained the consent of Austria to a partition of

Poland, made the same proposal to Russia in 1770, and in 1772 the *first partition* was effected. The territories seized by the three powers were as follows:

	English sq. miles.	Population.
Russia.....	42,000	1,800,000
Prussia.....	18,000	416,000
Austria.....	27,000	2,700,000

The whole country was now aroused to a sense of its danger; and the diet of the diminished kingdom laboured to amend the constitution. In 1788 a remarkable diet was opened which lasted four years. Many changes were introduced. The *liberum veto* was formally suppressed, and the throne was declared hereditary. The burghers were to send deputies to the diet on the same terms as the nobles; the peasants were not set free, but their condition was improved; and the Dissidents were granted complete toleration, although the Roman Catholic was declared to be the dominant religion. In this they were encouraged by Prussia, whose king, Frederick-William, swore to defend them against Russia. The new constitution was promulgated May 2, 1791. But some of the nobles were discontented at the loss of their privileges by the new order of things, and formed in 1792 the Confederation of Targovica (q.v.), and at their instigation Russian troops invaded Poland and Lithuania. Prussia now joined the Russians, and a second fruitless resistance to the united troops of Prussia and Russia, which was headed by Joseph Poniatowski (q.v.) and Kosciusko (q.v.), was followed by a *second partition* (1793) between those two countries as follows:

	English sq. miles.	Population.
Russia.....	98,000	3,000,000
Prussia.....	22,000	1,100,000

which the diet was forced to sanction at the point of the bayonet. The Poles now became desperate; a general rising took place (1794), the Prussians were compelled to retreat to their own country, and the Russians were several times routed. But Austria now appeared on the scene; her army advanced, and fresh Russian troops also arrived. Kosciusko was defeated at the battle of Maciejowice and taken prisoner. Suvorov (Suwarow), the Russian general, took Warsaw, and the Polish monarchy was at an end. The *third partition* (1795) distributed the remainder of the country as follows:

	English sq. miles.	Population.
Russia.....	48,000	1,200,000
Prussia.....	21,000	1,000,000
Austria.....	18,090	1,000,000

	Eng. sq. m.	Pop.
Russia....	220,500	16,000,000
Prussia....	26,000	3,000,000
Austria....	85,500	5,000,000

Cracow, with a small surrounding territory, was declared independent under the protection of Austria. Alexander I. gave the Poles a constitution, including biennial diets, a responsible ministry, a separate army, and liberty of the press. General Zajacek was appointed viceroy, and the Grand-duke Constantine took command of the army. For some time matters seemed to go on smoothly, but a spirit of discontent soon developed itself. Complaints were made that the freedom of the press was interfered with, and secret societies were formed. An insurrection broke out in November 1830; the grand-duke was obliged to quit the city, and General Chlopicki was appointed dictator. Early in 1831 a large Russian army, under Diebitsch, entered the country. Chlopicki resigned his dictatorship, and Prince Czartoryski was appointed president of the provisional government. From January 1831 till 8th September of the same year a series of sanguinary engagements

King Stanislaus resigned his crown, and died at St Petersburg in 1798. He lies buried in the Roman Catholic church there.

The main causes of the fall of Poland appear to have been (1) the want of patriotism and cohesion among the nobles, each pursuing his own interests, and the country thus being divided among a number of petty tyrants; (2) the want of a *national* middle class, the trade of the country being almost entirely in the hands of Jews and Germans; (3) the intolerance of the Jesuits, who persecuted on the one hand the Dissidents, which caused them to sympathise with Prussia, and on the other persecuted also the Orthodox inhabitants of the eastern provinces and the Cossacks, who thus looked to Russia; (4) in a less degree than the first three causes, the weakness of character of the kings—though with such a turbulent nobility it must be confessed that they had no fair play; (5) the want of natural frontiers.

The subsequent success of the French against the Russians and the promises of Napoleon to reconstitute Poland rallied round him the Poles, who distinguished themselves in several campaigns against their old enemies; but all that Napoleon accomplished in fulfilment of his promise was the establishment, by the treaty of Tilsit (1807), of the duchy of Warsaw, chiefly out of the Prussian share of Poland, with a liberal constitution and the Elector of Saxony as its head. In 1809 Western Galicia was taken from Austria and added to the duchy, but the advance of the allied army in 1813 put an end to its existence. After the cessions by Austria in 1809 the duchy contained 58,290 English sq. m., with a population of about 4,000,000. Danzig was also declared a republic, but given back to Prussia (February 3, 1814).

The division of Poland was rearranged by the Congress of Vienna in 1815; the original shares of Prussia and Austria were diminished, and that part of the duchy of Warsaw which was not restored to Prussia and Austria was united as the kingdom of Poland to the Russian empire, but merely by the bond of a personal union (the same monarch being the sovereign of each), and the two states being wholly independent of each other. The remaining parts of Poland were incorporated with the kingdoms which had seized them. The partition of Poland as thus arranged was as follows:

Political Divisions before Restoration.

Provinces of Courland, Vitebsk, Grodno, Minsk, Mohilev, Volhynia, Kiev, Podolia, and the Kingdom of Poland (see below). Of these portions of the original kingdom of Poland belonging to Russia it must be remarked that Courland was ceded to Russia in the reign of Catharine by the free action of the inhabitants; Kiev had belonged to Russia by conquest since 1667.

Posen, most of West Prussia, and several districts of East Prussia.

Galicia, Bukowina, Zips, &c.

took place, in which the Poles were at first successful. On the 8th of September, however, Paskevitch (q.v.), who had succeeded Diebitsch, took Warsaw, and the insurrection was virtually at an end. The Poles had not succeeded in obtaining any assistance from foreign powers. From this time the independence of Poland was suppressed, and in 1832 it was declared an integral part of the Russian empire, with a separate administration, headed by a viceroy chosen by the tsar; the constitution was annulled, and a strict censorship of the press was established. Many of the literary treasures were carried off to the public library of St Petersburg. Slight outbreaks occurred in 1846, which were severely repressed. Simultaneous disturbances in the Prussian and Austrian portions of Poland met with the same fate. Their leaders in Prussia were imprisoned, but released by the revolution of 1848 at Berlin. In no part was the work of denationalisation more complete than in

Prussian Poland. It proceeded quietly, but thoroughly. In Galicia the peasants at the same time massacred many of the nobles. On the 6th of November 1848 the republic of Cracow was incorporated with Austria.

After the accession of Alexander II. in 1855 the condition of the Poles was considerably ameliorated. An amnesty brought back many of those who had been expatriated, and various other reforms were hoped for. On the 29th November, on the thirtieth anniversary of the insurrection, many political manifestations took place, both in the churches and elsewhere. On these occasions riots took place, and some persons were unfortunately killed. Warsaw was now declared in a state of siege. In June 1862 an attempt was made to assassinate General Luders, the governor, who was succeeded by the Grand-duke Constantine, the brother of the emperor, the Marquis Wielopolski being appointed chief minister. Meanwhile Alexander II. had made great concessions; the public offices of the country were to be filled by Poles; the Polish language was to be the official one, and municipal institutions were granted to Warsaw and the chief cities. The people, however, received these overtures sullenly, and on the night of January 15, 1863, a secret conscription was held, and those suspected of disaffection to the government were seized in their beds to be enlisted. Attempts were made to assassinate the grand-duke and other Russian officials, and Lithuania and Volhynia were also declared in a state of siege. The committee of the National government issued its first proclamation in February 1863; and a week afterwards Mieroslawski raised the standard of insurrection in the north-east, on the frontier of Posen. The committee (*Rząd*) had secret sessions, and was for a long time able to defy the Russian government: its emissaries, called *stiletcziki*, put to death many obnoxious persons and Russian spies. It also issued proclamations from time to time; and many districts of Augustovo, Radom, Lublin, Volhynia, and Lithuania were speedily in insurrection. It was a mere guerilla war, and no great or decisive conflicts took place; but the sympathy of Europe was largely enlisted on behalf of the Poles. Incendiarism and murder were rampant; and at last, with the assistance of Prussia and the secret support of Austria, the tsar's troops succeeded in trampling out (1864) the last embers of insurrection. Langiewicz, one of the leaders who had directed the struggle, held out for some time, but at length made his escape into Galicia. From the time of the suppression of the insurrection the kingdom of Poland disappeared from all official documents. All education in the university and the schools was thereafter carried on in Russian. The administration was at first given to eight military governors, and then to a commission sitting in St Petersburg. Finally, in 1868, the Polish province was absolutely incorporated with Russia, and the ten governments into which it was divided were grouped with the governments of Russia proper.

When the Great War of 1914-19 broke out Austrian Poland alone had autonomy, and the Poles of Galicia were allowed an influence out of proportion to their numbers in the eastern half of that land, where Ruthenians (Ukrainians) were more numerous. The Russian Grand-duke Nicholas, invading Galicia, promised autonomy and religious and linguistic freedom to a Poland united under the tsar. Germany and Austria invaded Russian Poland in their turn, and they likewise proclaimed a modified restoration of the Polish kingdom. The complete independence of Poland was established by the treaties of 1919 (see PILSUDSKI), with provision for the protection of racial, linguistic, and religious minorities. Boundary settlement was difficult. The

Ermeland and Masurian regions declared by overwhelming majorities to remain German. In Upper Silesia the German majority was smaller, and an unsatisfactory compromise assigned part of the province to Poland. Teschen-Silesia was disputed by Czechoslovakia, and was divided. Danzig the Poles would have liked as an outlet to the sea, but its new status as a free city was maintained. In the east Poland pushed her claims by force. When peace was made with Russia in 1921 a large slice of country in which Poles were a minority was added to the republic. Ukrainian claims to Eastern Galicia were set aside. In 1920 General Zeligowski seized Vilna. By a *coup d'état* Marshal Pilsudski overthrew the government in 1926, but declined the presidency.

Among histories may be recommended *Histoire de Pologne*, by Lelewel (Paris, 1844); *Geschichte Polens*, by Röpell and Caro (Gotha, 1840-88); *Dzieje Polskie w Zarysie*, by Bobrzynski; *Outlines of Polish History* (1925) by Dyboski. See also books on Poland by Count Moltke (trans. 1885), Morfill (1893), Georg Brandes (trans. 1903), Alison Phillips (1915), and A. B. Boswell (1919); and *Poland*, ed. Piltz (1919). For maps of Poland at various dates, see, besides that given above, those at EUROPE.

POLISH LANGUAGE AND LITERATURE.—The Polish language is one of the most widely-spread members of the Slavonic family; it forms the western branch together with Czech or Bohemian, Slovak, and Sorbish or Lusatian Wendish. Kashubish and Masurian are so close akin that many count them dialects of Polish. Like all the Slavonic languages, it is highly inflected, having seven cases, and, by means of the so-called 'aspects,' expressing very delicate distinctions of meaning in the verb. Like Russian, however, it lacks the imperfect and aorist which are found in Bulgarian and Serbian. It has a rich vocabulary and great power of compounding words. It resembles Old Slavonic in having two nasals, like the French *on* and *in*; these are found nowhere else among Slavs except in a Bulgarian dialect. After the introduction of Christianity Latin exercised a great influence on its vocabulary and literature, and subsequent to the 14th century it adopted into its vocabulary numerous German words. Already in the 16th century Polish was a highly cultivated language, and began to supplant Latin, until then the language of the state and of the learned.

The history of Polish literature is divisible into six distinct periods. (1) From the earliest times to the middle of the 16th century, the epoch of the Reformation. The Poles, unlike most of their Slavonic kindred, are poor in legendary and popular poetry, and much of their early literature is in Latin. Casimir III. (q.v.), surnamed 'the Great,' did more than any other early Polish monarch for the encouragement of literature, and among other things founded the university of Cracow, which has continued to be the centre of intellectual life and culture in Poland. Among the very oldest literary monuments is a hymn to the Virgin Mary, ascribed to St Adalbert. The MS. in which it is preserved is dated 1408. Belonging to the middle of the 14th century is the so-called psalter of Queen Margaret, discovered at the convent of St Florian in 1826; there is also the Bible of Queen Sophia, which has come down in an imperfect copy, and is said to have been written about 1455. Writers of Latin chronicles were Martin Gallus, who flourished between 1110 and 1135, Kadlubek (1160-1223), and Jan Dlugosz or Longinus (1415-80), all of whom were ecclesiastics. The last is also worthy of remembrance as an able diplomatist. Jan Laski, Archbishop of Gnesen (1457-1531), published a valuable collection of the oldest Polish laws, *Commune Incoliti Poloniae Regni Privilegium*. In 1474 the first printing-press was established at Cracow by Günther Zainer; the

first book in the Polish language was published there in 1521. In 1543 died the great astronomer Nicholas Copernicus. Some other specimens of Old Polish before the 16th century will be found collected in the valuable work of Nehring, *Altpolnische Sprachdenkmäler* (Berlin, 1837).

(2) The second period of Polish literature embraces that which is called the golden age (1548-1606). The series of poets begins with Nicholas Rej (1505-69), commonly called the 'father of Polish poetry,' who spent his life at the courts of the Sigismunds. He was a Protestant. His best work is *Zwierciadło albo żywot Poczciwego Człowieka* ('The Mirror: or the Life of an Honourable Man,' 1567); he also wrote a play on the subject of Joseph. Although his language is rough and careless, there is much shrewdness and satire in his writings. Jan Kochanowski (1530-84), called the prince of Polish poets, has left a great deal of verse, the most beautiful of which are his *Treny* or Lamentations on the death of his daughter Ursula. His nephew Peter translated the *Jerusalem Delivered* of Tasso. Szaryński (died 1581) introduced the sonnet into Polish. Szymonowicz (1557-1629) was a writer of good pastorals (*Sielanki*), as was also Zimorowicz (died 1629), a native of Lemberg. Sebastian Klonowicz, called Acernus (died 1602), is celebrated as a satirist and descriptive poet. The Reformation made rapid progress in Poland; many of the nobility were Calvinists, and the Socini came to reside in the country. Translations of the Bible appeared, but the Jesuit reaction soon made itself felt, especially under the influence of Skarga (1552-1612), renowned for his pulpit eloquence. Among the historians of this period the most celebrated are Martin Bielski, whose Chronicle was continued by his son Joachim; Lukas Górnicki (died 1591), author of a history of the Polish crown (*Dzieje w Koronie Polskiej*, Crac. 1637); Strykowski (died 1582), whose Chronicle of Lithuania (*Königsb. 1582*) is an admirable work; and Paprocki (died 1614).

(3) The third period of Polish literature, also called the Macaronic (1606-1764), is coincident with the rule of the Jesuits, who first obtained a footing in Poland about 1566, through the influence of Cardinal Hosius, soon got possession of the schools, and seriously checked the intellectual development of the nation. The literature of the period is for the most part poor, consisting mainly of bombastic panegyric; the language being corrupted by Latinisms and frequently by the introduction of whole Latin sentences—hence the term Macaronic. To this period belong Casimir Sarbiewski, known by his Latin name Sarbievius (1595-1640), a celebrated writer of Latin odes; Wacław Potocki, now known to have been the author of the poem *Wojna Chocimska*, or War of Chocim, long preserved in manuscript; Kochowski (died 1699), a soldier-poet, who has left some sprightly odes; Twardowski (died 1660), a very prolific writer, author of a poem on Ladislaus IV.; Opaliński (1609-1656), who has left some bitter satires reviling his countrymen, whom he betrayed to the Swedes; Chroscinski, the translator of Lucan; Morsztyn, the translator of Corneille; and Elizabeth Druzbicka (died 1760), whose writings show some feeling for nature. History again took a Latin form, in spite of its having been written in the golden age in Polish: we may mention Starowolski (died 1656), author of *Polonia, sive Status Regni Polonice Descriptio* (Wolfenbüttel, 1656), and other works; Kojalowicz, a Jesuit (died 1677), who wrote a History of Lithuania; and Kaspar Niesiecki, a Jesuit (died 1744), whose *Korona Polska* (4 vols. Lemb. 1728-43) is the most important work on Polish heraldry.

(4) The fourth period is that of the reign of Stanislaus Poniatowski and the dismemberment of Poland, till the rise of romanticism (1764-1822); it owes its characteristics partly to the influence of French culture, partly also to the patronage of literature and science by King Stanislaus, the princes Czartoryski, Jabłonowski, and other noblemen, and the educational reforms of Stanislaus Konarski (1700-73). The good work begun by Konarski was carried on by Kopczyński (1735-1817), who was the first to establish on a scientific basis the grammar of the Polish language in his *Grammatyka Narodowa*; other authors were Bohomolec and Zablocki, who adapted a great many French pieces for the stage. But the best writer for the stage was Fredro, who belongs to a later period. The most noted dramatist, however, of this time, who may perhaps be called the real founder of the Polish stage, was Bogusławski (1759-1829), who wrote above eighty plays, the majority of which, under the title of *Dzieła Dramatyczne*, were published at Warsaw (9 vols. 1820). The most conspicuous poet of this time was Ignacy Krasicki (1735-1801), who tried all kinds of literature—an epic on the war of Chocim, a weak production, and some satires and fables. We must also mention Trembecki; Cajetan Wegierski, the satirist; Godebski, and Wezyk. Adam Naruszewicz was but a mediocre poet, but he wrote a valuable *Historia Narodu Polskiego* ('History of the Polish People'), which he carried down to the year 1386. In 1801 the historian Tadeusz Czacki, Franciszek Dmochowski, and Bishop Jan Albertrandy founded at Warsaw the 'Society of the Friends of Knowledge,' which especially under the auspices of Staszyc bore good fruit till it was dissolved in 1832, when its library of 50,000 volumes was carried off to St Petersburg. At the same time Józef Ossoliński, Hugo Kollataj, and Stanislaus Potocki by word and writing exercised a great influence on the renovation of the national spirit. Karpinski (1745-1825) was a very popular poet as a writer of sentimental elegies and idylls, and Woroniez (1757-1829) was celebrated both as a poet and divine. Niemcewicz (1757-1841) was a statesman and soldier, and is remembered for his historical songs (*Spiewy Historyczne*). Lastly, as the great precursor of the romantic school, must be mentioned Kasimir Brodzinski (1791-1835), whose idyll *Wiesław* has been much admired.

(5) The fifth period runs from 1822 to about 1863; the era of romanticism, dating from the appearance of Mickiewicz, the greatest Polish poet. At Wilno, which after 1815 became the centre of Polish literary activity, several young men united, with Adam Mickiewicz (1798-1855) at their head, in a crusade against the still dominant French school of literature. After a short stay in Russia, Mickiewicz emigrated and spent the latter part of his life at Paris. He died at Constantinople, whither he had gone on a political mission at the time of the Crimean war. We have only space to mention some of his chief works, his *Ballads*, *Sonnets*, *Konrad Wallenrod*, and *Pan Tadeusz*; the last probably the most popular poem in the Polish language. Anton Malczewski (1792-1826), remembered by his *Maria*, a pathetic story of the Ukraine, was a prominent poet of what has been called the Ukraine school; Goszczynski (1806-76) was author of the narrative poem *Zamek Kaniowski*; Bohdan Zaleski, author of *Duch od Stepu*; others are Odyniec, the friend of Mickiewicz, Siemiński, Garczynski, Gaszynski. The two names most worthy to be placed by the side of that of Mickiewicz are those of Zygmunt Krasiński (1812-59), author of the strange poem *Nieboska Komedya* (the 'Undivine Comedy'), and Juliusz Słowacki (1809-49). Most of these men belonged to what

was called the 'Polish Emigration,' whose headquarters were at Paris. Kamil Cyprian Norwid (1821-83) has a posthumous reputation. Of the novelists of this period we have only space to mention the prolific Józef Ignacy Krasiński (1812-87). A very original writer for the stage is Count Alexander Fredro (1793-1876). He is thoroughly national: although French influence is visible in his pieces, the characters are Polish. Many distinguished historical writers belong to this period, of whom we may mention Joachim Lelewel (1786-1862), the author of many works of the greatest value, Szujski, Schmitt, Szajnocha, and Michał Bobrzyński, professor in the university of Cracow. By these men the history of Poland has been treated in all its details with great vigour.

(6) After romance comes the period of the realistic and historical novel and of 'modernism.' Poland's best-known novelist, Henryk Sienkiewicz (1846-1916), by no means stands alone. Bolesław Prus is the name under which Aleksander Głowacki (1847-1912) published his studies of social change. Gomulicki, Tetmajer, Żeromski, may be named; and Władysław Stanisław Reymont (1868-1925) is famous beyond his own country. Dramatists of this period are Stanisław Przybyszewski (b. 1868), Lucjan Rydel (b. 1870), and Tetmajer. The two latter are likewise poets, not so well known as the very popular Adam Asnyk (1838-97), Marya Konopnicka (1846-1912), or Jan Kasprzowicz (1860-1926), considered the greatest of his time, or Leopold Staff (b. 1878).

The history of Polish literature has been written by Bentkowski and Wisniewski. See also Nitschmann's *Geschichte der Polnischen Literatur* (1884); Morfill's *Early Slavonic Literature* (1883) and *Poland* (1893); Nevill Forbes's *Polish Literature* (1911); and Dyboski's *Periods of Polish Literary History* (1924).

Polar Bear. See BEAR.

Polar Circle. See ARCTIC.

Polar Exploration. In scientific geography some of the best work done since the beginning of the 19th century is due to explorations and discoveries in the Arctic and Antarctic regions. Not only have new lands been surveyed, but large and important accessions have been made to several branches of natural science. The original motive, however, in England at least, for exploring the Arctic seacoasts was to discover a route to the wealthy countries of eastern Asia, and to share in the traffic monopolised by Spain and Portugal when at the height of their power. Thus arose a double series of attempts, either to coast eastward along the north of Europe and Asia, or to sail westward across the Atlantic; the latter being afterwards modified into attempts to coast westward along the north of America. Hence arose the terms 'North-east Passage' and 'North-west Passage.'

Some have traced the history of Arctic exploration to the time of King Alfred, who, in his translation of Orosius (q.v.), inserted an account of the voyages of Othhere and Wulfstan, narrated to him by Othhere himself, who seems to have sailed round the North Cape to Lapland. The voyages of the Norsemen to Greenland (q.v.) and the opposite coasts of America in the 10th and following centuries may be regarded as to some extent coming within early Arctic attempts. Cabot's discovery in 1497 of Newfoundland and Labrador might, however, be termed the first step in the exploration of American polar regions—for the earlier expeditions claimed on behalf of Portugal must be regarded as doubtful. Three years after Cabot, Gaspar Cortereal and his brother made three separate voyages in the same direction, sailing northwards by Labrador, where they were stopped in 60° N. lat. The expedition commanded in 1553 by Sir Hugh Willoughby led the way to the North-east Passage. Willoughby

sighted Novaya Zemlya, but he and his men ultimately perished on the coast of Lapland. Chancellor, who accompanied him, landed in Russia near Archangel. Other Englishmen followed, Burroughs (1556), Pet and Jackman (1580), Henry Hudson (1608-9), Wood (1676), but none succeeded in getting much beyond Novaya Zemlya, though they did good work in exploring the north coast of Europe, Spitsbergen, and other islands in these seas. In 1594-97 Barentz, a Dutchman, led three expeditions, wintering on the north-east coast of Novaya Zemlya, 1596-97, after discovering Spitsbergen. After the failures of Hudson and Wood in the 17th century, the attempt to sail eastwards came to be considered quite hopeless. In 1607 Hudson succeeded in reaching 81° 30' N. in the neighbourhood of Spitsbergen.

Meanwhile some exploration of the Arctic parts of America had been going on. Frobisher first sailed in 1576, and in 1585-88 the great navigator Davis sailed up the strait bearing his name to 72° 41' N. and coasted the west of Greenland, 'the land of desolation.' Hudson, who had tried the North-east Passage, discovered in 1610 the strait and great bay which bear his name. From the size of the latter he concluded it to be part of the Pacific; but that was disproved by Button, the next English explorer (1612). In 1615-16 Baffin, who went out at first under Bylot, and had had some scientific training, proved himself as skilful a navigator as Davis. He found the great northern outlet to Baffin Bay, and recorded some important magnetic observations. After the expedition of Fox and James in 1631, which only led to the partial exploration of what then was named Fox Channel, the North American coast was neglected for more than a century.

Russia was naturally interested in the exploration of the Siberian coast. Behring sailed from Okhotsk, and explored the straits which bear his name. In a second voyage (1741) he sailed from Petropavlovsk and explored part of north-west America. Another Russian expedition in 1742 found (but did not succeed in rounding) the most northerly point of Siberia, named from the discoverer Chelyuskin (or Severo); and an earlier one sailed from the Yenisei to 75° 15' N. In 1765 Tchitsakoff sailed to Spitsbergen, and finally reached 80½° N. The New Siberian Islands were explored by Liachov (1770), Hedenström (1809-11), Anjou (1823), and Bunge and Toll (1854-87). Wrangel explored the Siberian coast between Cape Chelagaskoi and the Kolyma in 1820-23, and in 1843 Middendorf laid down the unvisited coast in the neighbourhood of Cape Chelyuskin. In the reign of George III. there was a new revival of English zeal in naval adventure. Captain Phipps (afterwards Lord Mulgrave) sailed in June 1773 to Spitsbergen, and finally reached 80° 48' N. Cook, who next made the attempt through Behring Strait, could only penetrate to 70° 45'. After those failures there was no effort made till 1806, when Scoresby reached 81½° N. immediately north of Spitsbergen. In following expeditions Scoresby explored Jan Mayen Island and the east coast of Greenland, largely adding to our knowledge of the physical geography and natural history of the Arctic regions. The expeditions of Buchan and Franklin in 1818, of Clavering in 1823, of Graah in 1828, of De Blotseville in 1833, did not reach higher latitudes than those which preceded them.

To encourage polar exploration on the North American coast the British government had promised a reward of £20,000; yet nothing was done till the Admiralty in 1818 sent out Ross and Parry, who only explored part of Lancaster Sound. Next year Parry alone discovered Prince Regent Inlet, Barrow Strait, and (110° W.) Melville Sound. Following up this line of exploration, Ross in 1829

at last reached a point only 200 miles from Turnagain Point, which had recently been found by another expedition sailing eastward from Behring Strait. Ross then named Boothia Felix, in which the magnetic pole lay, and King William Island. In 1826-27 Franklin traced the North American coast from the Mackenzie River westwards to Cape Beechey, 860 miles, while his companions, Richardson and Kendall, proceeded eastwards towards the Coppermine River. Dease and Simpson in 1838 extended the survey of the American coast for about 100 miles, from Point Turnagain. In 1846-47 Dr John Rae explored the west shore of Boothia Gulf, and discovered Boothia Felix to be a peninsula. In 1851 he surveyed the coast from the Mackenzie River to King William Island, and also the south-east coast of Victoria Island.

The success of Ross led to Sir John Franklin's expedition (left England 19th May 1845), so unfortunate to him and his crew, so famous from the number of search-parties which it occasioned. His object was to penetrate to Behring Strait from Lancaster Sound (see FRANKLIN, SIR JOHN). In 70° N. lat., 98° 30' W. long., on the west side of King William Island, the ships were beset, and Franklin died June 1847. The survivors abandoned the ships, and all perished. Many search-expeditions were sent out. One of these, under Collinson and McClure, sailed to Behring Strait in 1850. Fixed in the ice on its eastward voyage, McClure's crew was rescued next spring by Sir Edward Belcher, about 60 miles west of Barrow Strait. Belcher now returned towards the Atlantic, and thus McClure with his crew reached England in 1854 after actually traversing the North-west Passage from ocean to ocean. He therefore received the honour of knighthood, and a sum of £10,000 was voted by parliament to him and the crew. Dr John Rae in 1854 first learnt from Eskimo of the fate of Franklin and his men, and received the government reward for the discovery. He was followed by Captain (afterwards Sir) L. McClintock, sent out by Lady Franklin in 1857 in the *Fox*. McClintock obtained many relics from the Eskimo of Boothia, and in a cairn on Point Victory found the record which told the story of the expedition. Owing to the different Franklin expeditions from Britain and the United States the whole Arctic coast of North America was explored almost exhaustively, so that several routes are now completely mapped between Davis and Behring Straits; and in 1904-6 Amundsen in the *Gjøa* successfully made the passage, after devoting two years to the investigation of the North Magnetic Pole area. For commercial purposes, however, the North-west Passage is of no value whatever.

Seeking the North-east Passage, Parry, sailing in 1827 to Spitsbergen, reached 82° 40' N. After 1855 Sweden began exploration in this region under the active guidance of Professor (afterwards Baron) Nordenskiöld, who in 1858-72 did much exploring work in the Spitsbergen islands and seas. In two voyages he reached the Gulf of Obi. At last, in 1878, he rounded Cape Chelyuskin, 77° 42' N., and after wintering near Behring Strait sailed into the Pacific and reached Yokohama in September 1879. Before that date an Austrian expedition under Lieutenants Payer and Weyprecht had been singularly successful, having discovered an island about 200 miles north of Novaya Zemlya. This new group, Franz-Josef Land, extends from 80° N. to about 82°. At a later date (1880-82) this land was still further explored to the north-west by Mr Leigh Smith. In 1894-97 the Jackson-Harmsworth expedition, under Mr F. G. Jackson, explored the southern section of the archipelago, and was able to render help to Nansen on his return from his famous journey to the North.

The more recent exploration to the north of America has added somewhat to our geographical knowledge, in addition to the attainment of the North Pole, and is of interest in certain scientific aspects. The expedition of Kane and Hayes in 1853-55 reached in sledges Cape Constitution in 80° 27' N., and saw what appeared to be an open polar sea. Hayes again (1860-61) reached 81° 35' N. In 1871 the *Polaris*, under Captain C. F. Hall, sailed from New London, U.S., and reached the latitude 82° 16', which was surpassed in 1876 by the British expedition under Captain Nares; Captain A. H. Markham, by means of sledges, reaching 83° 20' N. At the same time Aldrich explored the north shore of Grinnell Land. Full of interest but disastrous was the 'Lady Franklin Bay Expedition,' 1881-84, conducted by A. W. Greely. The explorers were compelled to abandon their ships and find their way southwards through almost impassable ice. In October 1883 Greely and his brave companions landed at Cape Sabine, one of the bleakest spots in the Arctic; and there in June 1884 Commander Schley found the six men who still survived. In the early part of Greely's exploration, when in Grinnell Land, one of his party, Lieutenant Lockwood, succeeded in reaching 83° 24' N. lat., on the coast of Greenland. The Greely expedition also explored the interior and the west coast of Grinnell Land. In 1869-70 Captain Koldeve's expedition reached 77° N. on the east coast of Greenland. The *Jeannette* expedition, under Commander De Long, sent out by the *New York Herald* in 1879 to push north by Behring Strait, ended in disaster. The vessel was crushed in the ice in June 1881 in 77° N., 155° E., and De Long and many of his men perished. Lieutenant Berry, sent out to search for the *Jeannette*, explored Wrangel Island. The icy plateau which covers Greenland (q.v.) was in 1888 crossed by Nansen, and Peary did good work there in 1886-1902, rounding the northern end of Greenland and reaching 84° 17' N. lat. In 1893-96 Nansen in the *Fram* sailed along the north coast of Europe and Asia to the New Siberian Islands, where the *Fram* entered the great north-west current. About 84° N. lat. Nansen with Johansen left the ship in March 1895, and in three weeks reached 86° 13' on the ice afoot. In 1900 a party under Captain U. Cagni reached lat. 86° 34'. In 1905-6 Peary reached 87° 6' N. lat., and on 6th April 1909 reached the Pole by a sledge-journey over sea-ice from the north coast of Grant Land.

In 1899-1902 an expedition in the *Fram* under Captain O. Sverdrup carried out extensive explorations on the western coasts and straits of Grant Land, adding Axel Heiberg Land and several other large islands to the American Arctic archipelago. From 1913 to 1918 V. Stefansson explored the north-west part of that archipelago, and added several new islands.

In 1905-7 Mylius Erichsen for the first time accurately delineated the north-east coast of Greenland, he and his companions perishing before the relief expedition under Einar Mikkelsen in 1909-11 could reach them. Their splendid records and observations were recovered. From 1912 onwards Russian expeditions have carried out valuable hydrographic work from Behring Strait westward, discovering in 1913 new land north of Cape Chelyuskin, stretching some 200 miles up to 81° N. and 96° E. It was named Nicholas Land.

The Arctic coasts of Asia have been completely resurveyed in recent years.

In 1912 de Quervain and in 1913 J. P. de Koch made new crossings of the inland ice of Greenland, and in recent years the Danes, notably L. Koch and K. Rasmussen, have been very active in the

exploration of northern Greenland. In 1916-17 D. Macmillan made surveys in Ellesmere Land. From 1922 to 1925 O. Wisting drifted in the *Maud*, hoping to repeat the *Fram's* adventure on a more northerly course, but was forced to return to Alaska. After an unsuccessful attempt in 1925 to fly from Spitsbergen to the Pole, R. Amundsen tried again in 1926, using a semi-rigid Italian airship in place of a hydroplane. He left Spitsbergen on 11th May, passed the Pole, and descended safely in Alaska after a flight of 72 hours. Two days earlier the American, R. E. Byrd, made an aeroplane flight from Spitsbergen, returning in 15½ hours. He claimed to have flown over the Pole.

An international series of polar observatories was established around the north polar area, and two in the south, for the purpose of taking a complete year's observations, beginning with August 1882. The result was a series of observations of high value on the physics, meteorology, and natural history of the polar, especially the Arctic regions.

In the Antarctic Cook was the first to undertake a systematic exploration of the region, sailing all round at a high latitude, and reaching 71° 10' S. in 106° 54' W. In 1820 E. Bransfield, in sighting Trinity Land, first saw the Antarctic continent. In 1821 the Russian Bellingshausen discovered the islands named Alexander Land and Peter Land. Weddell in 1823 sailed south to 74° 15', and in 1831 Biscoe discovered Enderby Land, 66° 25' S., and Graham Land. The French expedition, 1838, under D'Urville, found its advance in the Weddell Sea blocked by ice extending east and west for 300 miles, but farther east found Adélie Land. In 1840 the United States expedition under Captain C. Wilkes discovered a long coast-line, apparently extending from Enderby Land eastwards to Ringold's Knoll, but the only part of this which has since been found was discovered by Balleny in 1839. The most important results obtained in the Antarctic region in the 19th century were due to Sir James Clark Ross, who made three voyages in 1839-43, discovering Victoria Land, with a lofty range containing the volcanoes Erebus and Terror, and also the Ice Barrier. He traced the coast from 71° S. to 78° 11' S., the highest latitude till then reached in the Antarctic. The *Challenger* expedition in 1874 only just crossed the Antarctic Circle.

In 1895 C. E. Borchgrevink from a whaler was the first to land on the southern continent, near Cape Adare. In 1898 he led an expedition in the *Southern Cross*, which wintered in the Antarctic, and sailed along the Ice Barrier, reaching 78° 50' S. on the Barrier surface. In the same year a Belgian expedition in the *Belgica* explored the north and west coasts of Graham Land, and drifted for about a year in the ice; while a German expedition in the *Valdivia* rediscovered Bouvet Island. In 1901 a well-equipped expedition, organised by the Royal and Royal Geographical Societies, under Captain R. F. Scott, voyaged along the Ice Barrier to King Edward Land. It wintered on shore near Mounts Erebus and Terror, which are on an island. Scott with Wilson and Shackleton pushed southward across the barrier to 82° 17' S. lat., while other parties traversed the barrier in various directions and explored the mountains to the west. At the same time a German expedition under E. von Drygalski, in about 90° W. and 65° S., discovered Kaiser Wilhelm Land. In 1903-4 W. S. Bruce in the *Scotia* explored an entirely unknown sea lying between the tracks of Weddell and Ross, reaching 74° 1' S. A mountainous land was sighted to which the name of Coats Land was given. About the same time O. Nordenskjöld did good work in the neighbourhood of Graham Land. In 1904-5 J. B. Charcot cruised along west Graham Land and found a new coast which he named

Loubet Land. In 1908-10 he led a second expedition, which made its way some distance beyond Loubet Land, adding considerably to our knowledge of the coast and islands. In 1907 E. H. Shackleton led an expedition to McMurdo Sound. Mount Erebus was ascended, and the South Magnetic Pole reached. Marching over the barrier and plateau, Shackleton reached 88° 23' S., 162° E. In 1910 Scott led a second expedition, which landed in McMurdo Sound. Parties of the scientific staff were landed at various points of the coast. Scott himself, with Wilson, Oates, Bowers, and Edgar Evans, pushed his way along Shackleton's route and reached the Pole in January 1912, only to find that he had been forestalled by Amundsen. Unfortunately, owing to adverse conditions, all five perished on the return journey. The work of the expedition as a whole was a brilliant success. R. Amundsen established the headquarters of his admirably-equipped expedition in 1911 in an opening in the Ice Barrier about 400 miles east of Scott's position. Following 164° W. longitude he struck the mountain range of Victoria Land in about 85° S. He reached the highest point of the plateau near the 88th parallel, and reached the Pole at a height of 10,500 feet on 16th December 1911, returning to his base in January 1912.

In 1912 W. Filchner found Luitpold Land, a continuation of Coats Land and the Weddell Barrier, and in 1911-14 D. Mawson mapped the coast from 150° E. to Wilhelm Land.

Sir Ernest Shackleton in the *Endurance* in 1914 led an expedition to the Weddell Sea. His plan was to land parties on that coast to carry on scientific work, while he with other members of the staff pushed their way across the Pole. An auxiliary expedition was sent to the Ross Sea for the purpose of planting depots of provisions as far south as possible with this end in view. Unfortunately disaster met the expedition in the treacherous Weddell Sea. The ship foundered, and it was only by the indomitable exertions of the leader that the whole party did not perish. They were landed safely in South America in May 1916. Caird Coast was added to the extent of Coats Land.

The result of all these expeditions has been to add a vast amount to our knowledge of Antarctica and the Southern Ocean. Much of its outline has been mapped; a great knowledge of the character of the interior has been obtained; great gains have been made in geology, biology, meteorology, magnetism, oceanography, and other sciences. Still, though an exhaustive survey of the continent is not required, it is desirable to have the survey of the coast completed and a general knowledge of the interior, and there is ample room for further exploration in the interests of science.

The physical geography of the north and south polar regions is largely treated at ARCTIC OCEAN, ANTARCTIC OCEAN. See also GEOGRAPHY, GEOGRAPHICAL DISTRIBUTION, ANTARCTICA, GREENLAND, SPITSBERGEN, NOVAYA-ZEMLYA, FRANZ-JOSEF LAND, SIBERIA, NEW SIBERIAN ISLANDS, GLACIER, ICE, and the articles on Hudson, Cook, Franklin, Ross, Parry, M'Clure, Hall, Nordenskiöld, Greely, Nansen, Peary, Scott, Shackleton, Drygalski, and other polar explorers; Nansen's *In Northern Mists*; Barrow's *History of Voyages to the Arctic Regions* (2 vols. 1818 and 1846); C. R. Markham's *Threshold of the Unknown Region*; A. H. Markham's *Life of Franklin*; H. R. Mill's *Siege of the South Pole*; A. W. Greely's *Handbook of Polar Discoveries*; *Journal, Proceedings, and Geographical Journal, Roy. Geo. Soc.*; *Scottish Geographical Magazine*; and the published narratives of the various Arctic and Antarctic explorations.

Polarisation. (1) *Of Light*.—An ordinary narrow beam of sunlight has no sides, and is always divided into two equal beams by a crystal of Iceland spar; but if it has once been reflected from glass or water, it will then be found in general that

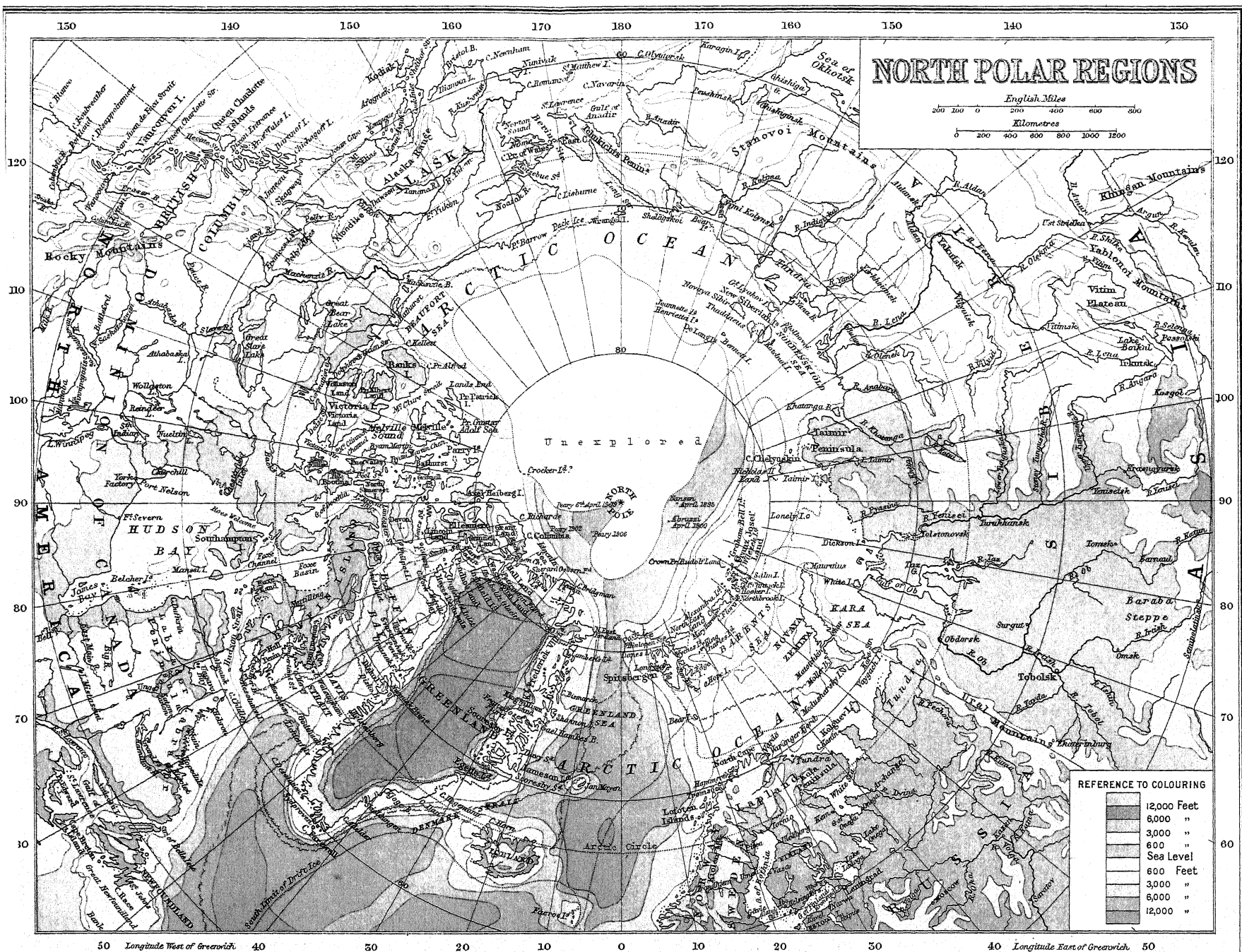
different results, as regards the intensities of these two beams, are produced by turning the crystal of Iceland spar round the axis of the beam into different successive positions. The beam is no longer the same all round, but has acquired sides. On the vibratory or undulatory theory of Light (q.v.) this shows that the vibrations must be transverse to the direction of propagation (see POLARITY). Suppose a long cord, fixed to a distant wall, to be held in the hand; apply a sharp up-and-down movement; an up-and-down wave will run along the cord to the wall; this illustrates the mode of vibration in a beam of *plane polarised* light. Make the hand move in a circle, in a direction contrary to that of the hands of a clock; a wave will run along in the form of a screw; this screw will have the form, and will advance after the fashion, of a corkscrew; this illustrates the mode of vibration in a *right-handed circularly polarised* beam of light. Make the hand move in a circle clockwise; the wave-screw advances in a left-handed fashion; this illustrates *left-handed circularly polarised* light. Make the hand move in an ellipse; an elliptical disturbance travels, screw-fashion, right- or left-handed as the case may be; this represents *elliptically polarised* light. Communicate a series of disturbances of the greatest irregularity in which no one direction, up or down, right or left, has on the whole any predominance; the irregular succession of transverse disturbances which will travel along the cord will represent the vibration in a beam of *common* or *natural* light. Assume that while communicating these irregular disturbances the hand is hampered but not disabled with reference to any particular direction, say up and down; the vibrations in that direction are on the whole less than those from right to left; and the whole complex of irregular disturbances would, if they wrote their own path, tend to fill up an ellipse with their trace-marking rather than to fill up a circle, as the vibrations in common light would tend to do; this would represent the nature of the vibrations in *partially polarised* light. Now suppose a slot in a board, which will allow the cord to swing from end to end of the slot, but will not allow the cord to swing athwart the slot; all those oscillations or components of oscillation which are parallel to the slot will be able to traverse the slot; but those which are at right angles to these will not be allowed to pass. On endeavouring to transmit through the slot the complex of oscillations which illustrate the vibrations of common or natural light, it will be found that no motion at right angles to the slot is transmitted, and that what does pass through is a complex of irregular oscillations restricted to the plane of the slot. A second slot, at right angles to the first, will cut off the whole of what passes through the first; and the propagation of transverse oscillations along a cord may thus be entirely checked. If, however, the second slot be parallel to the first, all the oscillations transmitted by the first may pass through it also; and if it lie in an intermediate direction, the second slot will allow a proportion to pass, which depends upon the angle between the two slots, being proportional to $\cos \theta$, where θ is that angle. The first slot illustrates the functions of a polariser; the second illustrates those of a second polariser or analyser. A polariser reduces incident common light to a plane polarised condition, and an analyser at right angles to the polariser will quench it altogether.

The phenomena of polarised light were first observed in sunlight reflected from water or glass. Common or natural light so reflected is always, except when it retraces its path by direct reflection, more or less partially 'polarised' by reflection. The polarisation is more or less complete according

to the angle of incidence. At one particular angle of incidence the reflected light is as nearly plane polarised as the particular reflecting substance employed can make it. At this angle, the so-called 'angle of complete polarisation,' the reflected and the refracted rays are (or tend to be) at right angles to one another, and $\tan i = \mu$, where i is the angle between the incident ray and the normal, and μ is the index of refraction (see REFRACTION). Metal reflectors have no angle of complete, but only of maximum, polarisation; and even among such substances as glass, which are usually said to have an angle of complete polarisation by reflection, it is only those whose index of refraction = 1.46 which can completely polarise common light by a single reflection. In that case the intensity of the reflected plane polarised beam is to that of the original incident beam of common light as 6.52 to 100, or 6.52 per cent. The intensity of light polarised by one reflection is therefore a good deal less than the 50 per cent. which might be secured by any contrivance which effectually acted in a way analogous to the first slot above mentioned. The intensity of light polarised by reflection is greatly improved by using, instead of a single reflecting plate, a pile of plates. A crystal of tourmaline or of iodo-sulphate of quinine will, on the whole, allow only light polarised in one particular plane to pass through; but then it darkens it and colours it. Advantage is accordingly taken of the property of a doubly-refracting transparent crystal, such as Iceland spar, of dividing an incident beam of common light into two equal beams, which are, when they travel in principal sections of the crystal (see REFRACTION), polarised in planes at right angles to one another, and each of which possesses (absorption apart) half the intensity of the original beam. As these two beams diverge from one another it is comparatively easy to arrange that one of them shall remain parallel to the axis of the incident beam and of the apparatus, while the other is allowed to wander away laterally: and this is the basis of the construction of the prisms of Nicol, Foucault, Wollaston, Rochon, and others, which receive incident ordinary light and transmit plane polarised light.

Two beams of plane polarised light can *interfere* with one another (see INTERFERENCE) provided they originate in the same source, when their vibrations are wholly or partly in the same direction, but not if they be at right angles to one another; and a beam of light polarised in any way can give rise to the phenomena of *Diffraction* (q.v.).

On interposing in the path of a plane polarised beam of light an analyser, so placed as to allow none of that light to be transmitted, and then placing in the course of the plane polarised beam before it reaches the analyser a thin film of a doubly-refracting substance, such as mica, the field of view may become filled with light. The doubly-refracting film generally breaks the incident plane polarised beam into two plane polarised beams, which are, after emergence from the film, parallel to one another and on the whole coincident if of sufficient breadth. These two beams are differently retarded in the mica; and, according to the amount of this relative retardation and to the position of the principal plane of the interposed film, their resultant, that which reaches the analyser, may be a beam plane polarised in the original plane, plane polarised in another plane, elliptically polarised, or circularly polarised. In all these cases except the first, the analyser lets some light through.—If we substitute for the analyser a doubly-refracting crystal, there will in general be two images seen on looking through; but as this crystal itself introduces relative retardations, the result of which depends on the wave-lengths—i.e. on the colours



—the different wave-lengths may give different relative intensities in the two images: some wave-lengths may predominate in the one image, the rest in the other; the two images may thus be coloured; and when coloured they will be complementarily coloured. The phenomena of colour produced by the reaction of polarised light upon various doubly-refracting crystals and films, &c.—all which colour-phenomena are due to varying relative retardations of ordinary and extraordinary rays in doubly-refracting media, and are either uniform all over the resultant wave-front or vary with respect to particular parts of it—are of great variety and extreme beauty. For an account of these we refer to Thomas Preston's *Theory of Light* (4th edition by Thrift, 1912).

A beam of plane polarised light may be recognised by means of a crystal of Iceland spar. Paste a piece of paper with a pinhole in it on one end of the crystal; look through, turning the crystal round; each of the two images waxes and wanes and disappears alternately with the other. In partially polarised ordinary light, and in elliptically polarised light, the two images wax and wane alternately with one another, but do not disappear. In circularly polarised and in ordinary light the two images remain equal to one another, and present no variation of intensity. Circularly or elliptically polarised light is converted by a plate of mica of proper thickness into plane polarised light; natural light, unpolarised or partially unpolarised, is not so affected by the same plate of mica. These criteria enable the character of a given beam of light to be readily recognised.

The name of Rotatory Polarisation is given to the phenomenon observed when a beam of plane polarised light is sent through a slice of quartz cut parallel to the axis. The plane of polarisation is found to have been rotated, and that into a different position for each component colour; so that, with white light incident, a crystal of Iceland spar gives two images complementarily coloured, and varying in colour on rotation of the prism. This property of rotation is shared by many substances even in solution: cane-sugar, grape-sugar, camphor act like quartz, rotating the plane of polarisation to the right (dextro-rotatory); fruit-sugar and starch rotate the plane to the left (laevo-rotatory). Upon this property are based various instruments for the quantitative estimation of saccharine solutions, called saccharimeters. If the light whose plane has been rotated be reflected back through the plane-rotating medium, the rotation is reversed, and the light emerges polarised in the original plane. A somewhat similar phenomenon, though much less pronounced, is observed on passing a beam of light through heavy glass in a strong magnetic field; but here, if the path of the light be reversed by reflection, the rotation of the plane is not reversed but doubled.

As to the direction of vibration in a plane polarised ray, a ray polarised by reflection is said to be polarised in the plane of incidence—i.e. in a plane containing both incident and reflected rays: the question is whether the vibration is in this plane or at right angles to it. Fresnel worked out the consequences of the vibration being at right angles to this plane, and arrived (on the assumption that the density of the ether in two media, at whose bounding surface reflection takes place, is different in the two media, while its elasticity is the same in both) at consequences consistent with experiment. Neumann and MacCullagh, from a contrary hypothesis as to the elasticity and density of the ether, and on the hypothesis that the vibrations are parallel to the plane of polarisation, arrived at optical conclusions which, so far as it is possible to test them by experiment, are

equally consistent with observation. Clerk-Maxwell's electric or electro-magnetic theory of light, confirmed by Hertz's researches (see MAGNETISM), requires that there should be an undulatory propagation of electric disturbances at right angles to the plane of polarisation, and of magnetic disturbances parallel to that plane. See LIGHT.

Polarisation of light is useful in several ways. A polariser can be made to cut off the glare from the surface of water while we look into its depths; or to cut off a large portion of the light which is reflected from haze and obscures our view of landscape; or it may be used in examining the light of the sky, which is partly polarised, because due to reflection. A polariser and analyser are of use in examining the strained condition of glass which, when heated or bent, &c., or too suddenly cooled, will give rise between crossed prisms to phenomena analogous to those produced by a doubly-refracting crystal; and they are also of use in low-power microscopic work for the examination or identification of crystals and of many organic structures. Crossed prisms have also been used to reduce the intensity of a beam of light to any required percentage for photometric purposes.

(2) *Polarisation of Dielectric*.—The condition of the dielectric or medium between two opposite charges of electricity: a condition of stress.

(3) *Polarisation of a Galvanic Cell*.—Production of a reverse 'electromotive force' by the deposition of elements of the electrolyte upon, or their combination with, the plates of the cell.

(4) *Polarisation of Electrodes*.—An entirely similar phenomenon in an electrolytic cell. When the battery is taken off, a reverse current flows from the electrolytic cell; this is the basis of the gas battery and of the modern accumulator (see ELECTRICITY).

Polarity, in physical science, a word of various application; but in all its uses there is present the idea of a directed quantity or Vector (q.v.). A sphere, situated in space, is a perfect type of all-sidedness, presenting the same aspect in every direction. Let this sphere, however, begin to rotate about some diameter, and at once it becomes a polar body; it becomes possessed of polarity (see POLES). Looked at from one end, it appears rotating clockwise; looked at from the other, it appears rotating counter-clockwise. A similar polarity is acquired by a body of any shape when it is set spinning about some axis. Hence we may take rotation as a very perfect illustration of kinematic polarity.

Perhaps the most familiar example in physics of a polar body is the magnet. Its polarity is a force-polarity, the ends or *poles* of one magnet having a selective action upon the ends or poles of another. This particular action is, however, only one of a host of manifestations of what is known as Magnetism (q.v.); and the general tendency in modern theory is to explain all magnetic phenomena as being essentially rotational. Thus, again, from a physical or dynamic point of view, we conceive of rotation as a true type of polarity. The phenomena of statical electricity have also been discussed as analogous to certain phenomena in vortex motion. In electrolytic polarisation, however, it is difficult to see any rotational analogy. Here the electrodes which bring and carry away again the electric current flowing through the decomposing liquid acquire new properties and functions which have distinct directive relations to the current that produced them. See ELECTRICITY, INDUCTION, MAGNETISM.

In all the cases so far mentioned the polarity or polarisation involved is of such a nature as that originally typified by the sphere's rotation; there are two ends which in some respects have opposite characteristics. In polarisation of Light (q.v.),

however, this condition is no longer always fulfilled. For instance, a plane polarised ray of light which is stopped by a Nicol prism passes more or less completely as soon as the prism is rotated round an axis codirectional with the ray. The ray has, in fact, peculiarities as regards its sides—its 'polarity' is strictly speaking lateral, not polar. On the other hand, in a circularly polarised ray we have, according to the ordinary theory, a true kinematic polarity of a rotational kind, so that, looking along the ray, we are able to distinguish right-handed and left-handed circular polarisations. It may be mentioned as a final illustration that the rotation of the plane of polarisation by means of quartz or a saccharine solution is not a real polar phenomenon, the rotation being for any one substance always in the same sense relatively to the travelling ray; but that the rotation of the plane of polarisation in a magnetic field is a true polar phenomenon, changing sign with the direction of the field.

Polar Lights. See AURORA BOREALIS.

Polder, in the Netherlands, is land below the level of the sea or nearest river, which, originally a morass or lake, has been drained and brought under cultivation. An embankment, forming a canal of sufficient height to command a run towards the sea or river, is made, and when carried quite round, as in the case of the Haarlem Lake, it is called the *Ringvaart*. At one or more points on the embankment apparatus for lifting water is placed, and worked by wind or steam power. If the lake deepens towards the centre, several embankments and canals are necessary, the one within the other, formed at different levels as the water-surface becomes lessened, a connection being maintained with the outer canal, which secures a run for the drainage water. In the Schermer polder in North Holland are four canal levels, the land between forming long parallelograms. The great polder of the Haarlem Lake (q.v.) is to be surpassed by that of the Zuider Zee (q.v.). See also HOLLAND.

Pole. See ROD.

Pole, DE LA, a family descended from William de la Pole, a Hull merchant, whose son Michael in 1383 became chancellor under Richard II., in 1385 was made Earl of Suffolk, and in 1389 died an exile in France. His grandson William (1396-1450) was the year before his death raised from Earl to be Duke of Suffolk, having since 1445 been practically prime-minister. His administration was a disastrous one; and he was on his way to a five years' banishment in Flanders, when he was captured by a ship sent after him, and beheaded. John de la Pole, Duke of Suffolk (died 1491), married Elizabeth, sister to Edward IV. and Richard III.; and from this marriage sprang John, Earl of Lincoln (died 1487), Edmund, Earl of Suffolk (executed by Henry VIII., 1513), two churchmen, four daughters, and Richard, on whose death at the battle of Pavia in 1525 the line became extinct.

Pole, REGINALD, 'Cardinal of England,' was the son of Sir Richard Pole, and Margaret, Countess of Salisbury, the daughter of the Duke of Clarence and niece of Edward IV. He was born in Staffordshire, March 1500. He received the rudiments of his education from the Carthusians at West Sheen, and at twelve years of age he was sent to Magdalen College, Oxford. His relationship to the crown made him an important person, and being destined for the church, he was presented at an early age with several benefices. At nineteen he went to Italy with a pension from the king to finish his studies at Padua. He returned to England in 1527. He was then high in Henry's favour, while Queen Catharine was much attached to his mother. Pole's position, when the question of the king's divorce was raised, became a difficult one. He

appeared at first disposed to take the king's side. In 1530 we find him in Paris endeavouring to obtain from the university a decision on the divorce question, but becoming more and more disgusted with the policy of Cromwell, he refused the archbishopric of York which was offered to him on the death of Wolsey, and remonstrated with the king upon the course he was pursuing. Henry, however, made no open quarrel with him; and Pole left England in 1532, and after a short stay at Avignon took up his residence in Italy. Here he formed intimate friendships with a number of men of learning and piety—Sadoleto, Contarini, Morone, Flaminio, Priuli, and others—who were urgent for an internal reformation of the church, and whose views on justification by faith as a rule approximated closely to the doctrine of Luther. Pole still retained his English ecclesiastical revenues, and made no hostile demonstrations against Henry, but in 1535 he entered into a political correspondence with the Emperor Charles V. Pole was now compelled by Henry to declare himself, which he did in a violent letter addressed to the king, afterwards famous in its revised form as the treatise *De Unitate Ecclesiastica*. The king withdrew Pole's pension and preferments. Paul III., on the other hand, made him a cardinal (22d December 1536), and legate to England. Henry retaliated by causing a bill of attainder to be passed against him, and by setting a price on his head. His mother, with other relatives, was thrown into the Tower on the ground of treasonable correspondence with the cardinal, and subsequently beheaded. Pole's diplomatic career was not, however, a brilliant one. His several attempts to procure the invasion of England were not successful. From 1541 to 1542 he acted as governor of the 'Patrimony of St Peter,' of which Viterbo was the capital. He took an active part in the discussions on the Interim, and when the Council of Trent was opened in 1545, he was one of the three cardinals who acted as legate-presidents. In the conclave which followed on the death of Paul III. in 1549, Pole was at one moment on the point of being elected pope; after the election of Del Monte, as Julius III., he lived in retirement at a Benedictine monastery at Maguzzano on the lake of Garda, until the death of Edward VI., when he was at once commissioned to proceed to England as legate *a latere*, to assist Queen Mary in the reconciliation of the kingdom to the Church of Rome.

Pole was still only in deacon's orders, and had not abandoned the idea which he had apparently entertained from his youth, of marrying Mary Tudor. The queen for a moment considered the project of obtaining a dispensation for this union with favour, but the influence of Charles V. prevailed in favour of his son Philip. The emperor's fear of Pole's interference or precipitancy led to the legate being prohibited from entering England for more than a year. Philip was married 25th July 1554. Pole's attainder was removed by parliament, 22d November, and two days later he arrived in London. He was provided with ample powers to allow the owners of the confiscated church property to retain their possessions, a condition which was understood to be absolutely necessary to secure the submission of parliament. On the 30th Pole solemnly absolved the Houses of Parliament and country from their schism, and reconciled the Church of England to Rome. As long as Cranmer lived Pole would not accept the archbishopric of Canterbury, although the see was vacant by his degradation, but the day before Cranmer was burnt Pole was ordained priest, 20th March 1556, and on the 22d consecrated archbishop. In the meantime Giovanni Pietro Caraffa, once a friend of Pole and afterwards his bitter enemy, had become (May

1555) Pope Paul IV. The pope was indignant at the concessions made by the authority of his predecessor to the holders of church property; and he revived the accusations of heresy which had been in former days brought against Pole, both on the ground of his leniency towards Lutherans when papal governor at Viterbo, and of his well-known opinions on justification. Paul IV. was, moreover, now at war with Spain, and could not tolerate Pole as his ambassador at the court of Philip and Mary in England. The cardinal's legation was accordingly cancelled, and he was summoned before the Inquisition, into the prisons of which the pope had already thrown Pole's friend, the Cardinal Morone. Mary angrily protested, and the pope somewhat relented. He would not reinstate Pole, but appointed William Peto, a Franciscan friar, as cardinal and legate in his place. The queen gave orders that the papal messenger bearing the hat should be stopped at Calais, and Peto died without receiving it. When peace was made between the pope and Spain, Paul still refused to reinstate Pole as his legate, and he did not withdraw the odious and unjust accusation of heresy. When the queen died, 17th November 1558, Pole, whose health had been long feeble, was lying dangerously ill. The impending failure of all his hopes no doubt hastened his end. He died on the same day, twelve hours after the queen, in his fifty-eighth year.

It has been a disputed question how far Pole was responsible for Mary's persecution of Protestants. His leniency towards heretics in Italy had even brought him into trouble. Nevertheless it is remarkable that after Philip's departure from England and Gardiner's death (November 1555), when Pole became the queen's supreme adviser and her inseparable companion, the persecution increased in violence. If it was not instigated by Pole, it could not have continued without his sanction and support. In his diocese of Canterbury he issued in the last year of the reign a fresh commission against heretics, and in July he delivered over to the secular arm five persons, who were burnt alive at Canterbury a week before his death.

Besides the above-mentioned *De Unitate*, Pole was the author of *De Concilio* (Rome, 1562), *De summi Pontificis officio* (Louvain, 1560), and *De Justificatione* (Louvain, 1569). His letters, with a life prefixed, were published by Quirini (Brescia, 1744). Beccatelli's life of Pole, originally written in Italian, was published in a Latin translation at London in 1690, and in an English translation by B. Pye in 1766. The first edition of Philipps' life, which occasioned much controversy, appeared in 1764-67. See *Lives* by Hook (in vol. viii. of his *Archbishops of Canterbury*), A. Zimmermann, S.J. (1893), and Martin Haile (1910); K. B. McFarlane's *Cardinal Pole* (1924).

Pole, William (1814-1900), born in Birmingham, was appointed Professor of Civil Engineering at University College, London, in 1859, and also acted as examiner in music. He produced much literary work and was a scientific exponent of whist.

Polecat, or **FITCHET** (*Mustela putorius*, or *Putorius feticus*), a large relative of stoat and weasel. The body is about 17 inches in length, the tail 7 inches more. Its colour is a deep blackish-brown; the head, tail, and feet almost black, the under parts yellowish, the ears edged with white, and a whitish space round the muzzle. The hair is of two kinds—a short woolly fur, which is pale yellow, or somewhat tawny, and long shining hairs of a rich black or brownish-black colour, which are most numerous on the darkest parts. The nose is sharp, the ears short and round, the tail pretty equally covered with longish hair. There is a pouch or follicle under the tail, which exudes a yellowish, creamy substance of a very fetid odour; and this odour is

particularly strong when the animal is irritated or alarmed. Hence, apparently, its name *Foumart* ('Foul Marten'), which, with various provincial



Polecat (*Mustela putorius*).

modifications, as *Fulmart*, *Thoumart*, &c., is prevalent in most parts of Britain. The origin of the names Polecat and Fitchet is much more uncertain.

The polecat was much more common in Britain in former times than now, and is almost extirpated from some districts, through the constant war waged against it by gamekeepers and others; and yet it is very prolific, bearing five, six, or even seven young at one birth. It is extremely destructive in the poultry-yard, the abundance present there inviting it to drink blood and eat brains, which seem to be its favourite luxuries. The rabbit is followed by the polecat into its burrow, and its ravages among poultry are partly compensated by its destruction of rats. The taming of the polecat does not seem to have been attempted. The smell prevents it. The skin is imported from the north of Europe under the name of *fitch*, and is used as a kind of fur, similar but inferior to that of the Marten (q.v., and see *FURS*). To artists the hair of the *fitch* or *fitchet* is well known as that of which their best brushes are made; the hairs used for this purpose being the long hairs already noticed, which grow through the lighter-coloured fur of the animal. The Ferret (q.v.) is a pale-coloured domesticated variety of the polecat. A dark-coloured kind of ferret is commonly regarded as a cross between the polecat and the ferret, and is sometimes called the *polecat-ferret*.

Polemon, a Greek geographer of the 2d century B.C., became an Athenian citizen about 200 B.C. Preller (1838) and Müller (1841) collected the extant fragments of his writings.

Polemoniaceæ, a family of plants, mostly herbaceous, allied to Convolvulaceæ, and containing about 200 known species, natives of temperate countries, and particularly abundant in the north-western parts of America. *Polemonium coeruleum* is Jacob's Ladder (q.v.); Phlox is also of the family.

Polenta, an Italian dish, the chief ingredients of which are maize meal and salt. Sometimes wheat or chestnut meal is used. It is made into a thick paste, cut into finger-like strips, and baked, generally with cheese. It is eaten either by itself or with roast liver or steamed meat and sauce. A similar dish, called Mamaliga, is eaten by Rumanians.

Poles (Gr. *polos*, a 'turning-point'), in Geography, are the two extremities of the axis round which the earth revolves; they are therefore situated the one on the north and the other on the south side of the equator, and equidistant from all parts of it, or in 90° N. lat. and 90° S. lat. They are called the north and south poles of the Earth (q.v.).—In Astronomy the poles, which for distinction's sake are frequently denominated 'celestial poles,' are those points in the heavens to which the earth's axis is directed, and round which the heavens seem to revolve. The celestial poles are valuable points of reference to astron-

omers and geographers, so that the determination of their position in the heavens is a matter of the utmost importance. Unfortunately, no stars mark their exact situation (see POLE-STAR)—though there is a minute telescopic star only a few seconds from the north pole, which may be employed instead of it in rough observations—and therefore it is necessary to adopt some means for discovering its precise position. This is effected in the following manner: A bright star (generally the pole-star) is selected, and its position in its upper and its lower *Culminations* (q.v.) is accurately noted; the point midway between these two positions of the star is the pole of the heavens. The observation of the star's two positions must be corrected for refraction, and it is for this reason that the pole-star is selected, since the effect of refraction is much the same in both positions of the star. The term 'poles' has, however, a wider application, as denoting the extremities of a line passing through the centre of a great circle perpendicular to its plane; thus, we have the poles of the horizon (viz. the zenith and nadir), the poles of the ecliptic, the poles of a meridian; and, in the same sense, the terrestrial and celestial poles are spoken of as the poles of the equator and equinoctial respectively.—Pole, in Physics, denotes those points of a body at which its attractive or repulsive energy is concentrated; see POLARITY, and MAGNETISM.

Polesie, the largest county of Poland, bordering on White Russia. Much of it is occupied by marsh land round the river Pripet and its tributaries, and the soil is unproductive. Considerably more than half the population are Ruthenians. The capital is Brzesc or Brest-Litovsk (q.v.) Area 16,261 sq. m.; pop. (1921) 879,925.

Pole-star, or POLARIS, the nearest conspicuous star to the north pole of the celestial equator. The star which at the present time goes under the name of the 'pole-star' is the star α in the constellation of Ursa Minor. By examining attentively the general movement of the stars throughout a clear winter's night, we observe that they describe circles which are largest at the equator, and become smaller and smaller as we approach a certain point (the north pole of the celestial equator), close to which is the star above mentioned. This 'pole-star' is, however, a little less than $1\frac{1}{2}^\circ$ from the pole, and has a small but sensible motion round it. Owing to the motion of the pole of the celestial equator round that of the ecliptic (see PRECESSION), this star will in course of time (about 2100 A.D.) approach to within $28'$ from the north pole, and will then recede from it. At the time of Hipparchus (156 B.C.) it was 12° , and in 1785 $2^\circ 2'$ from the north pole. Its place can easily be found in the heavens, for a line drawn between the stars α and β (called the two *pointers*, from this peculiarity) of the constellation Ursa Major, or the Great Bear, and produced northwards for about $4\frac{1}{2}$ times its own length, will almost touch the pole-star. Two thousand years ago the star β of Ursa Minor was the pole-star; and about 2300 years before the Christian era the star α in the constellation of the Dragon was not more than $10'$ from the north pole; while 12,000 years after the present time the bright star Vega in Lyra will be within 5° of it. See star-map at URSA MAJOR.

The south pole of the celestial equator is not similarly marked by the near neighbourhood of a bright star, the only star deserving the name of the south pole-star being of the sixth or least visible magnitude.

Polianthes. See TUBEROSE.

Police (Gr. *politeia*) is in modern times held to be synonymous with the whole body of men employed as constables, or with the system under which such

constables perform their duties in connection with the maintenance of law and order and the prevention and detection of crime. Originally, however, the *politeia* of the Greeks had a much wider signification, and what we now term *police* formed but a part of the regulation of the affairs of a state or country, which was the meaning of the original word. The Greeks, by the adoption of this term, says an old writer on police administration, apparently intended to indicate that the 'execution of those laws which make up public rights, the maintenance of that civil society which is the essence of every city, were two things inseparable from each other.' The strictly executive character of police duties, however, as performed in Great Britain of the 19th century, was not always recognised in ancient times, and whether at Athens, under officers called *archōn* or *nomophylax*, or at Rome, under consuls, pretors, quaestors, censors, or aediles, the judicial functions of a police-magistrate, or the responsibilities of a public prosecutor, devolved to a greater or less extent upon those officials who were entrusted with police administration. It is difficult to refer to any country in which the separation of executive from judicial or magisterial functions has so strictly been carried out as would appear to be required under our modern interpretation of police duties in England. The French system of police, which is based on the old Roman administration, unites to a very considerable extent executive with judicial functions. The same remark applies to continental police administration generally; and even in the great dependency of British India, which is governed by English law, the district magistrate, who is *ex officio* head of the police within the limits of his jurisdiction, is also a judicial officer with extensive powers. In the capital of England itself, where the distinction between executive and magisterial functions is specially marked, the chief of the police is still, by virtue of his office, a justice of the peace, although the exercise of his powers in that capacity is restricted by certain conditions.

The existing system of police administration in the United Kingdom is of comparatively recent origin; it arose within the 19th century, and in many instances was developed within the reign of Queen Victoria. In the early period of English history there was no such institution as a separate body of police. The responsibility for maintenance of the peace was imposed on each hundred or tithing, and the members of these divisions were held jointly liable for the consequences of any infractions of the laws which took place within their limits. Self-interest made every member of the association a constable; and although the collective responsibility of the tithing or hundred was for executive purposes represented by the headman of each, such transfer of liability was not recognised by the law when any penalty for breach of the peace was incurred. As time went on the place of the headman of the local division was taken by a constable or constables in the various villages or parishes of the country. In the larger towns the members of the various wards at first maintained order and kept watch within their various limits; gradually separate watchmen, very inadequately paid, were introduced; but the inefficiency with which watch and ward duties were performed, and the impunity with which crimes were committed, were conspicuous, and in no place more so than in the metropolis itself. During the 18th century spasmodic attempts were made to improve the administration in London, both as regards prevention and detection of crime. Horse patrols were introduced; a detective staff was organised; but the whole system was fragmentary and disjointed, and the results attained

under it were pre-eminently unsatisfactory. The decrepitude of the old 'Charlies,' as the watchmen were called, and their inability to afford protection to the inhabitants of London, were proverbial; and as to Edinburgh we may read in the pages of the *Heart of Midlothian* Sir Walter Scott's description of 'that black banditti,' the 'City Guard,' who were in his days the 'alternate terror and derision of the petulant brood of the High School,' and objects of scorn to the citizens generally. At last in 1829 Sir Robert Peel constituted the Metropolitan Police, abolishing local police administration in the metropolis outside of the narrow limits of the City of London itself, and placing the control of the new force in the hands of the Secretary of State. 'The new guardians of the peace in the metropolis, retaining the comparatively ancient name of constable, were called police-constables, and were in a sense a development of the tithing-man of old; but they resembled him even less than a member for a metropolitan borough resembles the burgesses who appeared before the chief-justices at Westminster with a statement of accounts in the reign of John. Yet the stages of growth are sufficiently well marked—from the responsibility of the tithing to the responsibility of its head, from the functions of the head borough or tithing-man to the functions of the constable, from the election of a constable to the election of a plurality of constables, and finally from a plurality of constables, deputy constables, and watchmen, under parochial or other local authority, to a plurality of constables under the central authority of a Secretary of State' (Pike's *History of Crime in England*, ii. 460).

By the Municipal Corporations Act, 1835, every municipal borough was required to appoint a police force: a number of special constables were also to be annually appointed to act when occasion arose. These provisions were continued in the Municipal Corporations Act, 1882. In 1839 the justices in quarter sessions, who then formed the local administrative body for each county, were empowered by the County Police Act, 1839, to establish a permanent and salaried police force, and in 1856 the establishment of such a force was rendered obligatory for each county by the County and Borough Police Act of that year. Under this measure the establishment of an effective police organisation for the whole country, commenced by the Metropolitan Police Act of 1829, was completed. Since that time the character of the police authority controlling the county police forces has been changed by the Local Government Act, 1888, which created elective councils for the government of the counties and transferred the control of the county police forces to the standing joint committees, composed of an equal number of representatives of the justices and of the newly-formed county council. Apart from this, the system remains to-day much as constituted by the statutes of 1829-56. While, however, the several forces are still independent one of another, much has been done in recent years to introduce common methods, closer co-operation and more uniform conditions of service, and great advances in the efficiency of the service have been made in a variety of ways. Provision is also made by which any force can be supplemented in an emergency by men lent from another force, and members of any force added temporarily to another force under this provision have all the powers of constables of the district in which they are acting.

It is, of course, necessary that constables should be more or less drilled to enable them when called upon to act together in bodies, but the force is, in its essence, constitution, and performance of duty, civil and non-military. In serious emergency the aid of the military forces of the crown can be re-

quisitioned by magistrates to supplement the police in the maintenance of law and order, but such occasions, happily, are of rare occurrence.

The total strength of the police forces in England and Wales is shown in the following table:

Date.	Authorised Establishment.	Population.	Population per Constable.
1892	40,596	29,002,525	712
1902	45,544	32,527,848	714
1912	53,112	36,070,492	679
1922	56,382	37,884,960	667
1925	57,043	37,884,950 *	664

* Census of 1921.

The above figures represent the total authorised establishment, apart from police specially employed for the protection of dockyards or other establishments at the expense of the parties concerned. These additional police numbered 2814 in 1925. During the Great War, when some 18,000 men served in H.M. Forces and recruiting was suspended, the strength of the police was much below the authorised establishment, and the force was supplemented by large numbers of special constables.

The number of police in proportion to population varies considerably in different police districts, mainly by reason of the varying needs and circumstances of the localities concerned, as is illustrated by the following figures for 1925:

Police District.	Authorised Establishment, 1925.	Population (1921 census).	Population per Constable.
Metropolitan	19,277	7,466,492	387
Liverpool	1,732	802,940	464
Manchester	1,395	780,307	524
Birmingham	1,586	919,444	580
Leeds	687	458,232	667
Herts	376	248,447	661
Gloucestershire	444	380,772	858
Bucks.	216	214,234	992
Cornwall	271	306,869	1132
Monmouth	268	355,436	1363

The total net expenditure on the police, which was 6½ millions sterling in 1911-12, was approximately 18 millions in 1924-25, the increase in cost being due in the main to the greatly improved rates of pay and pensions introduced since 1919.

Metropolitan Police.—The Metropolitan Police District (exclusive of the City of London, which has a separate police force) extends over a radius of approximately 15 miles from Charing Cross, including the whole of the counties of London and Middlesex, and parts of the counties of Kent, Surrey, Essex, and Herts, with a total area of about 700 square miles and a population estimated at nearly 7½ millions. Under 23 and 24 Vict. chap. 135, Metropolitan Police are also employed in some of H.M. dockyards and principal stations of the War Department. The total authorised strength of the Metropolitan Police in 1925 was 19,277 officers and men of all ranks, exclusive of 1173 men employed outside the Metropolitan Police District at dockyards, &c. The total net expenditure on the Metropolitan Police is at the rate of approximately 6 millions sterling per annum, or about 16s. per inhabitant.

The system of administration is a development of the principle on which the force was first established by Sir Robert Peel—'unity of design and responsibility of its agents.' The control of the force (subject to the general authority of the Secretary of State) is vested in a commissioner who is appointed by the Crown, assisted by a deputy commissioner, three assistant commissioners, three deputy assistant commissioners, and five chief constables. The whole of the Metropolitan Police District is divided into twenty-two divisions, each having a force of several hundred men in charge of a superintendent, aided by a chief inspector and other officers. There is in addition a division specially engaged in policing the river Thames. The superintendent is responsible

for all the details of police administration within his division. For executive purposes the divisions are brigaded into four police districts, each comprising several divisions and in charge of a chief constable. Each principal station is in direct communication by telegraph with the headquarters office, and there is an elaborate system of telephone communication linking the various stations.

The general control of the whole force is exercised from the central office of the commissioner at New Scotland Yard, which deals with all matters affecting the force as a whole, or of national, as opposed to local, concern. At this central office are also the headquarters of the Criminal Investigation Department, which is specially concerned in the detection of crime. Local crime is dealt with by C.I.D. officers attached to the several divisions, while the conduct of special cases is in the hands of the headquarters staff, which is specially in charge of one of the assistant commissioners and a deputy assistant commissioner. The strength of the C.I.D. is about 800 men.

City of London Police.—The City of London, which covers an area of about one square mile in the centre of the county of London, has a separate police force, under the control of a commissioner, established partly by special statutes and partly by virtue of extensive powers of local government derived from ancient charters. The strength of the force is about 1100 men.

County and Borough Police.—There were in 1925 sixty county forces and one hundred and twenty-two borough forces with a total authorised establishment, all ranks, of 36,604, apart from 1622 additional constables employed as dock police, colliery police, &c., at the expense of the firms or individuals concerned. The individual forces vary widely in size, the authorised establishments ranging from 2000 men down to 11 men of all ranks. All these forces are under the control of the local police authorities. In the county forces, as already mentioned, the police authority is the Standing Joint Committee, composed half of representatives of the justices and half of representatives of the county council. In the boroughs, the police authority is the Watch Committee, which is a committee of the town council elected annually. Each force is commanded by a chief constable, but the powers of the chief constables of counties are wider than those of borough chief constables. In the former, the chief constable has sole responsibility for all appointments and promotions in the force, and for discipline, whereas in the boroughs the responsibility in these matters is vested in the Watch Committee, though in practice it is delegated in greater or less degree to the chief constable.

Conditions of Service and Financial Provisions.—While the several police forces are independent one of another, all are subject in greater or less degree to the supervision of the Home Office. In the case of the Metropolitan Police, as already mentioned, the Secretary of State is himself the police authority. Under the County Police Act, 1839, the Secretary of State has always had power to make rules applicable to the county forces, but this power was extended to all forces by the Police Act, 1919, which provides that the Secretary of State may make regulations as to the government, mutual aid, pay, allowances, pensions, clothing, expenses and conditions of service of the members of all police forces in England and Wales, and all police authorities are required to comply therewith. Under these powers a comprehensive code of regulations, applying to all forces, and dealing with such matters as pay, allowances, discipline, promotion, hours of duty, &c. was made in 1920; in 1921 the statutes regulating the police pensions

were consolidated in the Police Pensions Act of that year. Thus the police in all forces, Metropolitan, City of London, County, and Borough, now serve under conditions which are substantially uniform throughout the country.

The expenses of the police are defrayed from the Police Funds of the several forces, and are met partly from local rates and partly by contributions from the Exchequer. These contributions consist of statutory grants from certain assigned revenues, supplemented by a direct grant, voted annually by Parliament, the amount of the latter being calculated so as to bring the total Exchequer contribution up to one half the total net expenditure. The Metropolitan Police Fund receives in addition a special direct contribution in respect of certain services of imperial, rather than local, character. The City of London force does not share in the statutory grant. The payment of the statutory grants is contingent on the issue of an annual certificate by the Secretary of State that the force has been maintained in a state of efficiency, and the payment of the voted grant is subject to the Secretary of State being satisfied that the force is fully and properly administered, and that the requirements of the police regulations as to the pay and allowances, &c. of the force have been complied with. For the purpose of the Secretary of State's certificate of efficiency every county and borough force is inspected annually by one of H.M. Inspectors of Constabulary, appointed under the County Police Act, 1856. The total net expenditure on the police in England and Wales which, as already mentioned, amounted in 1924-25 to 18 millions, was met approximately as follows: From local rates £9,150,000; from assigned revenues, £2,900,000; from direct grant, £5,950,000.

Police Federation.—By section 1 of the Police Act, 1919, already referred to, there was also established 'for the purpose of enabling members of the police forces in England and Wales to consider and to bring to the notice of the police authorities and the Secretary of State all matters affecting their welfare and efficiency, other than questions of discipline and promotion affecting individuals,' a representative organisation, designated the Police Federation, to which the members of all forces below the rank of superintendent belong by virtue of their office. There is in each force a local representative body, the Branch Board, for each rank, and Central Committees for each rank are appointed at annual conferences attended by delegates from all forces. These Central Committees have the right to submit representations to the Secretary of State in writing or by way of deputation, and they are consulted from time to time by the Secretary of State on matters affecting the interests of their ranks.

Auxiliary Police Services, &c.—In case of emergency, the police of any force may be supplemented, as already mentioned, by police borrowed from another force. In addition, provision may be made, and is made by many police authorities, to keep a register of police pensioners and other suitable persons who undertake to join the force for temporary service if called upon to do so. Men so registered receive in some forces a small retaining fee: when called upon for duty they act in all respects as ordinary members of the force and wear the usual uniform and accoutrements.

Another important method of supplementing the police force in time of emergency is, as it has been since the reign of Charles II., the employment of special constables. Special constables are ordinary citizens of good character who are sworn in to assist in the preservation of order, and as such they enjoy all the powers and privileges of a regular constable. By the Municipal Corpora-

tions Act, 1835, every borough was required annually to appoint a number of persons to serve as special constables, who, if necessary, might be called on to act by the warrant of a Justice of the Peace, and this provision is retained in the Act of 1882. In counties it was formerly the case that special constables could only be enrolled on information sworn before two or more justices that tumult, riot, or felony was to be apprehended (Special Constables Act, 1831, 1 and 2 Will. IV. chap. 41). Now, in virtue of the Special Constables Acts, 1914 and 1923 (4 and 5 Geo. V. chap. 61, and 13 and 14 Geo. V. chap. 1) there is power to appoint and maintain a force of special constables in all police districts and at all times. Special constables appointed under this provision do not ordinarily receive any retaining fee or other payment, but when called upon for duty are eligible to receive allowances by way of repayment of expenses, and if incapacitated by injury received on duty are entitled to pensions or gratuities. Unless other special provision is made by order of the Secretary of State, special constables, like the regular police, act at the disposition and under the control of the Chief Constable.

Police in Scotland.—It is only recently that the same acts relating to the police have applied both to England and Scotland. Earlier legislation dealt with each country separately, though it followed the same general principles in each case.

The principal statute regulating police in Scottish counties is the Police (Scotland) Act, 1857, which provides for the establishment of a police force in every county, except Orkney and Shetland. (The latter counties have police forces, but they do not come within the Police Acts, are not subject to the police regulations referred to hereafter, and do not share in the Exchequer grants.) As in England, the police authority in counties is the Standing Joint Committee.

The corresponding principal statute regulating the police in burghs is the Burgh Police (Scotland) Act, 1892, which supersedes earlier Acts of 1833, 1847, 1850, and 1862. Burghs which have a population of not less than 20,000 may maintain separate police forces, but some such burghs are policed by the police force of the county in which they are situated, and some have consolidated their police with the county force. Other burghs are policed by the county, but burghs which at the passing of the act maintained a separate force, and had at the census of 1891 a population of not less than 7000, retained their separate forces. Of the 201 Scottish burghs, 27 have separate forces. The police authority in burghs is the Town Council.

The Act of 1892 does not apply to the five most important burghs in Scotland, namely, Edinburgh, Glasgow, Aberdeen, Dundee, and Greenock, and the police forces in these burghs are regulated by a series of local acts, the provisions of which correspond generally to those of the Burgh Police Act.

In Scottish burghs there is no body corresponding to the Watch Committee referred to in the previous section of this article. The Town Council is the sole police authority in a burgh which maintains a separate force.

The total authorised strength of the police forces in Scotland on 31st December 1925 was 6553. The number of vacancies existing at that date was about 100. In addition there were 162 additional constables, that is, constables employed and paid for by private individuals, firms, and harbour and other authorities. As in England, the strength of the several forces varies widely. The force of the least populous county has a total strength of 8, and that of the most populous a strength of 391. The strength of the burgh forces varies from 9 to 2247.

In Scotland special constables are appointed in counties by the Standing Joint Committee, and in burghs by the magistrates, and serve under the same general conditions as special constables in England. Early legislation followed a different course in the two countries, but the Acts of 1914 and 1923, to which reference is made above, applied to both countries, and the orders in council issued under the last-mentioned act, which deal *inter alia* with allowances, pensions, and gratuities to special constables, are in similar terms for both countries. The number of special constables now enrolled in Scotland is about 22,000. The arrangements regulating the loan of police from one force to another and the engagement of temporary constables are similar to those in force in England, but it is not the practice in Scottish forces to pay a retaining fee to men who undertake to join for temporary service.

The Secretary for Scotland is the central authority for the administration of the police in Scotland, and his powers are similar to those of the Secretary of State in England. There is, however, no force in Scotland to which he stands in the same relation as the Secretary of State to the Metropolitan Police.

The Police Act of 1919 applied to both countries, and there is a Scottish Police Federation constituted in all respects in the same manner as the English Federation. A code of regulations has been issued for Scotland which resembles very closely the English code described in the previous section of this article. By the Police Pensions Act, 1921, the schemes of pension for the police of the two countries, which had up to that date been on a different basis, were revised and assimilated.

As in England, the cost of the police is met in part from the rates and in part from Exchequer contributions. Exchequer grants bear the same proportion to expenditure and are distributed on the same conditions in each country. The total net expenditure on the Scottish police in 1924-25 was £1,919,541, which was made up as follows: From local rates, £959,800; from government subsidies, £959,741.

Police in Ireland.—Formerly there were two police forces in Ireland—the Royal Irish Constabulary, a semi-military force under the control of the Irish Government, with jurisdiction throughout the whole of Ireland except the city of Dublin and its adjacent suburbs; and the Dublin Metropolitan Police, a civil force similar to the Metropolitan Police in London. These two forces no longer exist. The police in the Irish Free State and Northern Ireland are now under the control of the respective governments.

Polidori, JOHN WILLIAM (1795-1821), born in London, took his M.D. at Edinburgh, and in 1816 was appointed travelling physician and secretary to Byron, to whom he falsely ascribed his own story of *The Vampyre* (1819). Owing to gaming losses, he poisoned himself. See his *Diary*, edited in 1911 by his nephew, W. M. Rossetti.

Polignac, an ancient French family, which claims to derive its name from a castle—the ancient *Apolliniacum*—in the department of Haute-Loire, and which since the 9th century possessed the district of Velay. Among its most famous members was Cardinal Melchior de Polignac (1661-1742), who was employed in diplomatic missions in Poland and at Rome, and received a cardinal's hat after acting as plenipotentiary of Louis XIV. at the peace of Utrecht (1712). From 1725 till 1732 he was French minister at the court of Rome, and he was appointed Archbishop of Auch. Polignac succeeded Bossuet at the French Academy in 1704, and left unfinished the *Anti-*

Lucretius (1745), a poem intended for a refutation of *Lucretius*.

Some other members of the Polignac family are more notorious than noteworthy.—In the reign of Louis XVI. Iolanthe-Martine Gabrielle de Polastron, Duchesse de Polignac (born 1749; died at Vienna, 9th December 1793), and her husband, Jules, Duc de Polignac (died at St Petersburg, 1817), grand-nephew of the cardinal, were among the worst, but unhappily most favoured, advisers of Marie Antoinette. They obtained vast sums of the public money from their royal master and mistress, and were largely responsible for the shameful extravagance of the court. The Polignacs knew how they were hated, and were the first of the *noblesse* to emigrate. From the Empress Catharine of Russia the duke received an estate in the Ukraine, and did not return to France at the Restoration.—His son, AUGUSTE JULES ARMAND MARIE, PRINCE DE POLIGNAC, was born at Versailles, 14th May 1780. On the Restoration he returned to France; became intimate with the Comte d'Artois, afterwards Charles X.; from his devotion to the policy of Rome received from the pope in 1820 the title of Prince; was appointed ambassador at the English court in 1823; and finally, in 1829, became head of the last Bourbon ministry, in which capacity he promulgated the fatal ordonnances that cost Charles X. his throne. He then attempted to flee, but was captured at Granville on the 15th of August, was tried, and condemned to imprisonment for life in the castle of Ham, but was set at liberty by the amnesty of 1836. He took up his residence in England, but died at St Germain, 2d March 1847. He was a puzzle-headed man; 'a mere idiot' Guizot called him to Bishop Wilberforce.—His son, Prince Armand (1817–90), was a leading monarchist.

Poliomyelitis. See PARALYSIS.

Polishing. See DIAMOND, GLASS, &c.

Polishing, FRENCH, is the usual method of polishing furniture. Simple varnishing with copal or mastic varnish, put on with a brush, produces a comparatively uneven surface which soon wears off with friction. A French-polished surface, on the other hand, is beautifully smooth and glossy, and very durable. The process, which of course differs with the quality and grain of the wood, usually consists of staining, oiling, filling, and polishing. The wood is stained if necessary—good woods are usually left unstained—then rubbed over sparingly first with raw linseed oil, next with a preparation of whiting and methylated spirits to fill in the grain. Thereupon several coats of polish are applied with the rubber. The polish consists chiefly of shellac and methylated spirits, to which various gums and the requisite colouring are added. Finally the work is rubbed with methylated spirits to remove traces of oil and give a lustre. An 'egg-shell' finish is given to the surface by rubbing over the ordinary French-polished surface with pumice and linseed oil. The pads or rubbers used are either of flannel or cotton-wool covered with soft rag. A very little linseed oil is used as a lubricant during operations. Good work requires care, time, experience, and freedom from dust.

See *The French Polisher's Handbook* (1918); A. W. Parkhouse, *Practical Polishing and Staining* (1922); and the articles JAPANNING, VARNISH.

Polishing Slate, a siliceous rock of organic origin, consisting largely of the remains of diatoms. It is white or yellowish in colour, and is distinguished from diatomaceous earth by its slaty texture.

Politian. ANGELO POLIZIANO (Latinised *Politianus*) was born at Montepulciano in Tus-

cany, on the 14th July 1454. His real name was Ambrogini, but, in accordance with a common practice at the Renaissance, he early called himself by the Latinised form of his native town, which Italianised into Poliziano is the name by which he is known in his own country. His father, Benedetto Ambrogini, a jurist of some distinction, was assassinated by certain of his fellow-citizens, and left his widow and five children so scantily provided for that, even after Angelo the eldest had given the most signal proofs of his genius, he was on the point of being taken from his studies and put to a trade. At the age of ten he was sent to Florence, then under Lorenzo de' Medici, the brilliant centre of the Italian Renaissance. Here he had as his teachers the most famous scholars of his time, the Greeks Argyropoulos and Kallistos, and the Italians Landino and Ficino. His progress in the ancient languages, the special studies of the period, was extraordinary even in that age of precocious talents. By his sixteenth year he wrote epigrams in Latin and Greek that excited the wonder of his teachers. At seventeen he began the translation of the *Iliad* into Latin hexameters, a work which it had been the ambition of all the Italian humanists to achieve. The first book had already been translated by another scholar, and Politian at different periods carried on the work to the end of the fifth. By his success with the second book he became known as the 'Homeric youth,' and attracted the attention of the great Lorenzo himself, who now stood his firm friend and patron. Thus secure of a settled position his life was thenceforward devoted to incessant study, and he was soon recognised as the prince of Italian scholars, and the most remarkable literary genius of his time. At the age of thirty he became professor of Greek and Latin in the university of Florence, and the fame of his prelections drew students from every part of Europe, among whom, by reason of their own services to learning, Reuchlin, Grocyn, and Linacre may be specially mentioned. Politian was also entrusted with the education of Lorenzo's sons, Piero and Giovanni (afterwards Leo X.); but their mother Clarice, who had excellent reasons for doubting the great scholar's fitness to be the director of her boys, insisted on his being removed from their immediate superintendence. In such occupation, varied by occasional visits to other towns of Italy, Politian lived at Fiesole in a villa assigned to him by Lorenzo, whose familiar intercourse he daily enjoyed. The death of that prince in 1492 was the most serious trial of his life, and he mourned his death in a Latin elegy, which has been described as unique alike in form and feeling in modern Latin poetry. Two years later he himself died during the temporary supremacy of Savonarola, whose religious zeal was directed against every principle of that pagan revival which it had been the life's work of Lorenzo and Politian to forward. Politian's epitaph on his tomb in San Marco, at Florence, is so entirely in the ironical and sceptical spirit of that movement of which he was so brilliant a representative that it fitly closes any account of himself. It is as follows: 'Politian lies in this grave, the angel who had one head and, what is new, three tongues.'

Politian has the double distinction of being both a scholar of the first rank and a poet of high merit alike in Latin and in his mother tongue. Of his industry as a scholar his translations of classical authors (Epictetus, Herodian, Hippocrates, Galen, Plato's *Charmides*, to mention a few of the long series) are ample evidence, while his edition of the *Pandects* of Justinian is regarded by modern scholars as excellent even when tried by the latest tests. His original works in Latin fill a thick and

closely-printed quarto, half of which is made up of twelve books of letters, and the rest with miscellanies in prose and verse. Among Neo-Latin poets Politian holds perhaps the first place, his peculiar distinction being that, while he is not careful of classical purity, he has charged his verse with his own individual thought and feeling. In Italian literature also he takes a high rank, both in virtue of his own poetic production and as having at a critical period given an impulse to the cultivation of the Italian language. Before him the Italian humanists regarded their native tongue simply as a bastard Latin, which might serve the needs of the people, but was beneath the attention of scholars. The weight of Politian's name and example moved them to think differently, and thenceforward Italian was secure of a place among the other modern literatures. Of his productions in Italian his *Orfeo* deserves special mention as having been the first secular drama in the language. As to his personal character, Politian had in full measure the two great blemishes of the scholars of the Revival of Letters, and notably those of Italy. He was addicted to the lowest forms of vice, and he knew no bounds to his abuse of those who had the ill-fortune to offend him.

See *Opera Ang. Politiani* (Florence, 1499); *Le Stanze, l'Orfeo e le Rime di Messer Ang. Ambrogini, illustrate da Giosuè Carducci* (Florence, 1863). For accounts of Politian, see Roscoe, *Life of Lorenzo de' Medici*; J. A. Symonds, *Renaissance in Italy*, vol. ii.; Von Reumont, *Lorenzo de' Medici* (vol. ii. Eng. trans. 1876).

Political Economy. The name 'Political Economy' dates from 1615, having been first used in this special sense, as distinguished from domestic economy and from political theory, by Montchrétien de Vatteville in his mercantilist pamphlet entitled *Traité de l'Économie Politique*. Montchrétien's use of the term is, however, somewhat different from the modern use.

Nature and Scope of Political Economy.—Political economy has been variously defined, but the *nature* and *scope* of the study to which the term now applies cannot be better indicated provisionally than by the full title of Adam Smith's great work, *An Inquiry into the Nature and Causes of the Wealth of Nations*. Slight consideration will suffice to show that such an inquiry has inevitably two aspects: first, the theoretic and positive aspect, namely, the nature of wealth and the principles or influences *actually* determining its production, distribution, exchange, and consumption within the community considered; and second, the practical or ethical aspect, the methods which may or should be adopted by the community in these connections so as to attain certain economic ends or political ideals. In practice undoubtedly these two aspects are inseparably connected, but logically and for purposes of study they must be kept distinct. The economic scientist or the *science* of political economy is concerned with the first aspect. The second aspect constitutes the *art* of political economy, and is more properly the pre-occupation of the social reformer or the statesman as a branch of the art of government. Until the time of Adam Smith the two aspects were not distinguished, but on the whole it was the second aspect which the term political economy indicated. Political economy, was regarded as part of the art of government, and meant in the political sphere the same as domestic economy in the sphere of the household, namely, an adaptation of the economic resources for the good of all concerned. Adam Smith made no explicit separation between the science and the art of political economy. He obviously regarded them both as parts of the same inquiry; but he treated them, in fact, separately, and thus laid the foundations of the science.

N. W. Senior in 1837 was the first writer to make a clear division of political economy into (1) the theoretical, which 'explains the nature, production, and distribution of wealth'; (2) the practical, of which the office is 'to ascertain what institutions are most favourable to wealth.' Some years later, in a treatise written originally for the *Encyclopædia Metropolitana*, Senior, conscious that he is narrowing down the traditional meaning of the term, proposed to confine the name political economy to the theoretical branch, leaving the practical branch to be absorbed in the general art of government. He did this, not because he failed to recognise the importance of government action in the economic sphere, but because investigation in that sphere could be pursued like investigation in other spheres, quite independently of the practical applications which might be made of the knowledge thus gained. He further insisted that the practical applications of economic truths for the purpose of furthering the general welfare of society was not the business of the economist, but of the statesman, who in framing legislation must have in view the welfare of the state as a whole, taking into consideration many other factors than the merely economic. Senior's view of the scope of political economy has come to be, on the whole, the prevailing view of economists in Britain. The failure to grasp this fact has led to much confusion as to the nature of economic 'laws.'

Economic Laws.—These laws are like the laws of the physical sciences, merely statements of facts or tendencies. They indicate certain causal relations which exist under certain specified conditions. They are not in any sense precepts for conduct or rules for action; therefore, although the tendencies which they indicate may be overlooked or neglected, the laws cannot in any sense be 'disobeyed.' Rules for action may be laid down by the art of political economy, but these depend for their validity on the validity of the social or political end which they are framed to promote. Such rules may be regarded as political precepts and may take the form of legal enactments, but they must not be confused with economic *laws* in the positive and scientific sense.

Method of Political Economy.—The scope assigned to political economy has an important bearing on the much-controverted question of the method of economic investigation, viz. whether the method should be 'deductive,' which in political economy means, mainly, basing conclusions on certain fundamental facts of human nature, or whether it should be 'inductive' and historical, arriving at conclusions only after a study of all the relevant facts. Here it need only be said that the two methods are now admitted to be supplementary rather than distinct, and in themselves have different degrees of usefulness in different cases. In so far, however, as the scope of the subject is conceived to be theoretical, the arriving at general principles, the deductive method supported and verified by induction will yield the most fruitful results. As a natural consequence the English school of political economy since Ricardo has been in the main deductive in character. On the other hand, if the scope is conceived to be both theoretical and practical, the method must be primarily historical, since the aim is not merely the establishment of general principles, but much more the moulding of existing social conditions according to some economic or social ideal. This, on the whole, is the view of political economy in Germany, and the German school of economists is preponderatingly historical in character.

History of Political Economy.—The science of political economy is a branch of the study of man. Man is a creature with many needs, which he seeks

to satisfy by applying his labour to the nature by which he is surrounded. These needs are not a fixed quantity, but grow and change with the development of society; and man's devices for their satisfaction receive a corresponding development. In the growth of these needs and of the devices to satisfy them we can trace the economic development of the human race. Political economy may be regarded as the systematic and comprehensive study of the phenomena connected therewith. There have been economic facts therefore ever since the origin of man, although there was no real science of political economy till it was constructed by Adam Smith and his forerunners in France in the 18th century. Science generally is the systematic study of facts which existed before the study began. Yet, while political economy did not exist as an independent and comprehensive branch of human knowledge before the 18th century, much attention had been given to particular economic facts. Various economic problems had received great and serious attention.

The history of political economy naturally falls into four divisions—the *ancient*, the *medieval*, the *mercantilist*, and the *modern*. We shall treat them briefly in their order.

(1) *The Ancient Period*.—As in other sciences, the first notable efforts in economic reflection were made by the ancient Greeks. The leading Greek thinkers who handled economic questions were Plato, who in the economic as in other spheres represented the idealism of the ancient world; Aristotle, the exponent of scientific realism; and Xenophon, who expounded the plain common sense of his time and country. Of the problems which they treated with the insight peculiar to their race we may mention the following: the economic aspects of the origin of society; the division of labour; the function of money; economics of slavery, which they considered a natural thing; property and the related question of communism; the dependence of political change and of revolution on economic causes; the population question. On these and other subjects the teaching of the great Greek writers is most valuable; nor is its value lessened by the fact that their discussion of economic facts forms only a part of the science of politics. And, while the conditions of the modern world differ so vastly from the Greek world, the economic views of thinkers like Plato and Aristotle will always have an interest for us, inasmuch as the solid groundwork of human nature continues substantially the same through the changing conditions of history.

Roman economics had no special interest or originality. The main contribution of the Romans in connection with political economy was to give legal form to the prevalent ideas of property.

(2) *The Medieval Period*.—During this period there was little discussion on economic problems that could now be called scientific. The most interesting feature of the economic views that then existed was the influence exerted on them by Christian teaching. This influence was most profound and greatly affected also the economic thinking of subsequent times. The influence of Christianity was especially manifest in relation to the weak and oppressed classes. It tended to soften and then to abolish slavery and serfdom; it raised the position of women and gave a new refinement to family life; the care of the poor became a first duty of men and of human institutions. The ideas and institutions of property prevalent in the Roman world, which were often harsh, severe, and cruel, were corrected by the spiritual ethics of Christianity. To the struggling and half barbarous feudal world it taught a nobler life and a higher conception of duty in the economic as in other spheres.

It inculcated righteousness and charity, forbade usury and luxury, exalted poverty and resignation. In their opposition to the rigorous ideas of property some of the Fathers even advocated communism. The mediæval period was a time of confused struggle, in which Christian ethics were often opposed not only to the tough and warlike egoism of the feudal races, but to the harsh economic ideas that were incorporated in the Roman law.

(3) *The Mercantilist Period*.—Feudal communities were superseded by centralised monarchies; and this great political change was an organic one, being attended by important changes in other spheres. The church lost much of its power. The feudal nobles were transformed into courtiers. The feudal militia gave place to professional armies in the pay and in the immediate service of the monarch. For the maintenance of the army and of the court and other dependents of the centralising ruler it was necessary first of all to have a sufficient revenue. And, as the old revenue in kind was neither convenient nor effective, it was found particularly desirable to have a revenue in money. Accordingly it was one of the greatest and most pressing functions of the statesmanship of that time to foster and to secure an ample revenue in money. The rise of the Colonial System (q.v.) consequent on the discovery of America and of the sea-route to India, the great expansion of commerce thence resulting, the growth of manufactures, the development of the banking system, all these were regarded as elements in the strength of the centralised state, and were made subservient to its policy. Under these circumstances it was natural that special attention should be paid to the balance of trade; that trade should be so regulated by statesmen as to secure for their own country a good balance of the precious metals. Thus it became a special note of economic theory to place an exaggerated value on the precious metals. The Mercantile System (q.v.) was an expression of this exaggeration in the sphere of political economy. Economists differ as to the precise meaning and application of the phrase, and indeed it had no very precise meaning or application. The meaning of the phrase will naturally vary according as we confine the application of it to the exaggeration to which it specifically relates or extend it to the whole system of which the exaggeration was a conspicuous feature. But there can be no doubt that the system grew out of the needs and circumstances of the time. Its chief expounders were Bodin and Montchrétien de Vatteville in France, Antonio Serra in Italy, and Thomas Mun in England. In practical statesmanship it is associated chiefly with the great names of Cromwell and Colbert.

(4) *The Modern Period*.—I. *Adam Smith*.—Even during the prevalence of the mercantile system a new way of thinking on economics had arisen in England and France. Its keynote was freedom, and it too was an organic part of the social and political evolution of the time. The expounder of the new system was Adam Smith, but he was only the chief representative and culminating point of a movement which had been growing for more than a century. In England men like Locke, Joshua Child, William Petty, and Dudley North had been struggling more or less successfully towards a similar point of view. In France the school of Physiocrats, headed by Quesnay, had taught many of the new ideas; in particular they had been set forth with perfect lucidity and conciseness by Turgot in his *Réflexions sur la Formation et la Distribution des Richesses* (1766). In fact, Turgot's little book might be regarded as the first scientific exposition of political economy. Adam Smith's achievement was to give the fittest form to ideas

which were becoming current among the most progressive minds of his time. If Turgot's work may be regarded as the first brief statement of political economy, Smith's *Wealth of Nations* (1776) was the first thorough and comprehensive exposition of the subject by a man who had ample leisure and capacity, a remarkable knowledge of history, and an adequate philosophic training.

The teaching of Adam Smith was by himself well defined as a system of natural liberty. In view of the ill-judged or antiquated regulations of the past he advocated liberty; and to all that was artificial in such regulation he opposed a natural order, thus following the school of Rousseau in the return to nature from a perverted civilisation. Indeed, both in his assertion of freedom and in the appeal to nature, Smith was only applying to political economy principles that were dominant in other spheres of thought. Smith also followed the example of his predecessors, and showed himself in harmony with the new era, in regarding labour as the source of wealth. With regard to other economic questions relating to capital, rent, interest, &c., Smith has said much which, though it has not always gained the assent of subsequent economists, has at least had the merit of starting important discussion. Smith's pre-eminence as an economist lies in the fact that he summed up and presented in lucid perspective the best economic thought of the times preceding, while his writings were the starting-point of all further development.

The Modern Period—II. Malthus and Ricardo.

—The contributions of Malthus and Ricardo to political economy are largely the result of a change in social conditions after Adam Smith wrote, and are best understood in connection therewith. An increasing population, an insufficient food-supply, and an unwisely administered poor law led Malthus to inquire into the nature and causes of poverty as Adam Smith into those of wealth. In his *Essay on Population* (1798) he propounded the theory that population tended to press on the means of subsistence unless held in check by vice, misery, or the fear of both. He also discovered what is usually called the Ricardian theory of agricultural rent, that rent is the effect and not the cause of price, and is a surplus due to differences in the fertility of land. This theory had been stated by James Anderson in 1775, but in conjunction with Malthus's population theory it now assumed a new significance. Ricardo first came into prominence with the publication of his *Letters on the High Price of Bullion* (1809), which showed him to have an unrivalled grasp on problems of currency; but he owes his great influence on economic thought to his *Principles of Political Economy and Taxation* (1817). Ricardo had studied the *Wealth of Nations*, and from it he had abstracted certain fundamental ideas. Using these as a basis, he reared up a structure of economic theory which seemed to have a universal and absolute application. His fundamental assumptions are: pure self-interest as a motive of conduct, and perfect mobility of labour and capital. He developed the theory of rent, and made it with a new theory of value the centre of a theory of distribution of wealth between the three parties concerned, the labourers, the employers, and the landlords. The value of manufactured articles, he maintained, is determined mainly by the quantity of labour necessary to their production, and of agricultural products by the quantity of labour necessary to the cultivation of the worst land actually cultivated. As the margin of cultivation extended to inferior lands, rents rose, profits diminished, while the real wages of labour remained stationary, being determined by the necessities of subsistence. Ricardo himself recognised qualifications of this theory, but they are insufficient and

they are not explicitly stated, and by his ardent followers they were generally omitted altogether. Ricardo is thus popularly credited with a 'labour theory of value' and an 'iron law of wages' which he had no desire to maintain. The other writers of this period, McCulloch and James Mill, followed Ricardo closely, and, although Senior followed him with reservations, the importance of these reservations was not generally recognised until a later period. In this period French and German writers began to acquire greater influence, and it was from them that the attack on the Ricardian economics in the next period subsequently came. That attack was two-fold. The 'scientific socialists,' Rodbertus and Marx, accepted the conclusions but attacked the competitive system which made them possible. The 'historical economists,' Roscher, Hildebrand, and Knies, denied the conclusions, and attacked the assumptions on which they were based as essentially unreal and devoid of historic accuracy and truth.

The Modern Period—III. John Stuart Mill.

—Mill is in one sense the last of the Ricardian economists. In his *Principles of Political Economy* (1848) he attempted to combine abstract economic theory with the modifications necessary for its application to actual conditions. He thus summarises the best results of his predecessors and reflects the trend of the newer streams of thought. Influenced by the French philosopher Comte, he recognises that economic generalisations are relative to particular conditions, and that these conditions may be capable of modification and progressive change. His trend of thought is thus in sympathy both with the 'historical economists' (represented originally by Cliffe Leslie and Thorold Rogers in England) and with the 'scientific socialists.' Mill represents in a striking way the three schools into which economic thought has come to be divided—the theoretic, the historical, and the socialistic.

The Modern Period—IV. William Stanley Jevons.

—The most original contribution to economic theory after Ricardo is that of Jevons. Jevons maintained that the older economists had paid too much attention to *production* to the neglect of the all-important subject of *consumption*. He attacked the Ricardian 'cost of production' theory of value and emphasised the influence of *demand*, a view arrived at independently but substantially in accordance with that of the Austrian school. With the aid of mathematical terminology he showed there was an important distinction between the total utility derived from all portions of a commodity consumed and the final (marginal) utility derived from the last portion, and that its recognition was necessary to the elucidation of economic truths. Jevons's marginal method has effected a transformation in certain parts of economic theory, and has led in one direction to a mathematical school (Edgeworth and Wicksteed). The method frequently merely stresses ideas which the school of Ricardo had omitted to emphasise, but it has also given greater precision and completeness to the old ideas. Since the publication of Jevons's *Theory of Political Economy* in 1871, the development of theory in England (Sidgwick and Marshall) may be said to have taken the form of a re-statement of the old theories in the light afforded by his theory of value. In particular it has led to the discarding of the old 'Wages Fund' theory and the development of a new theory of wages and profits (Walker, *The Wages Question*, 1876).

The present tendency in political economy, as in other sciences, is towards a greater specialisation and a more detailed study of special subjects. Since the publication of Bagehot's *Lombard Street* (1873) there has been a steady development in monetary and financial theory, to which the

problems of the Great War have given a renewed impetus. The great growth of labour organisation and social legislation has led to an extensive study of industrial problems, which has in turn considerably modified the attitude of economic theory on the question of state action. The method of economic study has become more realistic and statistical, and there is an increasing study of economic history. The essentially theoretic character of English political economy, however, remains. The historical school is represented by historians rather than by economists. Scientific socialism has never taken root in England as a school or among professed economists, partly no doubt owing to Jevons's criticism of the labour theory of value. Socialism of the utopian and ethical type has many adherents and exponents, who can be distinguished more readily by their aims than by their adherence to any particular doctrine or theory.

The political economy of Adam Smith had great influence in other countries, where also the modern period is directly attributable to his work.

The *French School*, with the exception of the period 1803-1848, when the socialistic theories of Saint-Simon, Fourier, Proudhon, and Louis Blanc held sway, has remained faithful to the principles of freedom laid down by Adam Smith, and to the English deductive classical tradition. J. B. Say, Dunoyer, Bastiat, Leroy-Beaulieu, Guyot, Colson, and Gide represent a succession of classical economists in whom the idea of freedom has a physiocrat element. The historical school has gained slight foothold in France. In 1864 Le Play advocated more historical methods but adhered to the principle of freedom, and his followers are economic historians rather than historical economists in the German sense. The brilliant example of Cournot, who in 1838 was the first to introduce mathematical methods to elucidate economic theory, has not been followed in his own country.

The *German School* shows a greater diversity of thought, and has three main divisions, which, however, overlap to some extent. (1) A relatively small group of theoretical economists, who have followed Rau, Von Thünen, and Hermann, the original exponents of Adam Smith, and which includes also mathematical economists influenced by the Austrian school. (2) The historical school, which represents a reaction against the principle of freedom, and against the deductive method, of which it is the basic assumption. This school aims at studying economic phenomena in its historical setting and avoids abstract theory. It is the school most distinctive of Germany, and includes a large and comprehensive group of economists, some of whom use deductive methods freely, Roscher and Schäffle, while others would avoid them altogether, Schmoller and Brentano. (3) The socialist school, which includes 'Socialists of the Chair,' Wagner and Schmoller; scientific socialists, followers of Marx, Lassalle, Engels, Kautsky; and Christian socialists, Döllinger, Todt, &c.

The *Austrian School* was founded by Carl Menger in 1871 by the publication of his *Principles of Economics*. Menger's theories represent a reaction against the German historical school, and are essentially similar to those of Jevons, but are arrived at from the psychological standpoint. Value is regarded as the centre of all economic problems and final utility as the key to value. Less mathematical in method than Jevons, his theory was more easily understood, and had great influence in Italy and America, and later also in Germany, although at first it was there bitterly opposed. Leading members of the school who have further developed Menger's theory are Wieser and Böhm-Bawerk.

The development of political economy in America cannot yet be said to have attained to the dignity of a school represented by any distinctive theory or method. Since 1880 there has been a great development of inductive study and research into American conditions, which is constituting an increasing contribution to the general development of the science.

See J. N. Keynes, *Scope and Method of Political Economy*; Adam Smith, *Wealth of Nations*; J. S. Mill, *Principles of Political Economy*; Cairnes, *Some Leading Principles of Political Economy newly expounded*; Jevons, *Theory of Political Economy*; Sidgwick, *Principles of Political Economy*; Marshall, *Principles of Economics*; J. S. Nicholson, *Principles of Political Economy*, 3 vols.; E. Cannan, *History of the Theories of Production and Distribution*; A. C. Pigou, *Wealth and Welfare*, F. W. Taussig, *Principles of Economics*; F. Y. Edgeworth, *Mathematical Psychics*, also *Collected Economic Papers*; Roscher, *Grundlagen der Nationalökonomie* (Eng. trans.); Adolf Wagner, *Grundlegung*; Schäffle, *Baru und Leben des Sozialen Körpers*; Schönberg's *Handbuch der Nationalökonomie*, which is really an encyclopedia of the subject. Menger's *Grundsätze der Volkswirtschaftslehre*. Manuals and smaller works: Marshall, *Economics of Industry*; F. A. Walker, *Political Economy*; J. S. Nicholson, *Elements of Political Economy*; C. Gide, *Principles of Political Economy* (trans.). Histories of political economy: Roscher, *Geschichte der Nationalökonomie in Deutschland*; L. Cossa, *Guide to the Study of Political Economy*; J. K. Ingram, *History of Political Economy*; L. L. Price, *A Short History of Political Economy*; *Dictionary of Political Economy*, edited by R. H. Inglis Palgrave. See also the articles BANKING, BOUNTY, CAPITAL, COMMUNISM, CONSUMPTION, CO-OPERATION, CORN LAWS, DIVISION OF LABOUR, EXCHANGE, FREE TRADE, LABOUR, LAND LAWS, MONEY, MONOPOLY, PROTECTION, RENT, SOCIALISM, TAX, TRADE-UNIONS, and WAGES; and the articles on the more important economic thinkers—Smith, Malthus, Ricardo, Mill, Carey, Lassalle, Marx, &c.

Political Offences are usually exempted from treaties of Extradition (q.v.), by which a government agrees to arrest and surrender persons who have broken the law of a foreign state. A political offence may be defined as an offence committed in carrying on civil war or open insurrection. In November 1890 the English judges had to decide whether the Swiss government could demand the extradition of one Castioni, who was proved to have shot a member of the ministry during a revolution excited by the Liberals in the canton of Ticino. There was some evidence that the prisoner was moved by private malice; but the judges held that his act was *prima facie* political, and gave him the benefit of the exception in the treaty. The Conspiracy Bill of 1858, introduced after Orsini's attempt on the life of Napoleon III., proposed to make conspiracy to murder a felony instead of a misdemeanour. It was intended to secure the French emperor against plotters in England, and caused the fall of Palmerston's government, as being contrary to English traditions. As between a government and its subjects political offences have often been treated with extreme severity, as may be seen on referring to the Roman law relating to *perduellio* and *lesa majestas*. In France and Scotland the law of treason was framed on the model of those laws which had been made to protect the person and government of the Roman emperor and the interests of the Roman state; the old English law of treason was also extremely severe. In modern times the tendency is to treat offences against the state according to the ordinary principles of criminal law. There are, however, two kinds of crime which raise political questions of some interest. (1) Crimes committed in the territory of one state against the government of another. The Foreign Enlistment Acts were passed to enable the British government to deal with persons who levy troops

and prepare armaments against a foreign government within British territory. Some writers of authority have censured the American government for permitting Fenians within its jurisdiction to levy war against the British empire. (2) Crimes committed by persons who honestly think they have a grievance against the government of their own country. In such cases the political motive is not, in law, regarded as an excuse; if e.g. a member of parliament incites to a breach of the law, magistrates and prison authorities must deal with him as with any other offender. A humane government will often extend special indulgence to political offences.

Politics (Gr. *polis*, 'city' or 'state'), that branch of ethics which has for its subject the proper mode of governing a state, so as to secure its prosperity, peace, and safety, and to attain, as perfectly as possible, the ends of civil society. Among the subjects which political science embraces are the principles on which government is founded, the hands in which the supreme power may be most advantageously placed, the duties and obligation of the governing and governed portions of society, the development and increase of the resources of the state, the protection of the rights and liberties of the citizens, the preservation of their morals, and the defence of the independence of the state against foreign control or conquest. While the philosophy of governing constitutes the *science* of politics, the *art* of politics consists in the application of that science to the individual circumstances of particular states. The ancient Greek writers treated politics with reference to an ideal perfect state, which each propounded according to his own speculative views, pointing out the variation of every existing government from his standard. The 'politics of a country' implies the course of its government, more especially in its relations with foreign powers.

In the articles on the several countries a sketch of the constitution is in most cases given. See also AMBASSADOR, ANARCHISM, ANTHROPOLOGY, ARISTOCRACY, BALANCE OF POWER, CABINET, CONGRESS, DEMOCRACY, ENGLAND (HISTORY OF), FAMILY, FEUDALISM, GOVERNMENT, INTERNATIONAL LAW, NIILISM, PARLIAMENT, REPUBLIC, REPRESENTATION, SOCIALISM, WHIG, TORY, &c.; and the articles on the expounders of famous political theories—Plato, Aristotle, More, Machiavelli, Bentham, Lassalle, Marx, &c.

Poliziano. See POLITIAN.

Polk, JAMES KNOX, eleventh president of the United States, was born in Mecklenburg county, North Carolina, November 2, 1795. His ancestors, who bore the name of Pollock, emigrated from the north of Ireland; his father was a farmer in moderate circumstances. Polk was educated in the University of North Carolina, and studied law with Felix Grundy of Tennessee, an eminent lawyer and statesman. Admitted to the bar in 1820, he was three years after elected a member of the legislature of Tennessee, and in 1825 returned to congress by the Democratic party. In 1835 he was chosen speaker of the House of Representatives, a position he filled during five sessions with firmness and ability. After serving fourteen years in congress, he was in 1839 elected governor of Tennessee; but he failed to secure re-election in 1841 and 1843. In 1844 he was nominated as a compromise candidate for the presidency, against Henry Clay, and elected by a popular majority of only 38,000, but by 175 electoral votes to 105. His cabinet included James Buchanan as secretary of state and Bancroft, the historian, as secretary of the navy. Polk's firm attitude with regard to the annexation of Texas had mainly secured his election, and he carried out the policy to which he was committed with promptness and vigour. In his

first message to congress, in December 1845, he announced that the western bank of the Nueces River, beyond which Texas had not exercised jurisdiction, was already occupied by American troops. On 28th December Texas was admitted to the Union; on the 31st jurisdiction was extended to the disputed territory beyond the Nueces. These proceedings failing to goad the Mexicans into a declaration of war, the president forced on hostilities by advancing the American army, at the suggestion of General Taylor, to the Rio Grande. Palo Alto and Resaca followed, and the Mexican war was successfully started; the capital was taken in September, and its fall enabled the conquerors to dictate terms of peace, by which the United States acquired California and New Mexico. During Polk's term the Oregon boundary was settled by a compromise (49°) offered by England, though the party cry ('Fifty-four-forty or fight') which helped to elect him was a claim for the entire territory to 54° 40' N. lat. In 1846 a revenue tariff, in which *ad valorem* were substituted for specific and minimum duties, was adopted—in the senate, however, only by the casting vote of Vice-president Dallas. Polk consistently condemned the anti-slavery agitation; he did not believe in the possibility of a United States all slave or all free, and considered the *modus vivendi* between North and South quite satisfactory. Having pledged himself to a single term of office, he refused renomination, and retired to his home in Nashville, Tennessee, where he died 15th June 1849. Polk was devoted to the principles of the Democratic party of Jefferson and Jackson—state rights, a revenue tariff, independent treasury, and strict construction of the constitution—and taught an even intenser form of the Monroe doctrine.

See Life by Jenkins (1850); a History of his administration, by Chase (1850); and Whitelaw Reid on the Monroe doctrine and Polk's doctrine (1906).

Polk, LEONIDAS, the Antony Bek of the Confederacy, was born at Raleigh, North Carolina, 10th April 1806. He was a cousin of President Polk, and grandson of Colonel Thomas Polk, an officer of the Revolution. Graduating at West Point in 1827, he received a commission in the artillery, but was induced to study for the ministry, and in 1830 received deacon's and in 1831 priest's orders in the Episcopal Church. In 1838 he was consecrated Bishop of Arkansas and Indian Territory, with charge of the dioceses of Alabama, Mississippi, and Louisiana; in 1841 he resigned all these except the bishopric of Louisiana, which he retained—even when at the head of an army corps—until his death. Soon after the outbreak of the civil war he was offered a major-generalship by Jefferson Davis, and, accepting it, proceeded to strongly fortify strategic points on the Mississippi. At Belmont, in November 1861, he was driven from his camp by Grant, but returned and eventually compelled him to retire. At Shiloh and at Corinth he commanded the 1st corps; in October 1862 he was promoted to lieutenant-general, and in November he conducted the retreat from Kentucky. After Chickamauga, where he commanded the right wing, he was relieved of his command; but in December 1863 he was appointed to the department of Alabama, Mississippi, and Eastern Louisiana, and he afterwards joined Johnston in opposing Sherman's march to Atlanta. He was killed while reconnoitring on Pine Mountain, 14th June 1864, by a cannon-shot fired by some Northern officers who wished to give the bishop's party a fright. See the *Life* by W. M. Polk (1894).

Polka, a species of dance, of Bohemian origin, invented in 1830, and introduced into England in 1843, the music to which is in $\frac{3}{4}$ time, and has the

rhythmical peculiarity of being accented on the third quaver of the measure.

Pollack (*Gadus pollachius*), a common fish on British coasts, belonging to the cod, haddock, and whiting genus. It is about the size of the coal-fish, is active in habit, and is frequently caught. The lower jaw projects beyond the upper, and there is no barbel. In Scotland and in some parts of England and Ireland it is called *Lythe*.

Pollaiuolo, ANTONIO, goldsmith, medallist, metal-caster, and painter, was born at Florence in 1429, and died at Rome in 1498, whither he had been summoned to cast a sepulchral monument for Pope Sixtus IV., and where he also cast a similar one for Pope Innocent VIII. (died 1492), both in St Peter's, and both works of great merit. Antonio's pictures—the best being 'Hercules slaying the Hydra,' 'Hercules destroying Antæus,' and 'St Sebastian'—are distinguished for the life and vigour of their drawing.—His brother PIETRO, who was born at Florence in 1443, and died at Rome in 1496, was generally associated with him in his work, though he devoted most attention to painting. To him are attributed an altarpiece introducing SS. James, Vincent, and Eustace (if indeed it is not mainly by the other brother), an Annunciation, a Coronation of the Virgin, and the Five Virtues.

Pollan (*Coregonus pollan*), a species of 'white-fish' peculiar to Lough Neagh in Ireland, where it feeds largely on an interesting crustacean called *Mysis relicta*, the relatives of which are marine. It is netted in considerable numbers and is well flavoured. Another pollan (*C. altior*) is found in Lough Erne, and another (*C. elegans*) in the lakes of the Shannon system. See C. Tate Regan, *British Freshwater Fishes* (London, 1911); also COREGONUS, POWAN, VENDACE.

Pollanarua, a ruined city of Ceylon, 60 miles E.N.E. of Kandy, with a massive dagoba, a rock-cut temple, masses of sculptured stones, and a wide area of ruined buildings that attest the size and importance of the city, which became the capital of the kingdom about 770, after the Malabar invasion ruined Anuradhapura, the former capital. The city stood on the site of an immense tank, still called Topaweva or Topara. The place was first made known to Europeans in 1820.

Pollarding (to *poll*, to cut off, or shave the head) is the cutting off of the whole crown of a tree, leaving it to send out new branches from the top of the stem. Trees thus treated are called *pollards*. The new branches are never equal in magnitude to the original branches of the tree, although often more numerous, and when pollarding is often repeated the scars and stumps form a thick ring at the top of the stem, from which many small branches spring. Pollards are not beautiful; but pollarding is practised with advantage in districts where fuel is scarce, the branches being cut off in order to be used for fuel, and the operation repeated every third or fourth year. Willows, poplars, alders, elms, oaks, and limes are the trees most frequently pollarded, and in some parts of Europe the white mulberry. The trees of most rapid growth are preferred where fuel is the object; and willows, poplars, and alders are planted along water-courses, and in rows in moist meadows and bogs. Oaks are sometimes pollarded, chiefly for the sake of the bark of their branches, and the whole treatment very much resembles that of copse-wood. See CORSE.

Pollen. See FLOWER, STAMEN.

Pollio, GAIUS ASINIUS, an orator, poet, historian, and soldier, was born in Rome, 76 B.C. He sided with Cæsar in the civil war, fought at Pharsalia, and commanded in Spain against Sextus

Pompeius, but was defeated. He sided with the triumvirs against the oligarchic senate, and was appointed by Antony to settle the veterans on the lands assigned them in Transpadane Gaul. It was now that he saved the property of the poet Virgil at Mantua from confiscation. After Antony and Octavian had quarrelled, it was Pollio who effected their temporary reconciliation at Brundisium (40). This year he was consul, when Virgil's fourth eclogue was addressed to him. The year after, he went to Greece as legate of Antony, and defeated the Parthini, a people of Illyria. This was the period of Virgil's eighth eclogue, also addressed to Pollio. Thereafter he withdrew altogether from political life, and survived till 4 A.D. Pollio was the first to establish a public library at Rome, and was the patron of Virgil, Horace, and other poets. His own orations and tragedies and history have perished, and it is most probably no great loss. The severest critics are seldom themselves even decent writers, and he, we are told, detected *Patavinitas* in the limp style of Livy, and censured Cicero, Sallust, and Cæsar.

Pollock, an illustrious family descended from David Pollock, saddler to George III. in the later part of the 18th century, who kept a shop near Charing Cross. Three of his sons rose to eminence—Sir David Pollock (1780–1847), Chief-justice of Bombay; Sir Frederick Pollock; and Field-marshal Sir George Pollock.—The second, FREDERICK, was born 23d September 1783, and in 1802 passed from St Paul's School to Trinity College, Cambridge, where in 1806 he graduated B.A. as senior wrangler and first Smith's prizeman. Next year he was elected a fellow of his college, and called to the bar at the Middle Temple. He travelled the northern circuit; in 1827 became a K.C.; in 1831 was returned as a Tory for Huntingdon; was Attorney-general 1834–35 and 1841–44; and in the last year succeeded Lord Abinger as Chief Baron of the Exchequer. He had been knighted in 1834, and on his retirement in 1866 he received a baronetcy. He died 23d August 1870.—His eldest son, SIR FREDERICK POLLOCK, born 3d April 1815, was educated at Trinity College, Cambridge (1832–36), and in 1838 was called to the bar at the Inner Temple. He was appointed a master of the Court of Exchequer (1846), and Queen's Remembrancer (1874); in 1876 became senior master of the Supreme Court of Judicature; in 1886 resigned his offices; and died 24th December 1888. He published a blank verse translation of Dante (1854), and two pleasant volumes of *Personal Remembrances* (1887).—His eldest son, SIR FREDERICK POLLOCK, P.C. (1911), third baronet, was born 10th December 1845, and from Eton passed to Trinity, where in 1868 he obtained a fellowship. He was called to the bar at Lincoln's Inn in 1871, and became professor of Jurisprudence at University College, London (1882), Corpus professor of Jurisprudence at Oxford (1883–1903), and professor of Common Law (1884). Besides *Spinoza* (1880), he has published books on *Contract* (1875), *Partnership* (1877), *Torts* (1887), *Oxford Lectures* (1891); with Maitland, *The History of English Law before Edward I.* (2 vols. 1895), and with Mrs Fuller Maitland *The Etchingham Letters* (1899).—His younger brother, WALTER HERRIES POLLOCK, born in 1850, and likewise educated at Eton and Trinity, was called to the bar at the Inner Temple in 1874, and from 1884 till 1894 was editor of the *Saturday Review*. He was author of *Lectures on French Poets*, *The Picture's Secret*, *Verses of Two Tongues*, *A Nine Men's Morrice*, *Old and New*, &c. He died on his 76th birthday, 21st February 1926.—GEORGE FREDERICK POLLOCK (1821–1915), third son of the first baronet, became a master of the Supreme Court of Judica-

ture; and the fourth son, SIR CHARLES EDWARD (1823-97), became a baron of Exchequer and judge of the High Court.

SIR GEORGE POLLOCK, field-marshal, was born in Westminster on 4th June 1780, and entered the army of the East India Company as lieutenant of artillery in 1803. Almost immediately after his arrival in India he was engaged in active warfare in the battle and siege of Deig in Bhartpur (1804), at the siege of Bhartpur (1805), and in other operations in the war against Holkar. Nine years later he saw some service in the Nepal (Gurkha) campaigns of 1814-16; and in the first Burmese war (1824-26) he took an active share, winning his colonelcy. In 1838 he reached the rank of major-general. After the massacre of General Elphinstone and his forces in the passes of Afghanistan (q.v.), the Indian government decided to send a force to the relief of Sir Robert Sale, who was shut up in Jelalabad. The command of the relieving force was given to General Pollock. In April 1842 (5th to 16th) he forced the formidable Khaibar Pass, and reached Sir Robert Sale; then, after a few months' delay, he pushed on to Kabul, his object being to restore the prestige of British arms and to rescue the British prisoners in the hands of Akbar Khan. Both purposes were crowned with success; he defeated the Afghan chief at Tezin, and destroyed the bazaar in Kabul, and he recovered 135 British prisoners. Then, joined by Nott, who had marched from Kandahar, he successfully conducted the united armies back to India. He was rewarded with a political appointment at Lucknow, returned to England in 1846, was a director of the East India Company (1854-56), was created a field-marshal in 1870, a baronet in 1872; in 1871 he was appointed Constable of the Tower. He died on 6th October 1872. See *Life* by C. R. Low (1873).

Pollok, ROBERT, a minor Scottish poet, was born in 1799 at Muirhouse, in the parish of Eaglesham, Renfrewshire. He studied at the university of Glasgow and the Divinity Hall of the Secession Church, and was licensed to preach in 1827. In the same year he published, by the advice of Professor Wilson, *The Course of Time*, in ten books, an attempt at a poetical description of the spiritual life and destiny of man. It was warmly received, but its praises fell on a dying ear, for the poet had meantime been seized with consumption. He set out with his sister for Italy, but unable to leave England, he died at Shirley Common, near Southampton, 18th September 1827. *The Course of Time* is curiously unequal in merit as we might expect when we remember that its two sources of inspiration were Milton and the *Shorter Catechism*. It contains eloquent passages, but portions of it read like a dull sermon in poor blank verse. Pollok published *Tales of the Covenanters* anonymously before his poem. See the memoir by his brother (1843); Rosaline Masson, *Pollok and Aytoun* ('Famous Scots,' 1899).

Pollokshaws, in Renfrewshire, was incorporated with Glasgow in 1912. It derives its name from the 'shaws' or woods of the estate of Pollok, held for more than six centuries by the Maxwells.

Poll-tax, or **CAPITATION TAX**, a tax levied by the *poll* or head (*per capita*). In England, the first poll-tax was levied in 1377 at 4d. a head. Two further poll-taxes, graduated according to rank and wealth were levied in 1379 and 1380, and the collection of the latter was the immediate cause of the Peasant Revolt of 1381. Later, this form of tax was sometimes used to obtain revenue from aliens who escaped the ordinary dues, but a general poll-tax in 1513 took wages as one of the measures of capability. Graduated poll-taxes

were imposed during the reign of Charles II., and also after the Revolution for the war with France, but not after 1698. They were always extremely unpopular, and, owing to the difficulties of assessment and collection, never produced anything like the amount reasonably expected. In the United States most states impose a poll-tax or capitation tax as a condition of the suffrage, the sum varying. A considerable number have no such tax; in others the imposition of a poll-tax is expressly prohibited by the constitution.

Pollux. See CASTOR AND POLLUX.

Polo, an equestrian game, which may be shortly described as hockey on horseback. It is of oriental origin and of high antiquity; indeed, it has been claimed that it can be traced back to 600 B.C. The accompanying illustration is from a beautifully illuminated Persian MS. of the poems of Hâfiz, executed in the year 956 of the Hegira or 1549 of the Christian era, and now in the Bodleian Library, Oxford, by the permission of whose



authorities it has been specially photographed to illustrate this article. It bears the following legend: 'Welcome to the *meidan*, thou chief of horsemen: strike the ball.' Polo was first played by Europeans in 1863 in Calcutta, whither it had been brought by officers who had been stationed in Cachar in Assam, where polo has been played since time immemorial by the hill-tribe of Manipuris. Almost the same game exists in Tibet; whilst native equestrian games more or less closely resembling polo are played in Japan and other parts of the East. Since 1871 many polo clubs have been started in Britain and, since 1876, in America, as well as wherever Britons are found in the East. The principal British club, which makes the rules of the game, is at Hurlingham, near London. The following is a short description of polo: An oblong space of turf is marked out, of which the proper size is 300 yards by 200 yards; at each end in the centre of the line two poles are fixed 22 feet apart, forming the goals through which it is the object of the opposing sides to strike the ball. The players are mounted on ponies, the size of which, according to rule, should not exceed 14 hands; and each player is armed with a polo-stick, consisting of a strong cane about 4 feet long with a cross head about 8 inches long, with which to strike the ball of

light wood. The proper number of players is four a side, each of whom has a definite place (numbered one, two, three, and back) in relation to friends and opponents; and in polo, as in most games, combination is perhaps the first condition of success. The ponies have to be carefully trained, and some acquire wonderful cleverness in understanding what is required of them. It is part of the game so to ride alongside an opponent as to prevent him from hitting the ball, but it is not allowed to ride across in front of an opponent. To become a good player requires strength, good horsemanship, a quick eye, and much practice.

See Younghusband's *Polo in India* (1890); the chapter on 'Polo' by J. Moray Brown in *Radany* (1891); and books by Miller (1902) and Dale (1905).

POLO, MARCO, the greatest of mediæval travellers, was born of a noble family of Dalmatian origin, at Venice, in 1254. His father, Nicolo Polo, and his uncle, Maffeo Polo, both enterprising merchants, had, previous to his birth, set out on a mercantile expedition, visiting Constantinople, the Crimea, and the court of Barka Khan at Sarai. Thence they travelled round the north side of the Caspian Sea to Bokhara, and here they fell in with some envoys returning from Hulagu in Persia to his brother the Great Khan Kublai, and by them were persuaded to accompany them to Cathay. They were well received by Kublai, then either at Cambaluc (Peking) or his summer residence at Shangtu (Coleridge's *Xanadu*), north of the Great Wall. He listened eagerly to their reports concerning the peoples and mode of government in Europe, and commissioned them as envoys to the pope, bearing letters requesting him to send 100 Europeans learned in the sciences and arts, to act as instructors to the Mongols. They reached Venice in 1269, found Rome in the confusion of a long interregnum, and, after the new pope (Gregory X.) was elected, could only get two Dominicans, and even these had hardly commenced the journey when they lost heart and turned back. The Polos made their final start in the November of 1271, taking with them young Marco, and arrived again at the court of Kublai Khan in the spring of 1275, after travelling by Sivas, Mosul, Bagdad, Hormuz, through Khorasan, up the Oxus to the Pamir, by Kashgar, Yarkand, and Khotan, Lob Nor, and across the great desert of Gobi to Tangut, thence to Shangtu. Their second reception was still more honourable than the first, and the khan took special notice of Marco, from the rapidity with which he learned the customs and language of the Mongols. His wisdom and intelligence also recommended him as a fit envoy to the various neighbouring rulers; and during his residence at their several courts Marco observed closely the manners and customs of the country, and delivered on his return a detailed report to the khan. In various missions he visited the western provinces on the borders of Tibet, Yunnan, northern Burma (Mien), Karakorum, Champa or southern Cochin-China, and Southern India. For three years he served as governor of the town of Yang-chow, and with his uncle helped to reduce the city of Saisanfu by constructing mangonels for casting stones. The khan long refused to think of the Polos leaving his court, but at length in the beginning of 1292 they succeeded in obtaining permission to join the escort of a Mongol princess, who was travelling to marry Arghun, khan of Persia, grandson of Kublai's brother Hulagu. They sailed from Chwan-chow in Fukien (*Zaitun*), but were detained long on the coasts of Sumatra and Southern India, and only reached Persia after two years had passed. Two of the three envoys and most of their attendants had perished. Arghun Khan himself was dead, but the three Polos and the young princess were

safe, and she married the late khan's brother and successor. The Venetians finally reached their native city about the end of 1295, and Ramusio tells the story how like Ulysses they were recognised by none of their kinsfolk, and repulsed from the door. They brought with them much wealth in the portable form of precious stones, the fruits of their trading. In 1298 Marco fought his own galley in the great battle of Curzola, in which the Venetians under Dandolo were defeated by the Genoese under Doria, and was taken prisoner and immured for a year in a dungeon at Genoa. Here he dictated to another captive, one Rusticiano of Pisa, an account of his journey through the East. After his liberation he returned to Venice, where he died in 1324, and was buried in the church of S. Lorenzo. The traveller bore among his contemporaries the surname or nickname of *Marco Millions*, most probably from his having frequently used that word in his attempts to describe the wealth and splendour of the khan. The wonders he narrated seem to have excited incredulity—even long after Sir Thomas Browne commends the circumspection of the reader who 'shall carry a wary eye on *Paulus Venetus*, Jovius, Olaus Magnus, Nierembergius, and many others.'

Marco Polo's book consists of two parts: (1) a Prologue, the only part containing personal narrative; (2) a long series of chapters descriptive of notable sights, manners of different states of Asia, especially that of Kublai Khan; and ends with a dull chronicle of the internecine wars of the House of Genghis during the second half of the 13th century. Ser Marco Polo succeeds in almost entirely effacing himself, yet despite his modesty is unconsciously revealed to the eyes of his reader as a man truthful, brave, shrewd, keen-eyed, grave, of few words, fond of sport, with all the due respect of the prosperous man for wealth. He shows throughout a singular lack of humour—Sir Henry Yule cites as almost the solitary instance that in speaking of the khan's paper-money he observes that Kublai might be said to have the true Philosopher's Stone, for he made his money at pleasure out of the bark of trees. Nothing disturbs the even tenor of his narrative—not even when he has to tell of so strange a custom as the couvade among the Gold teeth on the frontier of Burma. He is no less sparing of scientific observations, and his geographical data are not infrequently the reverse of clear and adequate. He tells us that he acquired several of the languages current in the Mongol empire, and as many as four written characters, but of these Sir Henry Yule thought Chinese was not one. His work is poorer in information relating to the Chinese proper than anywhere else. Thus, he does not mention the Great Wall, nor yet customs so striking and distinctive as the use of tea, the compressed feet of the ladies, the fishing cormorant, artificial egg hatching, nor the printing of books. An absurd assertion has been made that block-printing was carried to Europe by our traveller, by him shown to one Panfilo Castaldi, from whom it was learned by John Faust of Mainz; and indeed the printers of Lombardy, misled by patriotic feelings, have stultified themselves by erecting a statue at Feltré to Castaldi, the illustrious inventor of movable printing types. Polo had learned more from men than books, yet it is evident that he had read romances, especially those dealing with the fabulous adventures of Alexander. To these he refers in his notices of the Iron Gate and of Gog and Magog, and of the Dry Tree (*Arbre Sol* or *Arbre Sec*) on the Khorasan frontier. Such stories as these, that of the Land of Darkness, of tailed men, of the great Roc, of trees yielding wine, and the like, go far to account for the grave and

matter-of-fact Messer Marco Polo's nickname of *Millioni*.

Ramusio (1485-1557) assumed that the book was first written in Latin; Marsden supposed in the Venetian dialect; Baldelli-Boni showed in his edition (Flor. 1827) that it was French. There exists an old French text, published by the Paris Société de Géographie in 1824, which M. Paulin Paris describes as the French of a foreigner. This Colonel Yule believed the nearest possible approach to Marco's own oral narrative. About eighty MSS. are in existence, showing considerable variations. These fall naturally into four groups: (1) the old French version already mentioned; (2) a revised French version, the basis of M. Panthier's edition (1865); (3) a considerably abridged Latin version by Francesco Pipino (about 1490)—not identical with, although similar to, the Latin version published by Grynæus at Basel in the *Novus Orbis* (1532), itself the parent of the 16th-century French editions; (4) a form of the text now alone represented by the Italian recension of Ramusio, published (1559) in vol. ii. of the *Navigazioni e Viaggi*. This last text has been subjected to considerable literary modifications, but undoubtedly contains many new circumstances which are substantially supplementary recollections of Marco Polo himself.

The notes of Marsden's excellent English edition (1818) were abridged by T. Wright for Bohn's 'Antiquarian Library' (1854). Another good English edition is that of Hugh Murray (1844); but all its predecessors were set aside by the admirable edition of Colonel Sir Henry Yule (1871; new ed. 1903), containing a faithful English translation from an eclectic text, an exhaustive introduction, notes, and other illustrations from the editor's wide learning and intimate knowledge of the East. French or Italian editions worthy of mention are those of the Soc. de Géog. of Paris (1824), Baldelli-Boni (1827), Lazari (1847), Bartoli (1863), and Panthier (1865). Sir Francis Palgrave's *Merchant and Friar* (1837) is of course a mere work of imagination, in which Roger Bacon and Marco Polo are brought together.

Polonaise, or POLACCA, a Polish national dance of slow movement in $\frac{3}{4}$ time.

Polonium, a radioactive element (atom. number 84). See CURIE, RADIUM.

Poltava. See PULTOWA.

Polyandry. See FAMILY, MARRIAGE.

Polyanthus (Gr., 'many-flowered'), a kind of Primula, much prized and cultivated by florists. It

supported on a common scape, instead of each flower rising on its own stalk from the crown of the root as in the primrose. Instead of the pale uniformity of the wild plants it exhibits great variety of delicate and beautiful colours. The subvarieties are innumerable, new ones being continually produced from seed, and of short duration. The seed is sown about midsummer, and flowers may be expected in abundance next year, if the young plants are properly planted out. A rich free soil is most suitable. The polyanthus loves shade and moisture more than its congener, the auricula. It is very hardy, and seldom suffers from the most severe winters. Fine kinds are preserved for a time by dividing the root. The cultivation of the polyanthus is prosecuted with particular assiduity and success in England. For the Polyanthus Narcissus, see NARCISSUS.

Polybius, the Greek historian, was born about 204 B.C. at Megalopolis in Arcadia. From his father Lycortas, one of the leading men of the Achæan League, he received valuable instruction in the science of politics and in the art of war. He was one of the 1000 noble Achæans who, after the conquest of Macedonia in 168, were sent to Rome on the ground that the Achæans had failed to assist the Romans against Perseus. Without any trial the Greeks were detained in an honourable captivity. Polybius was the guest of Æmilius Paulus himself, and became the close friend of his son, Scipio Æmilianus, accompanying him in his military expeditions. Polybius in his turn derived much advantage from the protection and friendship of Scipio, who gave him access to public documents, and aided him in the collection of materials for his great historical work. In 151, after sixteen years in Italy, the surviving Achæan exiles were permitted by the Roman senate to return to Greece; Polybius, however, soon rejoined Scipio, followed him in his African campaign, and was present at the destruction of Carthage in 146. But the outbreak of war between the Achæans and Romans summoned him again to Greece, where he arrived soon after the taking of Corinth. All his influence was now exerted to procure from the conquerors favourable terms for the vanquished; and so grateful were his countrymen for his services in their behalf that they erected statues in his honour at Megalopolis and elsewhere. It must have been about this time that Polybius undertook the writing of his great historical work, the materials of which he had so long been collecting; and in furtherance of his plan he undertook several long journeys—to Asia Minor, Egypt, Upper Italy, southern France, and even Spain—where it has been supposed he witnessed the capture of Numantia by Scipio in 133. He died about 122 B.C.

His history, the design of which was to show how and why it was that all the civilised countries of the world fell under the dominion of Rome, includes the period between 220, where the history of Aratus concluded, and 146 B.C., the year when Corinth fell, and with it the independence of Greece. Much the greater part of the work has perished. Of forty books only the first five are preserved complete; but the plan of the whole work is fully known. Of the two parts into which it was divided the first (books iii.-xxx.; the introductory books i. and ii. being a sketch of the earlier history of Rome) embraced a period of fifty-three years, commencing with the second Punic War and the Social War in Greece, and concluding with the subjugation of the kingdom of Macedonia in 168. The last ten books deal with the years 168-146. The great merits of Polybius are the care with which he collected his materials, his strong love of truth, his breadth of view, and his sound judgment, which was materially assisted by his



Polyanthus.

is believed to be derived from a hybrid between the Primrose (q.v.) and the Cowslip (q.v.), and like the latter has an umbel of numerous flowers

familiarity with political and military life. He was an excellent authority on the art of war. His tone is didactic, dull, and wearisome; he is too anxious to draw consequences and deduce lessons, and has been called 'the first pragmatical historian'. His method of exposition is careless, somewhat confused, and inartistic; his style, occasionally pithy, but usually bald to a degree, belongs to the period of beginning decadence.

Of the thirty-five books which have not been preserved entire we possess merely fragments or extracts. Fragments were found by Cardinal Mai, and published as late as 1827. Valuable editions have been published by Schweighauser (1789-95; new ed. Oxford, 1831), Bekker (1844), Dindorf (1862-68, new ed. 1882), Hultsch (1868-72; 2d ed. 1888). The portion on the history of the Achaean league has been edited by W. W. Capes, and selections (based on Hultsch) by Strachan Davidson (1888): there is a readable English translation by E. S. Shuckburgh (1889) and one by W. R. Paton (with text, 1923). See Mahaffy, *The Greek World under Roman Sway* (1890); German works on Polybius by La Roche (1857), Pichler (1860), Scala (1891) and Cuntz (*Polybius und sein Werk*, 1902).

Polycarp, one of the 'Apostolic Fathers,' was bishop at Smyrna in proconsular Asia during the earlier half of the 2d century. His is an important name, for he bridges the little known and much controverted period lying between the age of his master the Apostle John and that of his own disciple Irenæus, and his testimony is only the larger, clearer, and more valuable because of his rigid conservatism and lack of intellectual individuality. The 'Life' by 'Pionius' is utterly untrustworthy. All that is really known of Polycarp's origin is gathered from his dying declaration, which shows that he was born about 69 A.D., and probably of Christian parents. By the migration of apostles and others from doomed Jerusalem, Ephesus and the neighbouring districts became the new home of the faith, and there Polycarp was 'taught by Apostles,' John above all, and 'lived in familiar intercourse with many that had seen Christ' (Irenæus, *Heresies*, iii. 3, 4). The further statement that he was appointed bishop in Smyrna 'by Apostles' ('by John'-Tertullian) is probably coloured by the later conception of the episcopate, but he certainly appears to have been head of the church from early manhood.

Among contemporaries he was intimate with Papias. More interesting is his brief intercourse with Ignatius, who, on his way from Antioch to martyrdom at Rome, made a short stay at Smyrna, where Polycarp and the church ministered to him. The tone of his *Epistle to Polycarp*, written shortly after from Troas, is that of a letter to one less experienced, if not younger, and less energetic than the writer, but high respect is paid to Polycarp's steadfastness, piety, and position. In consequence of a request which Ignatius was making to the churches to send messages to Antioch, the Philippians wrote to Polycarp asking that their letter to Antioch might be forwarded by the Smyrnan messenger, at the same time inviting exhortation, and further asking for any of the epistles of Ignatius that he might have. Hence Polycarp's *Epistle to the Philippians*, in which he accedes to their various requests, and solicits further news of Ignatius. His influence on a younger generation, and his importance as a faithful preserver of the apostolic tradition, are vividly delineated by his greatest disciple Irenæus in his *Epistle to Florinus*, quoted in Eusebius, *Hist. Eccl.* v. 20: 'I can tell the very place where the blessed Polycarp used to sit and discourse. . . . Whatever things he had heard from them (John and others) about the Lord. . . . Polycarp, as having received them from eye-witnesses of the life of the Word, would relate altogether in accordance with

the Scriptures. These valuable reminiscences relate to a period somewhere between 135 and 150 A.D.

At the very close of his life Polycarp visited Rome, where he conferred with the bishop Anicetus, chiefly on the vexed question of the time for commemorating the Passion. On this point neither yielded to the other, yet their relations remained so cordial that Anicetus allowed Polycarp to take his place in celebrating the eucharist (see Irenæus quoted in Eusebius, *Hist. Eccl.* v. 24). After turning many Valentinians and Marcionites from their heresies by his preaching, the aged bishop returned to Smyrna, only to win the martyr's crown in a persecution which broke out during a great festival. Unsatiated with meaner victims, the mob called for Polycarp, 'the father of the Christians.' With truest dignity and modesty does Polycarp play the man. Betrayed by his servant-boy, but offered his life by the proconsul if he will revile Christ, he answers: 'Fourscore and six years have I been His servant, and He hath done me no wrong. How then can I blaspheme my King, who hath saved me?' As the games were over, death by fire was substituted for death by wild beasts, and Jews vied with heathens in providing fuel. But the fire arched itself about the martyr, and he had to be despatched with a dagger. The graphic *Letter of the Smyrnanæans* tells the story of the martyrdom to the Philomelan church. A chronological appendix to this letter has been elucidated by Waddington's skilful dating of the 'proconsul,' and his conclusions have been confirmed by the discovery of inscriptions relating to the 'high-priest,' also mentioned therein, so that the martyrdom may, with strong probability, be dated 23d February 155 A.D.

The only writing of Polycarp extant is the *Epistle to the Philippians*, incomplete in the original Greek, but complete in a Latin translation. Its genuineness has been assailed, but unsuccessfully. Somewhat commonplace in itself, it is of great value for questions of the canon, the origin of the church, and the Ignatian Epistles. More New Testament phrases are here inwoven than are found in any other work of the time. Their wider range, and especially the prominence given to Paul and his epistles by this disciple of John, tell heavily against Tübingen theories of the origin of the church and the canon. The letter bears so closely on the Ignatian Epistles that, while apart from it the external evidence for their genuineness is weak, with it that evidence is very strong. The grounds, however, for assigning the epistles of Ignatius and Polycarp to the reign of Trajan are not beyond question, while among other things a certain reference to heresy in Polycarp's epistle would better accord with a time about 130 A.D., or even later.

For one of the best editions of the *Epistle* (first edited by Halloix in 1633 and frequently since), see *Patrum Apostol. Opera* (ed. Gebhardt, &c., vol. ii. 1876); for the date of the martyrdom, Waddington's *Fastes des Provinces Asiatiques* (Paris, 1872), and the Oxford *Studia Biblica* (1885 and 1890). But the best and most exhaustive work on all the parts of the subject is Lightfoot's *Apostolic Fathers*, part ii. (2d ed. 1889). An ingenious, scholarly, and able attempt is made by the Rev. J. M. Cotterill in the Cambridge *Journal of Philology* (1891) to attribute the extant epistle to Antiochus, a monk of St Saba, who flourished under Heraclius, and from whose pen is still extant, 'if,' in Gibbon's phrase, 'what no one reads may be said to be extant,' a dull and feeble work entitled *Πανδέκτης τῆς ἐκκλησιαστικῆς γραφῆς*, divided into 130 homilies.

Polychæta. See **CHÆTOPODS**.

Polycotyle donous Plants are those whose embryos have more than two seed-leaves (cotyledons). Examples are found occasionally (regu-

larly in *Acer Pseudo Platanus*), or as monstrosities, among Dicotyledons. In the Pine group of the Coniferae (q.v.) the polycotyledonous condition is the normal one, and the cotyledons occur in whorls of from three to eighteen. Multiplication of cotyledons occurs in a few other groups of the Coniferae. Sometimes the numerous cotyledons unite in pairs, and this leads to the suggestion that they originally sprang from two; but many botanists believe that the cotyledons arise as separate leaves.

Polycrates, 'tyrant' of Samos from about 536 B.C. to 522. He conquered several islands of the Archipelago, and even some towns on the Asiatic mainland, waged war successfully against the inhabitants of Miletus, and defeated their allies, the Lesbians, in a great sea-fight. His intimate alliance with Amasis, king of Egypt, proves the importance in which this daring island-prince was held even by great monarchs. According to Herodotus, Amasis dreaded the misfortunes that the envious gods must be preparing for so lucky a mortal, and wrote a letter to Polycrates, earnestly advising him to throw away the possession that he deemed most valuable, and thereby avert the stroke of the spiteful gods. Polycrates, in compliance with this friendly advice, cast a signet-ring of marvellously beautiful workmanship into the sea, but next day a fisherman presented the tyrant with an unusually big fish that he had caught, and in its belly was found the identical ring. It was quite clear to Amasis now that Polycrates was a doomed man, and he immediately broke off the alliance. When Cambyses invaded Egypt (525) Polycrates sent him a contingent of forty ships, in which he placed all the Samians disaffected towards his tyranny, hoping they might never come back; but mutinying they returned to Samos, and made war against the tyrant, but without success. Hereupon they went to Sparta, and succeeded in securing the help of both Spartans and Corinthians. A triple force of Samians, Spartans, and Corinthians embarked for Samos, and besieged Samos in vain, and Polycrates became more powerful than ever; but Nemesis overtook her victim after all. Oroetes, the Persian satrap of Sardis, had conceived a deadly hatred against Polycrates, and, having enticed the latter to visit him at Magnesia by appealing to his cupidity, he seized and crucified him.

Polydipsia. See DIABETES.

Polydore Vergil. See VERGIL (POLYDORÉ).

Polygalaceæ. See MILKWORTS.

Polygamous, a term applied to plants which bear both unisexual and hermaphrodite flowers, either on the same or on different individual plants. For example, the maple produces male, female, and hermaphrodite flowers on the same tree; while some ash-trees sometimes bear male only, others female, and others hermaphrodite flowers.

Polygamy obtained at one time over a very large area of the world's surface; in general it may be said still to be the rule not merely amongst most African races, but amongst the peoples both more and less civilised, of 'the East' generally, and to a certain extent in Australia and Polynesia, though it is rare amongst American Indians. The ancient Egyptians practised it. That this custom was usual in Old Testament times is obvious from many references: the New Testament seems to indicate that monogamy was universal amongst the Jews of the 1st century, though the Talmud contains no positive prohibition against a plurality of wives. Greeks and Romans did not practise polygamy within historical times; but the ancient Germans were the only barbarians known to Tacitus who were content with a single wife. Moslem

law and usage permit a man to have four, but such plurality is confined to the rich; poor men can seldom afford more than one wife (see MOHAMMEDANISM). Polygamy became illegal in Turkey in 1926. There is no limit to the number of wives a Hindu may keep, without taking account of concubines. A high-caste man of wealth may sometimes have a hundred wives. But it should be remembered that in hot countries girls become marriageable at an early age, and soon lose their youth and attractiveness; a man's first wife may remain his confidant and real companion through life, though he provides himself with a succession of girl favourites. In China there is but one right wife in a household, though a man may keep concubines.

Christianity has never tolerated polygamy; even Concubinage (q.v.) has been always treated as sinful, and polygamy is a crime by the law of Christian states. Nevertheless there have occasionally been found divines to defend polygamy or something like it. The Anabaptists insisted on such freedom; Ochino (q.v.) wrote in defence of it. When in 1540 Philip the Magnanimous, the reforming landgrave of Hesse, resolved with the consent of his wife (then a confirmed invalid) to marry a second wife, Luther and Melancthon approved the step 'as his personal friends, though not as doctors of theology'; and Bucer (q.v.) promoted, approved, and witnessed the bigamous union. The first wife survived the second marriage for nine years. As late as 1667, when Catherine of Braganza miscarried, some Anglican divines suggested polygamy as the best way of securing a direct heir to the throne. In 1780 the Rev. Martin Madan, chaplain to the Lock Hospital in London, started the world and raised a violent controversy by arguing in favour of polygamy as a means of diminishing prostitution and saving human souls from guilt; the work in which these views were advocated was called *Thelyphthora, or a Treatise on Female Ruin* (3 vols. 1780-81). In recent times the Mormons (q.v.) by their practice of polygamy created a troublesome question for the administrators of United States law. It has always been a difficulty for Christian missionaries when converts with several wives desired baptism. As a rule the convert was treated as married only to the first wife in point of date, and was required absolutely to put away all the others—a rule that was inevitably harsh and inequitable in its operation. Bishop Colenso declined to make the convert part from wives he had married in good faith, so have other missionaries done elsewhere. See BIGAMY, FAMILY, HAREM, MARRIAGE, and the works cited there: also Gallican, *Women under Polygamy* (1914).

Polyglot (Gr. *polys*, 'many,' and *glōtta*, 'tongue') means a collection of versions in different languages of the same work, but is almost exclusively applied to manifold versions of the Bible. The Hexapla of Origen (q.v.) contained, besides the Hebrew text, several other Greek versions, but is not commonly reckoned among the polyglots. The most famous polyglots are (1) the Complutensian, published under the auspices of Cardinal Ximenes (q.v.) at Alcalá (Lat. *Complutum*), in 6 vols. folio, 1502-17, with Hebrew, Greek, Chaldee (each with Latin versions), and the Vulgate Latin; (2) the Antwerp Polyglot, printed at the Plantin press, at the cost of Philip II. of Spain, in 1569-72, edited by Arias Montanus; (3) the Paris Polyglot, edited by Le Jay in 1645, in 6 splendid volumes; and (4) the London Polyglot, edited by Brian Walton, in 6 vols. folio, 1654-57, and containing the Bible, or parts of it, in nine languages. Of modern works of this kind the most convenient is Bagster's Polyglot, first published by Bagster at London in 1831 (new eds.

1874, &c.), which gives the Old Testament in eight languages (Hebrew, Greek, Latin, English, German, Italian, French, and Spanish), and the New Testament in nine (the Syriac version being added).

Polygnotus, a Greek painter who flourished in the middle of the 5th century B.C., was born in the isle of Thasos, and belonged to a family of painters. He was a friend of the Athenian general Cimon, and is said to have been attached to his sister, Elpinice. His principal works were at Athens, at Delphi, and at Platea. In the first-named city he executed paintings in the temple of Theseus; in the Stoa Poikile (or Painted Portico), the Greek Princes assembled to judge of the Violation of Cassandra by Ajax; in the temple of the Dioscuri, the Rape of the Daughters of Leucippus; and in the Propylæa on the Acropolis, a series from the old Greek legends. At Platea he painted, in the temple of Athena, Ulysses and the Slain Suitors of Penelope. His greatest work is said to have been in the Lesche, a court or peristyle at Delphi, built by the Cnidians, the walls of which he covered with a series representing the Wars of Troy and the Visit of Ulysses to the Lower World. Polygnotus was a great advance on any of his predecessors. He was the first who gave life, character, and expression to painting. Aristotle extols the dignity and beauty of his conceptions.

Polygonaceæ, a family of dicotyledons, mostly herbs, but including a few shrubs. The leaves are alternate, with stipules cohering around the stem, though sometimes reduced to a mere ring. The flowers are not unfrequently unisexual; the fruit generally a nut, often triangular, the seed with farinaceous albumen, which has an economic importance in buckwheat. The genus *Polygonum* comprises numerous species, of which several are natives of Britain. Knot-grass (*P. aviculare*) is a very common British weed, and is found in cultivated and waste places in all parts of the world from the tropics to the Arctic regions. The stems of *P. amphibium*, an inhabitant of ponds and watery ditches all over Britain and Europe, central Asia, and North America, have been used as a substitute for sarsaparilla on the continent of Europe. *P. Hydropiper*, often called Water Pepper, a plant common by sides of lakes and ditches in Britain and North America, is acrid enough to be used as a vesicant. Several species are occasionally used for dyeing, as the Spotted Persicaria (*P. Persicaria*), a very common weed on dunghills and in waste places in Britain; but the only species really important on this account is that called Dyer's Buckwheat (*P. tinctorium*), a native of China, the cultivation of which has been successful in France and Flanders. It yields a blue dye scarcely inferior to indigo. *P. orientale* has long been occasionally cultivated in flower-gardens in Britain, and is quite hardy, although a native of the West Indies. The Bistort (q.v.) belongs to the genus. *Fagopyrum cymosum*, a species of buckwheat abundant on the mountains of the north of India, affords an excellent substitute for spinach. *Fagopyrum esculentum* (Buckwheat) is cultivated for the sake of its fruit, which furnishes a nutritious diet used in the countries of northern Europe. The Garden Sorrel (*Rumex Acetosa*) and some other species of *Rumex* have a singular combination of properties in their roots and in their leaves. In the former there is greater or less astringency, due to the presence of tannic and gallic acid; the latter are more or less acidulous, owing to their containing oxalic acid. The Dock (q.v.) belongs to this family; so does Rhubarb (q.v.). The root of *Calligonum leucocladum*, a native of the sandy

steppes of Siberia, when cut exudes a clear viscid gum similar to Tragacanth (q.v.), which swells in water and forms a mucilage of a brownish-yellow colour; it is eaten by the Kalmucks in times of scarcity. Its fruit, which is acid, is eaten to quench thirst. *Triplaris americana* and *T. Bonplandiana*, both natives of South America, are small trees with hollow branches which are the haunts of small venomous ants that shelter themselves on the unwary who may attempt to shelter themselves under their shade. *Mühlenbeckia adpressa* is the Macquarie Harbour Vine of Tasmania, an evergreen climbing or trailing shrub of most rapid growth, sometimes 60 feet in length. It produces racemes of fruit somewhat resembling grapes or currants, the nut being invested with the large and fleshy segments of the calyx. The fruit is sweetish and subacid, and is used for tarts. *Coccoloba uvifera* is the Seaside Grape (q.v.) of the West Indies. See also CALLIGONUM.

Polyhymnia, one of the nine Muses (q.v.).

Polymerism. See ISOMERISM.

Polymerphism. See DIMORPHISM.

Polynesia, Micronesia, and Melanesia.

These three areas comprise the greater part of the Pacific, Australia and the groups of islands ringing the Pacific coasts of Asia and of America being excluded. It is an island world. The islands extend from the Pelews (134° 45' E.) to Easter Island (109° 17' W.), and from Hawaii (20° N.) to Stewart Island at the southern extremity of New Zealand (47° S.). They are mostly small, so that in an expanse of 11 million square miles the extent of land is about 170,000 sq. m., two-thirds of which are comprised in New Zealand. The total population falls short of 1½ millions. The three divisions of Micronesia, Melanesia, and Polynesia differ from each other markedly in race, and to some extent in culture. Micronesia is in the extreme north-west, almost entirely north of the equator. It consists of small coral atolls and volcanic cones, and is divided into the Mariannes or Ladrões, the Pelews, the Carolines, and the Marshalls. Melanesia lies in the extreme west, entirely south of the equator. It mainly consists of comparatively large, upraised, coralline, crystalline, and volcanic islands, disposed in parallel chains from north-west to south-east, and forming the archipelagoes of the Admiralty Islands, Bismarck (New Britain and New Ireland), D'Entrecasteaux, Louisiade, Solomons, Santa Cruz, Banks, New Hebrides, New Caledonia, Loyalty, and Fiji. Polynesia lies on both sides of the equator, mainly east of a line drawn from Fiji to New Zealand. It consists of several archipelagoes—Hawaii (Sandwich), Phoenix, Ellice, Tokelau, Samoa, Tonga, Kermadec, Austral (Tubuai), Cook, Tahiti, Tuamotu (Paumotu), and Marquesas. New Zealand belongs to Polynesia. There are also several isolated islands and small groups, such as Norfolk, Chatham, Penrhyn, Easter, Manihiki, and Uvea.

The Pacific is uniform in climatic and biological conditions, with the exception of New Zealand which differs from the rest owing to its much greater size, its lofty mountain ranges, geological history, and high southern latitude. The trades prevail throughout the greater part of the year, while in the summer westerly and north-westerly winds occur frequently. These trades bring considerable rainfall to the higher islands, due to the oceanic conditions of the region. The rainfall decreases away from the equator. Over 150 inches fall annually in the Solomons, only 60 in Hawaii, and but 40 in New Caledonia. The coral atolls, too low to arrest the air currents, are rainless. They owe their guano deposits to this fact. The temperature is everywhere mild for the latitude, and varies little during the year. Mean tempera-

tures of about 90° occur near the equator. The average falls to 50° in New Zealand, where the annual range is considerably greater. The climate of the tropical islands is very relaxing, but New Zealand and New Caledonia are healthier.

The majority of the food-plants of Oceania have been introduced by man. The flora of the coralline groups is essentially tropical. The prevailing species are the coconut and one or two other palms, the pandanus, the bread-fruit tree, the banana, and edible fruits such as yams, taro, and sweet potatoes. The large archipelagoes of the west have a rich forest vegetation, mostly belonging to the Papuanian and Australian zones, with some American and a few indigenous plants. Hence the prevalence of casuarinas, damianas, araucarias, tree-ferns, besides myrtles, ebony, and the banyan fig.

The fauna is remarkably poor. The only undoubtedly indigenous mammals in the Polynesian groups are two or three species of rats and mice, and a few varieties of the bat family. Reptiles and insects are rare. Fiji is the easternmost limit of the frog, and the Solomons of the crocodile, which here lives both in salt and fresh water. Bird-life used everywhere to be abundant, but has been much reduced owing to the ravages of plume-hunters.

The products of the Pacific include copra, coconuts, pearls, pearl-shell, bananas, pine-apples, sweet potatoes, yams, sugar, tobacco, coffee, phosphates, oranges, tomatoes, rubber, and manioc.

The discovery of the groups of the Pacific began in the 16th century. Balboa saw the Pacific on 25th September 1513; Mendaña discovered Fiji and Tonga in 1643; Roggewein discovered Easter Island in 1721, and Samoa in 1722; and Captain Wallis discovered Tahiti in 1767.

The population of the Pacific presents interesting features. That of Micronesia is not well studied. It is mixed, and varies from west to east. The people at the west are more round-headed than those of the east, their skins are darker, and their hair is often frizzly, although sometimes wavy or straight. The people at the east end are very tall, while the people of the west are short. The original population of Melanesia was probably negroid in type—that is, black-haired, dark-skinned, medium of stature, long-headed with retreating foreheads, broad-nosed and with protruding jaws. Negritos still live in New Guinea.

Many views have been put forward to account for the racial affinities of the Polynesians. They have been claimed as constituting a uniform physical, cultural, and linguistic group. Some relate them physically to the Malays. They are also claimed as Nordic and as Mongolian, but actually the Polynesians are a mixed stock, and they themselves recognise their differences of physical type. Sullivan, on the basis of a large series of measurements, concludes that there are three physical types in Polynesia, and that the population was divided into two main groups. The first type was characterised by taller stature, longer heads, higher faces, narrower noses, straighter hair, more beard, more body hair, lighter skin colour, and more frequent incisor rim. The second type was characterised by shorter stature, shorter heads, lower faces, wider noses, more wavy hair, scant beard, scant body hair, darker skins, infrequent incisor rims. The second type is certainly related to the populations of the regions of the western Pacific and south-eastern Asia. Sullivan terms them Indonesian. When these are subtracted the Polynesians belong definitely to that group of races formerly termed Caucasian, and comprising (1) the Nordic; (2) the Mediterranean or Brown; and (3) the Central, Alpine, or Armenoid divisions. Elliot Smith has claimed the Polynesians to be the result of a mixture between the Armenoid or

Central race and the Brown or Mediterranean race, the mixture having taken place in the neighbourhood of India. He was led to this conclusion by the recognition of a skull of Armenoid type coming from the Chatham Islands in the southern Pacific. Sullivan has also detected this type in the light-skinned population of Polynesia. He speaks of 'an extremely short-headed element in Polynesia' with 'extremely short heads, associated with narrow faces, narrow noses, light skin, and well-developed beard and body hair.' This type is therefore characteristic of the so-called Alpine, Armenoid, or Central race. (Sullivan, *Marquesan Somatology*, 233 seq., Honolulu, 1923.)

The proportion of the different elements of population varies widely in the groups of Oceania. The negroid population of Melanesia must have arrived in Oceania long ago, and have remained there, in a food-gathering stage of culture, throughout many centuries. The light-skinned Polynesians, on the other hand, are of fairly recent origin in Oceania. They probably arrived not more than 2500 years ago. They came from the west, it seems, by way of the East Indian Archipelago, and wandered through Micronesia and down the coasts of New Guinea into Melanesia and Polynesia. They brought with them the fundamental food-plants of Polynesia, the bread-fruit, banana, and others. Nothing is known directly of their wanderings in Melanesia, though their history in Polynesia is well known. Samoa was a great centre of migration whence expeditions set out to colonise Tahiti. The first centre in Samoa was probably in the small group of islands at the east end named Manu'a, the principal island being Tau. Manu'a is said to have colonised the rest of Samoa. In the first period of colonisation of Polynesia, our knowledge of which is very obscure, there was constant intercourse between Fiji, Samoa, and Tonga. Expeditions went from Tahiti to Hawaii, and also from Tahiti to New Zealand by way of Rarotonga. Tahiti was the great centre for eastern Polynesia. Colonies also went from Samoa to the Gilberts and other groups of western Polynesia at later dates. The languages of the Polynesians have affinities with those of certain peoples of India, Burma, the Malay Peninsula, Indo-China, the East Indian Archipelago and Madagascar.

The ancestors of the Polynesians introduced a civilisation that is uniform in its essentials with that of Pre-Columbian America, and especially with that of Peru. Its most obtrusive material characteristics were the building of monuments of large stones, the carving of stone statues, the practice of terraced irrigation, the making of polished stone implements, and the great use of shells, especially pearl-shell, for ornamentation. The social organisation was originally based on what is called the Dual Organisation. Communities were divided into two distinct parts, associated sometimes with the seaward and the landward parts of the islands. In the more important settlements these two parts were ruled over by distinct chiefs. One, the superior, was the sacred chief; the other, the inferior, was the war chief. Their families intermarried in certain places, and it is probable that this formerly was the general rule. Communities with the dual organisation usually have the rule of intermarriage between the two sides. In addition a man was often bound to marry the daughter of his mother's brother, which constitutes the 'cross-cousin' marriage. The original superior chiefs were of the family of the Children of the Sun. This remarkable family can be traced in Ponape of the Carolines, in San Cristoval, in Samoa, in Tahiti, and vaguely in Fiji. They had a cult of their ancestor, the sun, which died out everywhere with them. They

were connected with the sky, and believed that the sun could have children by mortal women. The family with which they intermarried in Samoa was associated with an underground world. When the children of the sun died out in Samoa and elsewhere the underworld became the principal land of the dead for the Polynesians. The ruling groups of this early civilisation practised mummification. They also put their dead in megalithic tombs, while commoners were interred. Government was carried out principally by means of councils, and the council of the state was composed of the great land owning nobles.

The remains of this original civilisation are scattered throughout the Pacific, the most remarkable being those of Ponape and elsewhere in the Carolines. Ponape possesses the ruins of a town built out in the sea, and protected by immense breakwaters made of basalt blocks. It was divided into two parts—one for the priests, ruled over by the *Chau-te leir*, the Children of the Sun, and the other for the warriors. The stone tombs of these rulers exist in the Carolines. The people of the archaic civilisation in the Pacific made stone images. Those of Easter Island are enormous in size, but are similar in design and structure to those of Tahiti, the Marquesas, and elsewhere.

Certain areas of the Pacific formerly possessed secret societies. The most important of these were the *Urritao*s or *Uritao*s of the Mariannes, the *Areoi* of Tahiti and neighbourhood, the *Dutduk* and *Inqet* of the Bismarck Archipelago, the *Matambala* of Florida in the Solomons, the *Sulwe* and *Tamate* of the Banks Islands, and the *Mangge* of Ambrym. The organisation of these societies with their rites of initiation, masks, dances, and payments of shell money, is similar throughout the Pacific.

Oceanic civilisation was fundamentally uniform in most respects, but there are local divergences. The culture of the Micronesians is at a very high level, especially in the Carolines. They make splendid club houses. Their villages have paved paths, stone landing-stages, and stone dancing-platforms. They have elaborate irrigation canals. Their commerce was formerly highly developed. They had a currency of beads and shell, practised writing, and made charts of cane-work, which served them on their long voyages. The Melanesians practise tattooing, cicatrization and nose-boring, and wear armlets and necklaces of shells. Houses are rectangular or round, and pile-dwellings are common. Irrigation is widespread. Cannibalism occurs in various parts. Canoes are made, both dug-out and plank-built. Various forms of currency are in use, shell discs being universal. Pottery is made in Fiji, New Guinea, and in the New Hebrides. Looms occur in Santa Cruz. Various sorts of weapons are used, such as the club and the spear, the bow and arrow and the sling, while shields occur sporadically. Head-hunting is practised in the Solomons and in Torres Straits. Chieftainship is not common, but secret societies are very powerful. Much of the religion

centres round the cult of the ghosts of the dead. The Polynesians are great navigators, their canoes formerly making journeys of thousands of miles. Their houses are usually rectangular. They live chiefly on bread fruit and taro; the latter plant is usually grown by irrigation. Clothing was of bark-cloth made from the paper mulberry (*Morus papyrifera*). Tattooing was common. Ornaments were made of shell and whale ivory, and feathers were largely used to make cloaks and helmets for the chiefs. Polished stone implements were made, as in other parts of the Pacific. Clubs were the most important weapons, but spears and daggers were also used, whereas the bow and arrow was only a toy. The musical instruments were drums, shell trumpets, flutes, and whistles. Many dances were performed. The system of tabu was associated with the ruling groups, and with secret societies in other parts of Oceania. The most important gods of later times were the war gods, superseding the sun-cult as the dominant religion.

The following table gives the ascertainable populations of the various groups. The positive or negative sign denotes an increasing or decreasing native population:

	Area in sq. miles.	Population (Native).	Increase or Decrease.	State or Mandate.
MICRONISIA—				
Mariannes . . .	450	2,000	..	Japan.
Pelew	..	c. 30,000	..	Japan.
Caroline } . . .	..	..	..	..
Yap . . .	..	..	..	Japan.
Ponape . . .	340	c. 3,000	..	Japan.
Marshall . . .	150	c. 9,000	..	Japan.
MELANESIA—				
Admiralty Islands . .	600	4,000	..	Australia.
Bismarck Archipelago .	15,000	28,000	..	Australia.
D'Entrecasteaux . .	1,100	10,000	..	Australia.
Louisades . . .	870	2,000	..	Australia.
Solomons . . .	15,000	c. 150,000 (1919)	..	Britain
Torres Islands . . .	..	200 (1922)	..	Britain and France
Santa Cruz . . .	200	5,000	..	Britain
Banks . . .	190	4,500	..	Britain and France.
New Hebrides . . .	5,500	c. 70,000	..	Britain and France.
New Caledonia . . .	6,275	27,100	..	France
Loyalty Islands . . .	c. 800	11,000	..	France.
Fiji . . .	7,451	c. 86,000 (1921)	+	Britain.
POLYNESIA—				
Samoa . . .	1,800	94,000 (1922)	+	New Zealand and
Tonga . . .	885	28,759	+	Britain. (U.S.A.)
Tahiti . . .	600	17,000	+	France.
Hawai . . .	..	154,000	+	United States.
Phoenix . . .	16	58	+	Britain.
Gilbert and Ellice . .	170	30,000	+	Britain.
Tokelau (Union) . .	7	800 to 900	+	Britain.
Kermadec . . .	40	100	..	New Zealand.
Austral . . .	105	1,400	+	France.
Cook . . .	280	9,000	+	New Zealand.
Tuamotu . . .	..	2,500	+	France.
Marquesas . . .	238	3,000	+	France.
New Zealand . . .	108,862	58,950 (Maori)	+	..
Chatham Islands . .	372	477 (1916)	..	New Zealand.
Pitcairn . . .	2	140 (1914)	..	Britain.
Gambier . . .	..	1250	..	France.

See E. Best, *The Maori* (1925); G. Buschan, *Illustrirte Völkerkunde*; Cambridge Anthropological Expedition to Torres Straits Report; R. H. Codrington, *The Melanesians* (1891); W. Ellis, *Polynesian Researches*; C. E. Fox, *The Threshold of the Pacific* (1925); A. Fornander, *An Account of the Polynesian Race* (1878-86); *Hamburgische Wissenschaftliche Stiftung: Ergebnisse der Südsee-Expedition, 1908-10*; A. Krämer, *Ostmikronesien, Samoa*; W. J. Perry, *The Children of the Sun* (1923); W. H. R. Rivers, *The History of Melanesian Society* (1914); C. G. Seligman, *The Melanesians of British New Guinea* (1910); S. Percy Smith, *Hawaii* (1910); R. W. Williamson, *The Social and Political Systems of Central Polynesia* (1925). See also the numerous publications of the Bernice P. Bishop Museum, Honolulu; also Hastings's *Encyclopædia of Religion and Ethics*, under various headings; *Journal of the Polynesian Society*; *Transactions of the New Zealand Institute*.

Polyp, a name usually applied to an animal

like the fresh-water Hydra or like the Sea-anemone, having a tubular body and a wreath of many tentacles around the mouth. The name is equally applicable to an isolated individual or to a member (zoid or 'person') of a colony. Thus, the individuals which make up a zoophyte or a coral colony are called polyps, and the term is seldom used except in reference to Cœlenterate animals. But the history of the word has been strange. In Greek and Latin works on natural history the term *polypous* or *polypus* is usually applied to the octopus (*poulpe*), or some other cuttle-fish, though sometimes to the many-footed wood-louse, Oniscus. Réaumur and Jussieu were the first to apply the word to zoophytes and the like; Lamarck used it more loosely, but gradually it has been narrowed to the signification above noted. See ANEMONE (SEA), CœLENTERATA, CORAL, HYDRA, HYDROZOA, &c.; and POLYPUS, for the surgical use of the term.

Polyphemus, in the Homeric mythology, the son of Poseidon and the nymph Thoosa, the most celebrated of the fabulous Cyclopes (q.v.), who inhabited the island of Sicily. He was of immense size, and had only one eye. When Ulysses landed on that island he entered the cave of Polyphemus with twelve companions, of which number this tremendous cannibal ate six. The others stood expecting the same fate, but their cunning leader made Polyphemus drunk, then burned out his single eye with a burning pole, and so escaped, leaving the blinded monster to grope about in the darkness. See ACI REALE.

Polyphonic (Gr. *polys*, 'many,' and *phōnē*, 'voice'). When a musical composition consists of two or more parts, each of which has an independent melody of its own, it is said to be polyphonic, in opposition to a homophonic composition consisting of a principal part with a leading idea, and accessory parts employed to strengthen it. Each part of a polyphonic composition aims at melodic perfection, and, while supporting the other, has an equal share in the entire effect. A Fugue (q.v.) is the most perfect example of polyphonic composition.

Polypodium (the Greek name, as old as Theophrastus, was *polypodion*, from *polys*, 'many,'



Polypodium:

1, *Polypodium Dryopteris*; 2, *P. vulgare*.

and *podion*, 'a little foot'—indicating the foot-like appendage of the rhizome, not the leaf), a genus of Ferns, with spore-cases on the back of the frond, distinct, ring-shaped, in roundish sori, destitute of *indusium*. It is the largest genus of

the Filices, comprising some 600 species; and amongst them are plants of different modes of growth, of different venation, and from almost all climates. Several species, differing very considerably in appearance, are natives of Britain, where no fern is more common than *P. vulgare*. It grows on rocks, trees, dry banks, &c., and has fronds 2 to 18 inches long, deeply pinnatifid, with large sori. *P. Dryopteris*, with delicate ternate bipinnate fronds, is a fine ornament of many dry stony places in Scotland. *P. calaguala*, a native of Peru, is said to possess important medicinal properties—solvent, deobstruent, sudorific, &c.

Polyporus, a genus of basidiomycete fungi, many of them large, hard, woody, bracket-like or hoof-like parasites on trees. The porous appearance is due to a closely-packed mass of tubes. See AMADOU, DRY ROT.

Polypterus, an interesting genus of African fishes, from the Nile, the Congo, and some other rivers. The various (10) species of Polypterus, along with one other fish, *Calamichthys calabaricus*, from the Niger, Old Calabar, and other West African rivers, are the only living representatives of the archaic Crossopterygii, and may be fairly called living fossils. See *Budgett Memorial Volume*, Cambridge (1910).

Polypus, in Surgery, is an ancient term employed to signify any sort of pedunculated tumour attached to the surface of a mucous membrane, to which it was supposed to adhere like a many-footed animal, as its name indicates. The most common seats of polypus are the nose and the uterus; but these tumours are also found in the rectum, the larynx, and the external auditory passage of the ear. The only satisfactory mode of treatment consists in their removal, which must be effected in various ways, according to their position, as by the forceps, écraseur, ligature, &c. The cause of the polypus is often some local inflammation which must also receive appropriate treatment.

Polytechnic (Gr. *polys*, 'many,' *technē*, 'art') is an institute in which the technical sciences that rest in great part upon a mathematical basis, such as engineering, architecture, &c., are taught. The first school of the kind was established in Paris (1794) by the National Convention, under the name of School of Public Works. No students were admitted but those who intended to enter the public service, especially the corps of civil and military engineers and the artillery. The École Polytechnique, as it was called from 1795, has been repeatedly reorganised as the different political parties have succeeded to power. At the present time it is the institute in which France trains her artillery and engineer officers, and all her officials who require to know something of the higher branches of technical science. Germany, too, has her polytechnics, or *Technische Hochschulen*. Those that came into being during the first half of the 19th century were in great part training-schools for the higher branches of the industrial arts; but since Zürich established (1856) a polytechnic modelled on the plan of the German universities, most of the German polytechnics have followed suit. In America the oldest institutions of the kind are the Rensselaer Polytechnic Institute at Troy, New York, and the Franklin Institute at Philadelphia, both founded in 1824. See TECHNICAL EDUCATION; also ART.

Polytheism. See RELIGION.

Polytrichum, a genus of Mosses (q.v.).

Polyzoa, or BRYOZOA, a class of small animals which, with one exception, form colonies, and are

almost always fixed. Most familiar are the sea-mats or horn-wracks (*Flustra*), cast-up pieces of which are abundant on the beach. On these will be seen the hundreds of separate chambers in which the minute individuals live. Each individual has a sac-like or cup-shaped body, traversed by a food-canal bent like a U, crowned around the mouth by a wreath of tentacles, controlled by a single nerve-centre. The cuticle which surrounds the body is usually horn-like, not unfrequently calcareous (*Cellepora*, *Lepralia*, &c.), and sometimes gelatinous (*Alcyonidium*, *Lophopus*). The individuals of a colony are not always all alike; thus, some of them are occasionally modified into strange birds'-beak-like or whip-like structures. All *Polyzoa* multiply by budding, and thus the colonies increase. The individuals in the older parts of the colony usually degenerate or die. Fresh-water forms reproduce by peculiar winter-buds or statoblasts, which are liberated on the death of the parent, are floated away by currents, and after a winter's quiescence develop in spring. But all *Polyzoa* also reproduce sexually; the sexes may be separate or united; the larvæ developed from the eggs are free-swimming. The *Polyzoa* used to be ranked with zoophytes (among the *Hydrozoa*), but the individual animals are much more complex and are independent of one another. Often they are called molluscoid, because of apparent affinities with lamp-shells or *Brachiopods*, which used to be regarded as allied to molluscs. Most modern zoologists rank them as a distinct but heterogeneous class in the great assemblage of 'worms' or 'Vermes.' Representative genera are *Cristatella*, *Lophopus*, *Plumatella*—in fresh water; *Flustra*, *Membranipora*, *Alcyonidium*, *Cellepora*—marine; *Pedicellina* and *Loxosoma*—two marine genera, simpler than the others, the latter non-colonial. *Rhabdopleura*, a remarkable genus sometimes included in this class, shows at least hints of vertebrate affinities.

See Allman, *British Fresh-water Polyzoa* (Lond. 1886); Busk, *Challenger Report*, X. (1884); Hincks, *British Marine Polyzoa* (Lond. 1880); E. Ray Lankester, article 'Polyzoa' in *Encyc. Brit.*

Pomaks, Mahommedan Bulgarians. See BULGARIA.

Pombal, SEBASTIAN JOSEPH DE CARVALHO E MELLO, MARQUIS OF, the greatest of Portuguese statesmen, was born 13th May 1699 at the castle of Soure, near Coimbra. In 1739 he was appointed ambassador in London, and six years later was sent to Vienna in a similar capacity. Just before Joseph I. ascended the throne of Portugal (1750) Pombal was appointed secretary for foreign affairs. Among his first acts was to re-attach to the crown a number of domains that had been unjustly alienated. When the great earthquake happened at Lisbon in 1755 Pombal displayed great calmness and fertile resource, so that next year the king made him prime-minister. He crushed a revolt instigated by the great nobles and the Jesuits, and in 1759 banished the latter from the kingdom. Then he set himself to establish good elementary schools, and published a new code of laws. Besides this, he reorganised the army, introduced fresh colonists into the Portuguese settlements, established an East India Company, and another for Brazil. The tyranny of the Inquisition was broken. Agriculture, commerce, and the finances were all improved. In 1758 he had been made Count of Oeyras, and in 1770 he was created Marquis of Pombal. On the accession of Joseph's daughter, Maria I. (in 1777), who was under clerical influence, Pombal, who had himself been high-handed, if not despotic, especially towards the Church, was banished from court, while many of his institutions

were abolished. He died at his castle of Pombal, 8th May 1782.

See Life by G. Moore (1819); John Smith, *Memoirs of Pombal* (2 vols. 1843); Carnota, *Marquis Pombal* (Eng. trans. 1871); and Carayon, *Prisons du Marquis de Pombal*—his diary (Paris, 1865).

Pomegranate (*Punica Granatum*), a fruit much cultivated in warm countries, and apparently a native of the warmer temperate parts of Asia and Europe, perhaps also of the north of Africa. It has been cultivated in Asia from the most ancient times. In a wild state the plant is a thorny bush, in cultivation it is a low tree, with twiggy branches, flowers at the extremities of the branches, the calyx red, the petals scarlet. It is generally referred to the family *Myrtaceæ*. The calyx is leathery, tubular, 5- to 7-cleft; there are 5 to 7 crumpled petals; the fruit (technically called *balausta*) is as large as a medium-sized orange, having a thick leathery rind of a fine golden yellow, with a rosy tinge on the sunny side, not bursting when ripe; the cells filled with numerous seeds, each of which is surrounded with pulp, and separately enclosed in a thin membrane; the upper and lower series of carpels being differently attached. Thus the pomegranate appears to be formed of a great number of reddish berries packed together and compressed



Pomegranate (*Punica granatum*).

into irregular angular forms. The pulp is sweet, sometimes subacid, and of a pleasant delicate flavour, very cooling, and particularly grateful in warm climates. It is often used for the preparation of cooling drinks. A kind of pomegranate without seeds is cultivated and much prized in India and Persia. Pomegranates have long been imported in small quantities into Britain from Portugal and the north of Africa, but have never become an article of general demand and commercial importance like oranges. There is an ornamental variety of the pomegranate with double flowers. The rind of the fruit is very astringent, and a decoction is used as a gargle in relaxed sore throat, and as a medicine in diarrhoea, dysentery, &c. Deriving its astringency from tannin, it is used to tan leather. The finest Morocco leather is said to be tanned with it, and small quantities are imported into Britain from the north of Africa for the preparation of the finest kinds of leather, under the name of *Pomegranate Bark*. The bark of the roots is used as an anthelmintic, and is often successfully administered in cases of tapeworm. It contains a peculiar principle called *punicin*, having the appearance of an oleo-resin, an acrid taste, and affecting the nostrils like veratrina. Its value was known to the ancients, and it has long been in use in India. The pomegranate tree is occasionally cultivated in hothouses or green-houses in Britain. It bears the winters of the latitude of London in the open air, and is very ornamental, but the fruit is worthless. In some parts of the south of Europe it is used as a hedge-plant. In northern Mexico it grows to great perfection, and in some of the southern states of the

American Union; even as far north as New York it will, if protected in winter, bear fruit, and in some seasons ripen it.

Pomelo. See SHADDOCK.

Pomerania (Ger. *Pommern*), a province of Prussia, bounded N. by the Baltic, E. by Poland, S. by Grenzmark and Brandenburg, and W. by Mecklenburg. Area, 11,661 sq. m. It is one of the lowest and flattest regions in Germany, and has few hills of even moderate height, but numerous lakes and ponds. The river Oder divides Hither Pomerania (next Mecklenburg) from Farther Pomerania. The shores of the latter are lined with sand-dunes. The islands of Völin and Usedom form the northern side of the Stettiner Haff (Lagoon); and farther to the north-west lies the island of Rügen. Pomerania is essentially an agricultural province. Rye and potatoes are the principal products; in a secondary degree come wheat, barley, oats, flax, beet-root, tobacco, hops, and fruit. Commerce flourishes in the coast towns, Stettin and Stralsund being the most important. Apart from shipbuilding, machine-works, and the manufacture of sugar, chemicals, bricks, &c., carried on principally in the coast towns, the industries are paper, tobacco, glass, and woollen wares. The fisheries are valuable. Much poultry is reared, especially geese, in Farther Pomerania. Greifswald is the seat of a university; Stettin is the capital. Pop. (1919) 1,789,216. See PRUSSIA; and for the Pomeranian dog, SPITZ.

Pomerania formed a part of the territory of the ancient Vandals. When they moved south in the 5th century, it was occupied by Slavic tribes, one of whom was called Pomerani; hence the name of the region. From about 1100 it had its own line of princely rulers, and about 1124 it adopted Christianity in consequence of the preaching of Bishop Otto of Bamberg. The native princes assumed the title of duke in 1170 and joined the German empire, being put under the suzerainty of Brandenburg. The duchy was overrun by the Imperialists in the Thirty Years' War, and Wallenstein besieged Stralsund; they were followed by the Swedes, who established themselves permanently in Hither Pomerania and in several towns of Farther Pomerania. In 1637 the last duke of the native dynasty died, whereupon Brandenburg claimed the duchy; the Swedes, however, stuck to what they held until 1720, and certain districts in Hither Pomerania were not given up to Prussia until 1815.

Pomerellia, POMMERELLIA, or LITTLE POMERANIA, Poland's north-western corridor to the Baltic in Pomorze (q.v.), inhabited by Kashubish (q.v.) speakers.

Pomeroy, capital of Meigs county, Ohio, between the Ohio River and a range of precipitous hills, 133 miles by rail SE. of Columbus. Coal and salt are produced. Pop. 4300.

Pomfret. See PONTEFRACT.

Pomfret, JOHN (1667-1702), son of the rector of Luton, Bedfordshire, was from 1695 rector of Maulden, also in Bedfordshire. The only piece of Pomfret's now remembered—we can hardly say read—is *The Choice*, a graceful but tame and monotonous celebration, in neat verse, of the mild joys of a country retirement. Dr Johnson said that perhaps no poem in our language had been oftener perused; and Southey still asked why Pomfret was the most popular among the English poets.

Pomona, the Roman divinity of the fruit (*pomum*) of trees. She was beloved by several of the rustic divinities, as Sylvanus, Picus, and Vertumnus. Propertius tells us that the last, after vainly trying to approach her under various forms,

at last succeeded by assuming the figure of an old woman. In this guise he recounted to her the lamentable histories of women who had despised love, and, having touched her heart to pity, suddenly transformed himself into a blooming youth. Varro tells us that at Rome the worship of Pomona was under the care of a special priest, the *flamen Pomonalis*. In works of art she was generally represented with fruits in her lap, or in a basket, with a garland of fruits in her hair, and a pruning-knife in her right hand.

Pomona, or MAINLAND. See ORKNEY.

Pomorze, a Polish county or voivodeship consisting of the greater part of the former Prussian province of West Prussia. A continuation of the North German plain, it is cut across, in the south, by the Vistula, which farther north separates it from the Marienwerder district of Germany and from Danzig, and then enters the territory of Danzig. The north of Pomorze is thus narrowed to a strip (Pomerellia) which reaches the Baltic between Danzig and Pomerania. On its coast a seaport is being constructed at Gdynia, adjoining Danzig. Area, 6302 sq. m.; pop. (1921) 939,495; capital, Thorn (Polish Toruń).

Pompadour, JEANNE ANTOINETTE POISSON, MARQUISE DE, the most famous among the mistresses of Louis XV., was born in Paris, 29th December 1721. She was baptised as the child of François Poisson and his wife Madeleine de la Motte, but it was suspected that her father was Le Normant de Tournelle, a wealthy *fermier-général*, who provided for her education. She grew up a woman of remarkable grace and beauty, devoted to music and painting, and charmed every one by her vivacity and wit. But her mind was early depraved by her mother, who constantly dinning into her ears that she was 'un morceau de roi,' and habituated her to see in the rôle of king's favourite the ideal of feminine ambition. In 1741 she was married to her protector's nephew, Le Normant d'Étiolles, and soon became a queen of fashion in the financial world of Paris. But neither this nor a devoted husband's love could satisfy her heart, and, as it was impossible to hope for an introduction at court, for two years she sought to attract the eye of the king by waylaying him when he went out hunting. At length in February 1745 she attained her object at a ball given by the city on the occasion of the dauphin's nuptials, and ere long she was installed at Versailles, and ennobled by the title of Marquise de Pompadour. Her husband, to whom she had already borne a daughter, was removed from Paris, but later had his loss recouped with lucrative offices; her brother was afterwards made Marquis de Marigny. Ere long she assumed the entire control of public affairs, the king being merely an indolent *fainéant* who assisted at the spectacle of his reign without even taking an interest in it. For twenty years the mistress swayed the whole policy of the state, and lavished its treasures on the gratification of her artistic tastes, and in carrying out her own ambitious schemes. She reversed the traditional policy of France because Frederick the Great lampooned her, and the proud Maria Theresa addressed her in a letter under the royal style as *Ma cousine*. She filled all public offices with her nominees, corresponded with the generals in the field, and made her own creatures ministers of France, the Abbé de Bernis and the Duc de Choiseul. Her policy was disastrous, her wars unfortunate; still the ministry of Choiseul was the only fairly creditable portion of the reign, which owed to her twenty years of relative dignity. She was a lavish patroness of the arts, and heaped her bounty upon poets and painters, yet did not escape showers of

lampoons—the famous *Poissardes*, for a suspected share in which many a wit went to the Bastille. She loved china, fine buildings, books, and sumptuous bindings, and it is said printed with her own hands a fine edition of the *Rodogune* of Corneille. Indeed, she was an artist in everything—‘elle était des nôtres,’ as Voltaire said truly when he heard of her death. The king remained faithful to her from habit rather than affection, and from the rôle of mistress she passed into that of *amie nécessaire*, and retained her difficult position to the end, by relieving him of all business, by diverting him with private theatricals in her famous ‘théâtre des petits cabinets,’ where she acted charmingly, and at last even by countenancing his infamous debaucheries and providing him with mistresses too insignificant to be rivals. She herself said with the pathos of truth, ‘ma vie est un combat,’ and at last her nerves gave way under the strain, and after a languor of twenty days she died, 15th April 1764. She met the inevitable with that queenly dignity that marked everything she did. Her breath fled on the wings of a playful sally—‘Stay, Monsieur le Curé,’ she said to the priest who was leaving her room, ‘wait a little; we shall go out together.’

Madame de Pompadour was the last mistress of the king worthy of the name; the descent from her reign of grace and decorum to the boisterous vulgarities of Dubarry was profound. She was ‘froide comme une macreuse,’ says Madame du Hausset, her *femme-de-chambre*, in her silly but interesting memoirs, and there can be no doubt that throughout life ambition was the one passion of her heart. She secured her reign till her last hour—no sooner had she closed her eyes than she was forgotten.

The *Mémoires* (Liège, 1766) attributed to her are of no value. See the studies by Capefigue (1858) and Campardon (1867); E. and J. de Goncourt, *Les Maîtresses de Louis XV.* (vol. ii. 1860); Beaujoint's *Secret Memoirs of La Marquise de Pompadour* (1885); her *Correspondance*, edited by Malassis (1878) and Bonhomme (1880); books by H. Noel Williams (1903), Pierre de Nolhac (1913), Marcel Tinayre (trans. 1925).

Pompeii, an ancient seaport town of Campania, originally situated near the mouth of the Sarnus, which now, however, enters the sea nearly 2 miles distant. It occupies the top of a small hill of lava, and was situated on the line of a trade route, which, from the earliest times, connected the districts of Naples and Capua with the Sorrento promontory. The original settlement is represented by a small, irregularly-planned nucleus of streets in the south-west portion of the town, which was founded by the Oscans; while the regular street plan of the enlarged town is probably due to the Etruscans, though Pompeii was also largely influenced by the Greek civilisation of the coast. In the second half of the 5th century B.C. the Samnites from the mountains of the interior swept over Campania, but adopted the arts and customs which they found there. Pompeii passed under the sway of Rome with the rest of Campania in the early 3d century B.C., but took a prominent part in the Social War (91–89 B.C.), and was one of the last cities of Italy to be reduced by siege. In 80 B.C. Sulla settled a military colony in its territory, and the population was rapidly Romanised, the neighbourhood becoming a favourite resort of the Roman nobles, among them Cicero, who alludes frequently to his Pompeian villa. Its prosperity continued under the empire, but was checked by a serious earthquake in 63 A.D. A large part of the town, including most of the public buildings, was so seriously damaged as to require reconstruction, which was still in progress when the whole city was overwhelmed by the great eruption of Vesuvius in 79 A.D.

G. Fiorelli (d. 1896) was responsible for the

division of the city (for convenience of reference) into nine regions (now only six), for their subdivision into *insulae*, or blocks, consisting of one or more buildings or houses, and for the names of the streets and houses. About one-half of the whole extent has been cleared; but of recent years attention has been concentrated entirely on the careful investigation of the north-eastern portion of the Strada dell' Abbondanza, and the slowness of progress has been compensated for by the exceptionally interesting discoveries made, coupled with the greater care with which the work of preservation has been carried out. The greatest gain has been our increased knowledge of the upper stories of the façades of the houses, which (contrary to what was hitherto believed) were diversified by numerous openings—balconies, open loggias, &c. Some interesting paintings have been found on the façades themselves, and have been most carefully preserved. But at the present rate of progress there is no likelihood that the work will be completed during the present century.

The city forms an irregular ellipse, rather less than 2 miles in circumference, extending from the amphitheatre on the east to the Herculaneum gate on the west, where the street of tombs begins. Seven other gates traversed the walls, the line of which had, however, been obliterated on the south-west, inasmuch as they were no longer required for purposes of defence. A *trottoir* borders the streets, which are straight and narrow—the broader 24 feet wide, the narrower 14 feet only—and admirably paved with polygonal blocks of lava. High stepping-stones, placed mostly at the corners, lead across from one *trottoir* to another, and these retain the impressions of horses' hoofs, while, in the causeway between, the wagons have left deep ruts. The street-corners are provided with fountains, ornamented usually with the head of a god or a mask. Notices painted in red letters, and referring to municipal elections for which some particular candidate is recommended, occur frequently on the street walls, while trade-signs and advertisements are rarer. An occasional ‘phallus,’ to avert the evil eye, projects from over a doorway, and, much more common, one or two large snakes, emblems of the Lares, are to be seen. The stuccoed walls, to judge from the *Graffiti* (q.v.) or roughly-scratched drawings on them, were as tempting to the Pompeian *gamin* as to our own, though adult lovers often gave way to the temptation.

The portion of the city which has been excavated includes the more important public buildings—the forum (the centre of the life of the city), with the edifices adjacent to it, the Capitolium, which every Roman colony possessed, dedicated to Jupiter, Juno, and Minerva, and the temples of Apollo and Vespasian, the Basilica, the Curia or Senate-house, and other municipal buildings; also the temples of Heracles (so-called), Isis, Zeus Melichius, Fortuna Augusta, and Venus Pompeiana, the two theatres and the amphitheatre, the barracks of the gladiators, three public baths, &c., and a large number of fine private houses. The nucleus of their plan is the *atrium*, or central space, with an opening (the *compluvium*) of greater or less size in the centre (sometimes indeed developed into a peristylar courtyard), and rooms all round it, with a garden at the back; while the larger houses have one or more peristyles in place of the garden. Elaborate precautions were thus taken against heat, but hypocausts are only found in connection with baths, as in Rome itself; though the scanty use of window-glass must have made the houses very cold—as the dwellings of the poorer classes still are. Recent discoveries at Ostia (q.v.) have shown that the Pompeian house is not to be regarded as the main type of Roman domestic architecture.

House-construction consists mainly of concrete (rubble held together by cement) or brick, and sometimes of stone blocks, especially at the corners. Two-storied houses are numerous, though the upper floors, built of wood, have been consumed by the eruption. Shops usually occupied the ground floors of dwelling-houses, on their street aspect, let out to merchants or dealers as at the present day, but not connected with the back part of the house. They could be separated from the street by large wooden doors, while inside they had tables covered with marble, in which earthen vessels for wine or oil were inserted. The shopkeeper had sometimes a second room at the back, when he did not live on an upper floor or in another part of the town. Retail traffic must have been considerable at Pompeii, to judge from the number of shops along the streets.

An exhaustive study has recently been made of the occupants of the various houses, and the names given to the latter have in many cases been shown to be incorrect. Especially as rebuilt after 63, Pompeii shows little marble facing (and what had been used was in some cases removed after the destruction of the city), the walls and columns being covered with a coating of stucco, which presented an ample field for ornamental painting. This has been divided into four styles—a classification which can only be regarded as provisional; for far finer contemporary examples from Rome itself still await study and publication. The earliest or Structural style came in from Asia Minor or Greece (perhaps by way of Sicily) about the end of the 2d century B.C. In it marble facing is imitated in actual relief, but in the second style only by painting on a flat surface, while in it architectural designs begin to appear, framing pictorial scenes, which are supposed to be seen through openings in the wall. While this style may have developed in Italy itself, it is probably modelled on Hellenistic stage decoration, in which columns with screens between them were placed in front of the back wall of the stage.

If we follow the traditional classification we shall find the third style characterised by a free use of ornament, whereas the architecture has become quite fantastic; while the fourth is distinguished from it by a return to architectural forms, though these are of far greater intricacy than before. Some of the floor-mosaics, especially those corresponding with the first period of mural decoration, are very fine.

A number of houses, many of them farmhouses, have also been discovered in the vicinity of Pompeii. One of them, in the so-called Villa Itern, has some very fine life-size figures representing scenes in the mysteries of Dionysus.

Owing to the circumstances of the burial of Pompeii, the works of art found, and especially the statues, are exceptionally numerous. Many of them, and especially those found in the earlier excavations, have been removed to the Naples Museum; but latterly they have been left on the spot, and this, especially when the buildings found have (as recently) been carefully repaired and reconstructed as far as is possible, adds greatly to the vividness of the picture of ancient life which this wonderful city presents. Perfect casts in plaster of Paris have been obtained, not only of the bodies of those who perished, but of doors, ladders, roots of trees, &c. The best work on the subject for the English reader is *Man's Pompeii: its Life and Art*, translated by F. W. Kelsey (1902; a new edition is in preparation). A useful summary of recent work by A. W. Van Buren will be found in the *Classical Journal* (of America), xv. (1920), pp. 404 *sqq.*

Pompelmoose, or **POMELO** (Dut. *pompelmoes*), also 'pumelon' and 'pomelo,' a kind of Shaddock (q.v.), *Citrus decumana*, var. *Pompelmous*.

Pompey. Cneius Pompeius Magnus, the rival of Caesar, was born in 106 B.C., and at seventeen fought along with his father in the Social or Italian war on the side of Sulla against the faction of Marius and Cinna. When Sulla returned from Greece to Italy to oppose Marius (84) Pompey hastened into Picenum, and there raised an army of three legions, with which he drove the soldiers of Marius out of the district, and then joined Sulla. For his prudence, valour, and good fortune throughout the war he was sent to destroy the remains of the Marian faction in Africa and Sicily. On his triumphant return to Rome he was honoured with the name of Magnus, or the Great. His triumph was an unprecedented distinction for one who had not yet held any public office and was merely an *eques*. His next exploits were the reduction of the followers of Lepidus, whom he drove out of Italy, and the extinction of the Marian party in Spain under the brave Sertorius (76-71). Pompey suffered some severe defeats from Sertorius, and, indeed, put an end to the war only after his antagonist's assassination. Returning to Italy, he fell in with the remnants of the army of Spartacus, and thus closed the Servile war. He was now the idol of the people, and, though legally ineligible for the consulship, was elected for the year 70, the senate relieving him of his disabilities rather than provoke him to extremities. Hitherto Pompey had belonged to the aristocratic party, but of late years he had been looked upon with suspicion by some of the leading men, and he now publicly espoused the people's cause. He carried a law restoring the tribunician power to the people; and aided largely in introducing the *Lex Aurelia*, by which the *judices* should for the future be taken from the *senate*, the *equites*, and the *tribuni aerarii*, instead of from the senate alone. In 67-66 Pompey cleared the Mediterranean of the pirates who infested it; and during the next four years (65-62) conquered Mithridates, king of Pontus, Tigranes, king of Armenia, and Antiochus, king of Syria. At the same time he subdued the Jews and captured Jerusalem. On his return to Italy he disbanded his army, and entered Rome in triumph for the third time in 61. But now his star began to wane. Henceforward we find him distrusted by the aristocracy, and second to Caesar in popular favour. After his return he was anxious that his acts in Asia should be ratified by the senate, and certain lands apportioned among his veterans. But the senate declined to accede to his wish, and he therefore formed a close intimacy with Caesar, and the pair, together with the plutocrat Crassus, formed that coalition which is commonly called 'the First Triumvirate,' and which for a time frustrated all the efforts of the aristocratic party. This small oligarchy carried all before them: Pompey's acts in Asia were ratified, and his promises to his troops fulfilled; Caesar's designs were all gained, and his agrarian law, distributing land in Campania among the poorer citizens, was passed. Caesar's daughter, Julia, was given in marriage to Pompey, and private relationship was thus made to bind tighter the tie of political interest. In the year following Caesar repaired to Gaul, and there for nine years carried on a career of conquest that covered him with glory, while Pompey was idly wasting his time and his energies at Rome. But Pompey could not bear a rival. Jealousies arose betwixt the two; Julia died in 54, and thus father-in-law and son-in-law were sundered by a yet wider gulf, which no bridge could span. Pompey now returned to the aristocratic

party, whose great desire was to check Cæsar's views, and strip him of his command. Cæsar was ordered to lay down his office and return to Rome, which he consented to do, provided Pompey, who had an army near Rome, would do the same. The senate insisted on an unconditional resignation, and ordered him to disband his army by a certain day, otherwise he would be declared a public enemy. To this resolution two of the tribunes in vain objected; they therefore left the city and cast themselves on Cæsar for protection. It was on this memorable occasion that he crossed the Rubicon, and thus defied the senate and its armies, which were under Pompey's command. The events of the civil war which followed have already been recorded in the life of Cæsar. It remains only to mention that, after being finally defeated at Pharsalia in 48, Pompey escaped to Egypt, where, according to the order of the king's ministers, he was treacherously murdered by a former centurion of his own, as he was landing from the boat. His head was cut off, and afterwards presented to Cæsar on his arrival in Egypt. But Cæsar was too magnanimous to delight in such a sight, and the murderer of Pompey was by his orders put to death. The body lay on the beach for some time, but was at length buried by a freedman, Philippius, who had accompanied his master to the shore.

Pompey's younger son, Sextus, by his third wife, endeavoured after his father's death to prolong the struggle with Cæsar. He secured a large fleet, manned largely by slaves and political exiles, and, occupying Sicily, ravaged the coasts of Italy. But in 36 B.C. he was defeated at sea by Agrippa, and next year was slain at Mitylene.

Pompey's Pillar, a red granite Corinthian monolith at Alexandria, 73 feet high (with pedestal, 98 ft. 9 in.), 29 ft. 8 in. in circumference. On the summit is a circular depression for the base of a statue. The name was given by old travellers; the Greek inscription on the base shows that it was erected by Publius, prefect of Egypt, in honour of Diocletian, perhaps to record his conquest of Alexandria, 296 A.D.

Pomponatius, PETRUS (Pietro Pomponazzi; 1462-1525), 'last of the Schoolmen and first of the Aristotelians,' was born at Mantua, taught philosophy in Padua and Bologna, and maintained that the doctrine of individual immortality, though contrary to reason, might be received by faith. See monograph on his psychology and philosophy by Halliday Douglas (1910).

Pomptine, or **Pontine Marshes**, the southern part of the province of Rome, extending S.E. from Velletri to the sea of Terracina, but separated from the sea by sand-dunes. Many attempts have been made to drain these marshes, from that of Appius Claudius (312 B.C.) till a law of 1899 provided for reclamation in twenty-four years, under which considerable progress has been made, the installation of electric pumping stations and the boring of artesian wells being the principal factors in making cultivation and habitation possible.

Ponapé. See CAROLINE ISLANDS.

Ponce de León, FRAY LUIS, otherwise FRAY LUIS DE LEON, one of the greatest of Spanish poets, was born in 1527, probably at Granada. He studied at Salamanca, entered the order of St Augustine, and became professor of Theology there in 1561. His translation and interpretation of the Song of Solomon brought him five years' imprisonment from the tribunal of the Inquisition at Valladolid. Released at length and reinstated in his chair, he quietly resumed his lectures with the words: 'As we observed in our last discourse' In 1580 he published a satisfactorily orthodox Latin

commentary on the Song of Solomon, later his *De los Nombres de Cristo* (1583-85) and *La Perfecta Casada* (1583), full of imagery, eloquence, and enthusiasm, and both in prose. Shortly before his death, which occurred in August 1591, he had been appointed general of his order. His poetical remains were first published by Quevedo at Madrid in 1631, under the title *Obras Proprias y Traducciones*. The latter consist of translations from Virgil's *Eclogues* and *Georgics*, the *Odes* of Horace, and the *Psalms*. His original poems are few, but they are among the masterpieces of Spanish lyrical poetry.

See studies by Fitzmaurice-Kelly (1921) and Aubrey Bell (1925); and the *Poesías Originales* (Oxford, 1925).

Ponce de León, JUAN, the discoverer of Florida, was born at San Servas, in Spain, in 1460, was a court page, served against the Moors, and in 1502 sailed with Ovando to Hispaniola, and became governor of the eastern part of the island. In 1510 he obtained the government of Porto Rico, and had conquered the whole island by 1512, when he was deprived of his post. He then, broken in health, set out on a quest for the fountain of perpetual youth, and on Palm Sunday 1513 found Florida, landing a little to the north of where St Augustine now stands. He secured the appointment of adelantado of the country, and, after staying on his way back to drive the Caribs out of Porto Rico, he returned in 1521 to conquer his new subjects; in this, however, he failed, and lost nearly all his followers. He retired to Cuba, and died there in July from the wound of a poisoned arrow.

Poncho, an important article of male attire in Chile, the Argentine Republic, and some other parts of South America (see GAUCHOS). It consists of a piece of woollen or alpaca cloth, 5 to 7 feet long, 3 to 4 feet broad, having in the middle a slit through which the wearer passes his head, so that the poncho rests upon the shoulders and hangs down before and behind.

Pond, JOHN, was born in London in 1767, studied at Cambridge, and succeeded Maskelyne as astronomer-royal in 1811. His name is identified with numerous improvements in the methods and instruments of observation; he translated Laplace's *Système*, and published a star catalogue and many valuable papers. He died 7th September 1836.

Pondicherry (Fr. *Pondichéry*), the chief of the French settlements in India, situated on the Coromandel Coast, 83 miles S. by W. of Madras City, is divided into two parts by a canal, White (European) town being next the sea. It has handsome streets, a government house, a college, a lighthouse, and cotton-mills. Pop. 47,000. It exports chiefly oil-seeds. The French colony of Pondicherry has an area of 115 sq. m. and a pop. of 174,000. The governor of Pondicherry is governor-general of the French possessions in India. The French first settled here in 1674. The Dutch took the town in 1693, but restored it to the French in 1697. In 1748 Admiral Boscawen besieged Pondicherry for two months, but was compelled to raise the siege. Eyre Coote, however, took it in 1761, yet it was restored to the French in 1763 with reduced territory. It was taken by the English under Sir Hector Monro in 1778, and given back in 1783. In 1793 the English again repossessed themselves of it, but it was a third time restored to the French by the peace of Amiens; taken again in 1803, and a fourth time restored in 1816.

Pondoland, a district of Kaffraria, on the Natal frontier, 65 miles long by 30 wide, was annexed to Cape Colony in 1884-94. Pop. about 265,000.

Pond-weed. See AQUATIC PLANTS, ANACHARIS, POTAMOGETON.

Pongwe. See PUNGWE.

Poniatowski, a princely family of Poland. STANISLAS (1677-1762) joined Charles XII. of Sweden in supporting Stanislas Leszczyński, and was the chief instrument in saving the Swedish king at Pultowa. He held his administrative offices under Augustus II. and Augustus III.—His son STANISLAS AUGUSTUS (1732-98) was the last king of Poland (q.v.).—JOSEPH ANTONY, son of Andrew, brother of king Stanislas Augustus, was commander of the Polish legion in the army of Napoleon. He was born at Warsaw, 7th May 1762, and trained in the Austrian army. In 1789 the Polish Assembly appointed him commander-in-chief of the army of the south, with which he gained brilliant victories over the Russian invaders (1792); but the convention of Targowice (see POLAND) put an end to the contest in 1793. On the outbreak of the following year he joined the army as a volunteer, but Kosciuszko put him in command of the division charged to defend Warsaw on the north. On its fall he withdrew to Vienna. In 1806 the Prussians evacuated Warsaw before the invasion of the French; and when the duchy of Warsaw was constituted (1807) Poniatowski was appointed minister of war and commander-in-chief for the duchy. In 1809, in the course of the war between Austria and France, he invaded Galicia, after having previously retired before stronger forces. Three years later he joined, with a large body of Poles, the French army in its invasion of Russia, and rendered distinguished service at Smolensk and Borodino, but more especially in the great battle of Leipzig (1813), when he valiantly held his ground on the right wing of the French battle-array. Napoleon rewarded him by making him marshal of France. After the battle he was left to cover the retreat of the French army, and, whilst attempting to swim his horse over the river Elster to join the main body of his troops, he perished in its waters, 19th October 1813. His body was recovered, taken to Warsaw, and in 1816 removed to Cracow, and placed beside the ashes of Sobieski and Kosciuszko. See (German) Biography by Boguslawski (Cracow, 1831).

Pont, TIMOTHY (c. 1560-c. 1630), a pioneer in Scottish geography and map-making, was the son of Robert Pont (1524-1606), a celebrated Edinburgh minister. He graduated at St Andrews in 1584, became minister of Dunnet in Caithness (1601), and in 1609 subscribed for 2000 acres of forfeited lands in Ulster. 'He was,' says Bishop Nicholson, 'by nature and education a complete mathematician, and the first projector of a Scotch atlas. To that great purpose he personally surveyed all the several counties and isles of the kingdom; took draughts of 'em upon the spot, and added such cursory observations on the monuments of antiquity and other curiosities as were proper for the furnishing out of future descriptions. He was unhappily surpris'd by death;' but his collections were rescued from destruction and oblivion by Sir John Scott of Scotstarvet, and his maps at last appeared in Blaeu's magnificent *Theatrum Orbis Terrarum* (vol. v. Amst. 1654). See Dobie's *Cunninghame Topographised by Timothy Pont* (1876).

Pontac, an old name for a kind of red Bordeaux wine, from a family owning large vineyards.

Ponta Delgada, the largest town of the Azores (q.v.), in São Miguel; pop. 20,000.

Pont-à-Mousson, a town of France (dept. Meurthe-et-Moselle), on the Moselle, 18 miles SSE. of Metz, with a 13th-c. Gothic church; pop. 14,000.

Pontarlier, a French town (dept. Doubs), 35 miles SE. of Besançon, on the Jura route; pop. 9000.

Pontchartrain, LAKE, in Louisiana, about 5 miles N. of New Orleans, is 40 miles long and 25 wide, and communicates with the Gulf of Mexico.

Pontecorvo, a city of the Italian province of Caserta, on the Garigliano, 37 miles NW. of Capua; pop. 12,000.

Pontederia, a genus of aquatic monocotyledons comprising *P. cordifolia*, in North America, and *P. rotundifolia* in South America. It is the type of the small family of Pontederiaceæ, distributed in six genera and a score of species over the tropics. Monochoria serves in India as a vegetable, whilst *Eichhornia azurea* is much cultivated in hot houses for its showy flowers.

Pontefract, or POMFRET, an ancient and not unpleasant market-town in the industrial area of the West Riding of Yorkshire, on an eminence near the influx of the Calder to the Aire, 13 miles SE. of Leeds, 8 E. by N. of Wakefield, and 14 NNW. of Doncaster. It stands on the line of a Roman road, but seems to have arisen round its Norman castle, which, founded about 1076 by Ilbert de Lacy, was the scene of the execution or murder of the Earl of Lancaster (1322), Richard II. (1400), and Earl Rivers (1483), was taken in the Pilgrimage of Grace (1536), and during the Great Rebellion sustained four sieges, being finally dismantled in 1649, after its capture by Lambert. There are two old churches, a town-hall (rebuilt 1796), a market-hall (1860), two secondary schools, and large market-gardens and nurseries, the growing of liquorice for the lozenges called 'Pomfret cakes' being a speciality as old as about 1562. At Ackworth, 3 miles south, is a large Quaker school (1778). The borough, which was chartered by Richard III., lost one of its two members in 1885, the other in 1918. Pop. (1921) 16,790.

Pontevedra, a cathedral town of Spain, capital of a like-named province in Galicia, on a bay 30 miles S. of Santiago; pop. 27,000.

Pontiac, capital of Oakland county, Michigan, on Clinton River, surrounded by many small and beautiful lakes, 26 miles NNW. of Detroit, with a large asylum for the insane; pop. 34,000.

Pontiac, chief of the Ottawa Indians, in 1746 defended Detroit for the French, and was said to have led his warriors at Braddock's defeat in 1755. After the French had surrendered Canada, his hatred of the English prompted him to organise an Indian conspiracy to exterminate 'those dogs dressed in red.' In 1763 eight garrisons were massacred; but at Detroit, where Pontiac led in person, the commander was forewarned, and a five months' siege ensued. Peace was made in 1766. Pontiac was murdered in 1769 by a Kaskaskia Indian. See Parkman's *Conspiracy of Pontiac* (1851).

Pontianak, capital of the western division of Dutch Borneo, on the equator, near the mouth of river Kapuas; pop. 30,000.

Pontifex, a member of the sacred college which in ancient Rome had supreme authority in all that concerned religion. Under the monarchy they were the legal advisers of the king as to the duties of the people to the recognised gods of the state, and under the republic took over the whole responsibility. They were not attached to the service of any one particular deity. From their decrees there was no appeal. Their number gradually increased from three to fifteen, including their chief or *pontifex maximus*, and they held office for life. The *pontifex maximus* (the others acting as his council) controlled (but did not perform) sacrifices and ceremonials, consecrated temples, regulated the calendar, ad-

ministered the law as to burials and graveyards, and had control of adoption and of some parts of the marriage law. The college had charge of the state archives and lists of magistrates, and kept records of the events of the year (*annales*) as well as of their own proceedings. Originally co-opted, they were ultimately chosen by a form of popular election. Associated with them were the Flamens (q.v.) and Vestal Virgins (see VESTA), who were chosen by the *pontifex maximus*. The name—once assumed to be from *pons* and *facere*, and in some way associated with bridges—may be from an Oscan-Umbrian word *puntis*, 'propitiatory offering,' assimilated to *pons*, *pontis*. Julius Cæsar was *pontifex maximus* for the last twenty years of his life, and after Augustus the office was held by the emperor *ex officio* till Theodosius finally resigned it. Later the title of *pontifex maximus* naturally passed to the popes, all bishops coming to be called *pontifices*.

Pontifical, one of the service-books of the Church of Rome, in which are contained the services in which the bishop or a priest delegated by the bishop officiates, with rules for the ceremonial to be observed. That which is now in universal use throughout the Western Church is the *Pontificale Romanum* of 1485, as revised under Clement VIII. in 1596. It contains the services for ordinations, for religious professions and receptions of monks and nuns, consecrations, benedictions, as well as of the solemn administration by a bishop of those sacraments which are ordinarily administered by priests.

Pontigny, a village of the French department of Yonne, 18 miles SE. of Auxerre, with a famous 12th-century Cistercian monastery, devastated by the Huguenots in 1567, and finally destroyed at the Revolution; but the church (mainly 1150-70) is the most perfect Cistercian church in existence. Hither three English archbishops retired—Becket, Langton, and St Edmund, the last being buried here.

Pontine Marshes. See POMPTINE MARSHES.

Pontoise, an historic town on the right bank of the Oise, 18 miles NW. of Paris, has two old churches and the remains of a Cistercian abbey. It trades in grain and flour. Pop. 10,000.

Pontoon, a buoyant vessel used in military operations for supporting a temporary bridge (see BRIDGE); and for pontoons in connection with floating-docks, see DOCKS.

Pontoppidan, ERIK (1698-1764), born at Aarhus, was professor of Theology at Copenhagen, and from 1747 bishop of Bergen in Norway. He wrote on Danish history and topography and antiquities, and a *Natural History of Norway* (trans. 1755), containing accounts of the kraken, the sea-serpent, and other marvels.

Pontoppidan, HENRIK, Danish novelist, was born 24th July 1857, at his father's parsonage in Fredericia, and studied at Copenhagen. From short tales he passed to novels of great length, the most noteworthy being *Lykke Per* (1898-1904), and the trilogy *De Dødes Rige* (1912-16). He was awarded a Nobel prize in 1917.

Pontresina, a tourist centre of the Swiss canton of Grisons, in the Upper Engadine.

Pontus, a country in the north-east of Asia Minor, bordering on the Pontus Euxinus (whence its name), and extending from the Halys to Colchis and Armenia, and southward to the Anti-Taurus. It was long governed by Persian satraps, one of whom, Ariobarzanes, in the 4th century B.C., laid the foundations of an independent sovereignty. One of his successors (see MITHRADATES), one of the most formidable enemies that Rome ever

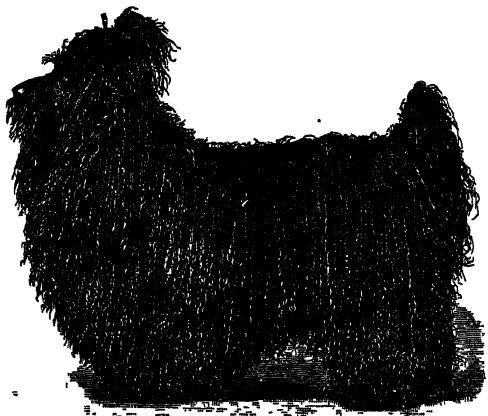
encountered in the east, was overthrown by Pompey (65 B.C.), and in 63 A.D. Pontus constituted two Roman provinces. On the coast there had long been Greek colonies—Sinope, Cerasus, Trapezus amongst them.

Pontypool, an urban district of Monmouthshire, 9 miles N. by W. of Newport, with collieries, iron and tinplate works, and markets; pop. 6900.

Pontypridd, a town of Glamorgan, at the junction of the Rhondda and Taff valleys, 12 miles NW. of Cardiff, with a famous one-arch bridge, and coal mines. Near the town is a rocking-stone weighing over nine tons. Pop. 47,200.

Pood. See PUD.

Poodle, a breed of dog almost unknown in Britain until the beginning of the 19th century. From his great intelligence and cleverness in learning tricks, he was generally adopted as a circus or 'trick dog'; but on the Continent the large variety of poodle had long been the humbler sportsman's companion, as he combines the properties of a land and a water dog. Poodles have been loosely divided into the large and small varieties, or the corded-coated and fleecy-coated varieties, as also into black Russian and white German poodles. The large black Russian poodle is much the most handsome and agile specimen of the race, and may be easily trained to retrieve. The small white poodle is only fit for a house dog, but is extremely



Black Corded Poodle.

(From a Photograph by Gamber Bolton, F.Z.S.)

clever and apt. For some unknown reason the poodle has usually been clipped in a peculiar manner; with the exception of a few tufts, his body and hindquarters are shaved entirely bare, while the coat on his shoulders sometimes grows to an enormous length. On the Continent the poodle is humanely left with his natural coat during the winter.

Pool, a game played on a billiard-table. Any number may play. Each is provided with a ball of distinctive colour (taken at random from a pool-basket), with which he tries to pocket the balls of the other players in a certain order (white, red, yellow, &c.); each player contributing an agreed sum, the whole of which falls to the winner at the end of the game. The American game is played with balls numbered 1 to 15, and the number of each ball a player pockets is added to his score. See also PYRAMIDS.

Poole, a seaport of Dorsetshire, 5 miles W. of Bournemouth and 30 E. of Dorchester. It stands on the north side of Poole Harbour (7 by 4½ miles), an irregular inlet, formed by the projection of the

'isle' of Purbeck, with four tides a day. On Brown-sea or Brank-ea Island, just within the narrow entrance to the harbour, is a castle of Henry VIII.'s time. Poole has an old town-hall (1572), a guild-hall (1761), a town-house (1822), considerable shipping, some yacht-building, and a large trade in clays, tiles, and pottery. The men of Poole were great fighters by land and sea, as buccaneers, smugglers, and Cromwellian soldiery. Till 1867 the borough returned two members, and then till 1885 one. Pop. 44,000.

Poole, JOHN (c. 1786-1872), wrote the immortal *Paul Pry*, first produced at the Haymarket in 1825, and several other farces and comedies, also the satirical *Little Pedlington* (1839), and other books of a light, humorous kind.

Poole (or **POLE**), **MATTHEW** (1624-79), born at York, and educated at Emmanuel College, Cambridge, held a London rectory from 1648 till the passing of the Act of Uniformity (1662), when he retired to Holland. In his *Synopsis Criticorum Biblicorum* (5 vols. fol. 1669-76) the opinions of 150 biblical critics were summarised. The *Annotations on the Holy Bible* were completed by his friends (2 vols. fol. 1865). He also wrote on the Romish controversy.

Poole, REGINALD STUART (1832-95), lived some years in Cairo with his uncle, E. W. Lane, and became keeper of arms and medals in the British Museum, and professor of Archæology at University College. He wrote on matters Egyptian and numismatics.—His nephews, **STANLEY LANE POOLE** (b. 1854), professor of Arabic in Trinity College, Dublin (1898-1904), and **REGINALD LANE POOLE** (b. 1857), lecturer on diplomatics at Oxford, and keeper of the Bodleian (1914), are well-known authors.

Poole, WILLIAM FREDERICK (1821-94), born at Salem, Mass., as a student at Yale prepared an index to periodical literature, which was greatly extended in 1853 and again in 1882, supplements from time to time increasing its value. He died librarian at Chicago.

Poona, or **PUNA**, a town of British India, 119 miles by rail S.E. of Bombay, is the military capital of the Deccan and the seat of the government of the presidency during the last half of the year. Under the peshwas the city was the capital of the Mahratta princes and power; it was occupied and annexed by the British in 1818. Here have been built the Deccan College, colleges of science and agriculture, a technical school, and other educational establishments. The Europeans live chiefly at the cantonments, north-west of the city. Jewellery and brass-work, cotton, paper, and mineral waters are manufactured. In 1897 and later Poona was severely visited by plague. Pop. (1851) 73,209; (1911) 158,856; (1921) 214,796.

Poon-wood, the timber of *Calophyllum Inophyllum* and other Indian species of the genus. Poon-oil is expressed from the seeds.

Poor Clares. See **CLARE** (St.).

Poor-law. **THE BRITISH EMPIRE—England and Wales.**—The responsibility of the state for its destitute citizens has been recognised in England by three centuries of legislation. The system of poor-law relief as at present in force had its genesis in the often-quoted provisions of the Poor Relief Act of 1601 (43 Eliz., chap. 2). This law was originally temporary, but was made perpetual in 1641. To a certain extent it embodied the experience gained through administration of previous acts of the Tudor period designed to suppress vagabondage and mendicancy. Its object was to compel the provision of work for unemployed able-bodied adults 'having no means to maintain

them,' and of maintenance for the aged and incapacitated poor, and to provide for the apprenticing of the children of such persons, through the agency of the parochial authorities and the magistrates. A new executive officer was created, styled overseer of the poor, who, with the church-wardens, was to administer relief. For refractory persons, houses of correction had been required by 18 Eliz., chap. 3, to be elected. The Settlement Act (14 Car. II., chap. 12) almost destroyed all fluidity of labour by empowering parochial officials to send immigrant labourers back to their last place of settlement within forty days from their coming into the parish. The 9 Geo. I., chap. 7, passed in 1722, empowered parochial authorities to erect houses in which to maintain their paupers, and introduced the principle of the workhouse test by enacting that 'no poor who refused to be lodged and kept in such houses should be entitled to parochial relief.' Gilbert's Act (22 Geo. III., chap. 83) of 1782, however, ordered that the able-bodied should be found employment near their own homes, and that only the aged and incapacitated and orphans should be placed in poor-houses. In 1796 the act of 1722 was repealed.

During the half-century following the passing of Gilbert's Act, the various abuses crept in which were afterwards brought to light by the Royal Commission of 1832. The expenditure in poor relief rose from £2,000,000 in 1785 to £7,870,000 in 1818. Not only did the rates in many parishes approximate to 20s. in the pound, but the labouring classes were demoralised by a system of out-relief, originated in 1795 by the justices of Speenhamland (now part of Newbury in Berkshire), and subsequently widely copied. Under this system wages were supplemented from the rates, and in a way which put the industrious and the idle on a common level. The Royal Commission urged a return to a sounder policy by enunciating as the guiding principle of reform that the situation of the (able-bodied) pauper should not be made on the whole 'really or apparently so eligible as the situation of the independent labourer of the lowest class.'

The recommendations of the Royal Commission were partially embodied in the Poor-law Amendment Act of 1834 (4 and 5 Wm. IV., chap. 76). The principle of central control over the action of the local authorities was for the first time reduced to practice by the creation of a special government department. This statute, as modified and extended by numerous later acts, and elaborated in a host of administrative orders, constitutes the present law of public assistance, of which the General Consolidated Order of 24th July 1847 is the chief summary.

This law is carried into effect by Boards of Guardians elected *ad hoc* by household suffrage of both sexes in groups of parishes styled unions. Overseers (see **PARISH**) are still appointed, but their duties as to poor-relief are nominal. Populous parishes have each their own board. Till 1894 a certain proportion of the guardians held office *ex officio*, the remainder being elected by the rate-payers and owners, the voting power of each voter rising with his property qualification. Since that date all have been elected on the wider franchise. They meet weekly or fortnightly to supervise the management of the establishments belonging to them, and to decide applications for relief. They have the assistance of a salaried staff, consisting of the clerk to the guardians, who discharges the functions of legal adviser and secretary; the master and matron of the workhouse; the relieving officers, who inquire into applications and dispense out-relief; medical officers for indoor and out paupers; a nursing and sometimes a teaching staff; and

minor officers, such as porters, labour-masters, and dispensers. Responsibility for the consequences of withholding or delaying out-relief, enforceable by criminal proceedings, rests with the relieving officer, even when in so doing he carries out the instructions of his board. A Board of Guardians which refuses relief may be compelled by writ of *mandamus* to justify its action in court. On the other hand, relief improperly granted may be surcharged against the guardians or their officer; and by act of 1926 the Minister of Health is empowered to supersede a defaulting Board of Guardians, e.g. a board insolvent, or threatening to become insolvent, on account of an alleged extravagant administration of out-relief.

Inefficiency and maladministration by the guardians is, to a great extent, checked by the supervision of the Ministry, or Board, of Health, formerly the Local Government Board (hereafter called the central authority), exercised through a staff of inspectors who attend the meetings of the guardians and visit the establishments in their charge. Its powers of control are large.

The policy has long been adopted of protecting the children of pauper parents from being contaminated in character or injured in their future prospects by any taint of pauperism. This principle, already recognised in a statute of 1844 enabling unions to combine to erect district schools apart from the workhouse, was put slowly into practice. Official inquiries have, however, since disclosed disadvantages in massing large numbers of children in big institutions. One of these had accommodation for 2000 inmates. Three alternatives have been introduced: to place children in groups often to twenty in scattered homes within the town, or, secondly, outside the town in cottage homes, in both cases under a foster-mother; to board children out among carefully selected cottagers under conditions prescribed by the Boarding Out Order, 1911. Only orphans, deserted children, and children to whom the guardians stand *in loco parentis* may be thus boarded out. They are supervised either by a committee appointed by the guardians or by an independent committee approved by the central authority. At least one member must be a woman. With lapse of time the type of smaller home was found to possess defects of its own. As between this type and the so-called 'barrack' schools, according to a Board of Education report of 1908, 'the success of the school depends almost entirely on the character of the supervision and the *personnel* of the staff.' A few blind and other defective children can be placed in special schools. A proportion of orphan and deserted children are emigrated to Canada.

The sick may be treated in institutions belonging to or utilised by the guardians, or in their own homes, according to their circumstances and the nature of the malady. The accommodation provided for in-patients may be either a sick-ward in the workhouse building itself, or a building adjacent to, but distinct from, the workhouse, or an infirmary entirely separated from other poor-law establishments, and occasionally the joint property of several unions. Trained nurses are now usually employed, and infirmaries of the latter type are generally equipped as modern hospitals. Persons of a higher class than would enter the sick or ordinary wards of a workhouse are said frequently to avail themselves of them. Patients suffering from serious infectious disorders are usually removed, whether indigent or not, to isolation hospitals, which, though supported from the rates and managed by committees on which the guardians are represented, are not poor-law institutions. So with county lunatic asylums, to which both pauper and non-pauper insane are committed. The hospi-

tals are under the sanitary, the asylums under the county and municipal, authorities.

The medical men in charge of large separate infirmaries usually give their whole time. Those who attend the poor at home are generally in private practice. The latter are termed district medical officers. They have power to order medicines, and to recommend special diet to be granted by the guardians, or, in emergencies, by the relieving officer. In London and other large towns dispensaries have been opened under the charge of the district medical officers. The effect of the National Insurance Act (1 and 2 Geo. V., chap. 55), which came into force on 15th July 1912 (see INSURANCE), has been greatly to modify this department of the poor-law system.

The Poor Law Institutions Order, 1913, was designed to consolidate the regulations governing indoor relief. Admission to the workhouse is granted on the written order of the guardians or by a provisional order of the overseers or relieving officer. In urgent cases the master or matron can admit without an order. Except in cases of sickness, accident, or infirmity affecting himself or one of his family, institutional relief is only to be granted, as a general rule, to an applicant together with his dependants. (See below on out-relief.) Separate quarters are required to be provided for the infirm and the able-bodied above the age of fifteen of both sexes, for boys between seven and fifteen, for girls of the same age, and for younger children. The last-mentioned, however, may be placed in the women's quarters; and married couples are allowed to live together if either of them is over sixty or not able-bodied, a privilege not always appreciated. Further classification of the old according to character is effected in some workhouses. An inmate may leave the workhouse at any time on giving notice. Generally twenty-four hours suffices; but inmates in the habit of leaving and returning at short intervals may be required to give up to seven days' notice. Such 'ins and outs' are partly responsible for the large number of children temporarily retained in workhouses. The head of a family is required to take his dependants with him (or her) on leaving, and the difficulty of moving children to or from separate establishments is obvious.

Special dietary and other privileges are conceded to old inmates of superior character in many unions. For loafers and the able-bodied of bad character special test workhouses have in a very few localities been set apart, where more rigorous discipline is enforced. Great differences prevail locally in the arrangements made for keeping able-bodied male inmates occupied. In some instances they are engaged in making articles or raising vegetables required in the establishments of the union, but in others they are practically unemployed. A more liberal diet, but no cash remuneration, is sometimes allowed the more industrious. Female inmates are engaged in the laundry and other household work of the institution. There is no generally accepted definition of the term 'able-bodied,' and many included under it are unfit for an average day's work. Indoor paupers so classed are practically those to whom the medical officer assigns what is termed 'able-bodied diet.'

The Relief Regulation Order of 28th December 1911, superseding the Outdoor Relief Prohibition and Regulation Orders of 1844 and 1852, codifies the rules of the central authority regarding domiciliary relief. Certain restrictions are imposed upon granting assistance in this form to men or single women in health. But, on the ground of 'special circumstances,' a Board of Guardians may temporarily give out-relief to the family of a man in the workhouse, or to a man himself when set to work and kept employed by the guardians. These

alternatives had been sanctioned by previous orders, and have been generally known as the Modified Workhouse Test and the Labour Test respectively. Relief given under the latter order must be half in kind. Guardians exercising this power must notify the central authority of the circumstances attending their action. The measure was intended to provide a test of destitution alternative to the workhouse whenever, owing to exceptional causes, that institution could receive no more inmates. The task set has usually been stone-breaking, but has occasionally taken other forms, as reclaiming waste land. In some unions a labour-yard has formed one of the permanent establishments of the guardians. Now, however, the class whom the authors of the order of 1844 had in view has been, to a very large extent, provided for by voluntary means or, more recently, through relief-works provided under the Unemployed Workmen Act of 1905 (5 Edw. VII., chap. 18). Relief may not be given to men on strike so long as they are physically fit to work, but may be given to their wives and children when destitute, in which case the men are liable to prosecution for neglecting their families. The Children Act (8 Edw. VII., chap. 67) makes it a penal offence for a parent to abstain from applying for relief if he cannot otherwise supply his child with adequate necessities, including medical aid.

The Relief (School Children) Order of 1905, left intact by the Relief Regulation Order of 1911, authorises school managers to apply for out-relief for any child attending their school in want of sufficient nourishment, whose father is not already in receipt of poor-law relief. This is the sole case in which relief may be given without an application from the recipient. The National Insurance Act of 1911 (1 and 2 Geo. V., chap. 55, sec. 109) provided that, in fixing the amount of out-relief to be granted to a person in receipt of benefit under the act, guardians should not take into consideration such benefit except in so far as it exceeded 5s. a week; and by the National Health Insurance Act of 1924 (14 and 15 Geo. V., chap. 38, sec. 105.1) the figure was raised to 7s. 6d. A similar provision is made regarding members of friendly societies. The history of every application for relief of any kind must be preserved on a form styled a 'case-paper.'

Vagrants and tramps form a distinct class of pauper, for whom separate treatment is prescribed. They must be lodged apart from other inmates of the workhouse, or in distinct buildings known as casual wards. They must remain at least one clear day, and must complete a stint of work before leaving. Their diet is scantier than that of other inmates. The guardians have power to lengthen the detention of habitués. Paupers who are lunatic or idiot may be detained in workhouses, provided a magistrate is satisfied on medical evidence, including the workhouse medical officer's certificate, that separate accommodation is provided for them, or that they can mix with the other inmates without inconvenience. Acute cases are placed in county or borough asylums for the insane. All lunatics found wandering or not under proper care must be brought, irrespective of the question of means, by the police or the relieving officer before a magistrate, to be dealt with according to medical evidence. As a rule the district medical officer's certificate is necessary.

In the view of the reformers of 1834, official relief was designed for the destitute only, and of the genuineness of the destitution admission to the workhouse was to be the test, at least wherever the applicant was able to work. For the impotent or unable to work, the system of out-relief was continued where necessary. The central authority

has pointed out that a person may be destitute in some particular—e.g. medical treatment—'without being destitute in all respects.' Where a family is admitted into the workhouse, it is in the discretion of the guardians to store their household effects in order that they may have them on leaving the house. The right of guardians to recover cost of relief from a pauper or those legally liable for his maintenance is regulated by 12 and 13 Vict., chap. 103, and several subsequent statutes. There is also a common-law right to recover six years' maintenance. Receipt of relief formerly entailed parliamentary and local disenfranchisement during its receipt and thereafter within the registration year, but in 1885 the disqualification, so far as relief ordered by the medical officer was concerned, was removed by 48 and 49 Vict., chap. 46, and in 1918 was completely done away by 8 Geo. V., chap. 64, except in the case of persons actually inmates of a poor-law institution at the time of an election. The introduction by the Act of Settlement, already referred to, of the principle of removability became the cause of great hardship to the labouring class, and of vast litigation and expense to parochial authorities. The law on the subject is still highly complicated, but it now recognises that a person is to be relieved in the place where he becomes destitute, and at the cost of that union, if (*inter alia*) he be legally settled there or have resided within the union for a complete year without break, or if his destitution result from accident or temporary sickness. The qualifications conferring settlement are too numerous to be set forth here, but three years' residence is one of these. The Royal Commission reporting in 1909 expressed the opinion that settlement in its present form 'neither restricts the mobility of labour, nor makes it more difficult for the poor to find houses in their union.' The cost of relief is met by a rate levied on owners of real property and occupiers of land and buildings of every description, whether for purposes of residence or business (see RATES). The effect of the Old Age Pensions Acts, especially following the removal in 1911 of the pauper disqualification, was greatly to reduce the number of old persons in receipt of poor-relief.

Scotland.—The Poor-law Act of 1834 relates to England and Wales alone. In Scotland the principles as well as the machinery of official relief differ in some important respects from those adopted in England. The principal act relating to Scotland is the 3 and 9 Vict., chap. 83. Previous to the passing of this act in 1845 the poor in most parishes were supported out of voluntary collections at the parish church, administered by the heritors and kirk-session; parishes if they chose might levy a tax, but up to 1845 no poor-rate had been levied over the whole of Scotland. In Scotland no claim on the part of the able-bodied to relief of any kind, even on behalf of a sick dependant, is recognised in law, though to a considerable but varying extent it is in practice. No special provision is made for homeless persons or vagrants. Since 1894 the local relief authority has been the Parish Council. The assessment for cost of relief is divided equally between owners and occupiers of lands and buildings. The erection of a poorhouse is discretionary. Parishes having a less population than 5000 can only erect a poorhouse in combination with other parishes. The Parish Council adjudicates on applications for relief upon the report of the inspector of the poor, an official who combines the functions of clerk to the guardians and relieving officer. Bodily or mental inability to earn a subsistence is in law a condition precedent to relief. It is sometimes disregarded in practice. An in-pauper, when certified by the medical officer as in good health, is liable to be

discharged. The inspector has power to refuse relief, but must in that case give the applicant a certificate stating the grounds of refusal. The applicant may appeal against such a refusal to the sheriff, or against inadequate relief to the central authority.

Ireland.—Different systems obtain in Northern Ireland and in the Irish Free State. Previous to its break up as a single legislative unit the principal poor-law enactment affecting Ireland was that of 1838. It established Boards of Guardians and was modelled on the English act, though differing in details. Only indoor-relief was to be given. This prohibition, however, was later relaxed, the position coming to be that out-relief might not be given to occupiers of land or to able-bodied men, and this restriction itself was liable to suspension in times of exceptional distress. In Northern Ireland the system continues along these lines, but in the Irish Free State the inauguration of a county system of administration involved the disappearance of Boards of Guardians and the vesting of control in county councils and committees thereof, as also the abolition of union workhouses and the establishment of county homes and county hospitals.

Royal Commission of 1905-9.—On 4th December 1905 a royal warrant was issued appointing a commission of inquiry into the poor-laws and relief of distress in the United Kingdom. A vast amount of evidence was collected, and in 1909 a majority and a minority report were presented.

The Majority Report proposed that the existing Boards of Guardians should be abolished and that in each county or county-borough a new body (Public Assistance Authority) should be established, assisted by local committees and by voluntary aid committees, the second designed to procure co-operation with local and private charities; that one uniform order regarding out-relief should apply to the entire country, and that voluntary agencies should be utilised for the care of individual cases; that out-relief to the able-bodied should not be prohibited, but regulated according to special conditions; that general workhouses should be abolished, and that separate institutions should be set apart for (1) children, (2) aged and infirm, (3) sick, (4) able-bodied men, (5) able-bodied women, (6) vagrants, (7) feeble-minded and epileptics; that the authority should possess powers of removal to and detention in institutions, and should establish labour and detention colonies for the able-bodied and unemployed; that medical assistance should be reorganised on a provident basis with the aim that all preventive and curative methods approved by science and reasonably accessible to the citizen of average means should be 'obtainable by his poorer neighbour upon payment of a contribution according to his means, and . . . available for the very poor without any payment'; that inability to earn a livelihood should cease to be a condition of relief in Scotland. Stress was laid also upon making the administration of relief of educational value in strengthening the moral fibre of those relieved. The proposals relating to unemployment, that a national system of labour bureaux should be established and that a scheme of government unemployment insurance should be instituted, passed into legislation in the Labour Exchanges Act of 1909 (see LABOUR) and in the unemployment insurance measures of 1912 and of 1920 (see INSURANCE).

The Minority Report agreed with the Majority in advocating the transference of the functions now entrusted to the Boards of Guardians, so far as they concerned the non-able-bodied, to the county and county-borough councils, but differed from it in recommending the apportionment of such functions among the existing committees (education, health,

asylums, pensions) of the councils instead of the creation of a new department, the work of the committees to be supervised by the appropriate national government departments. The measures proposed for dealing with the destitution of the able-bodied included the appointment of a Ministry of Labour (such a ministry was established in 1917), whose chief should be responsible to parliament for organising the labour-market so as to minimise unemployment. This department should manage a network of labour exchanges, should subsidise trade union and other societies giving out-of-work benefit (government insurance against unemployment being rejected in view of its probable adverse effects on trade unions), and maintain labour colonies and day training depôts, where able-bodied men applying for assistance might, without disfranchisement, receive 'such varied beneficial training of body and mind as they proved capable of' while their families received domiciliary relief, and also detention colonies for the refractory. To ensure greater continuity of employment, the Board of Agriculture should put into operation during periods of slackness schemes of afforestation, coast protection, and land reclamation at an outlay not below an average of £40,000,000 per decade.

The keynote of the Majority Report was the unification of the administration of public relief on certain main lines that would tend to further independence and self-maintenance among those assisted. That of the Minority Report was to divide and departmentalise the administration of relief with a view to ensuring 'a national minimum of efficiency.' One would deal with those who make application; the other would seek out and relieve those who do not. No fundamental changes in the poor-law system resulted immediately from either of the reports, but the poor-law orders of 1911 and of 1913 mentioned above introduced minor administrative reforms.

The Local Government Committee of the Ministry of Reconstruction issued an important report ('Maclean Report') in 1918, endorsing the principles advocated in 1909 by the Royal Commission. The committee included representatives of both majority and minority of the Royal Commission, and officials of the Local Government Board. It recommended not merely the abolition of the workhouse and the Board of Guardians, but the sweeping away of the whole existing system of poor-law; and legislation was promised along these lines, later definitely for 1927. In 1919 the Local Government Boards were superseded by the Ministry of Health and Board of Health.

The Dominions.—Throughout French-speaking Canada and the greater part of Australasia public relief has taken the form of state subsidies towards private charities, and has not become the concern of local authorities except to a limited extent in New Zealand. A claim to relief on the ground of destitution alone is not recognised. Nova Scotia and New Brunswick retain the English localised system under overseers. Ontario blends the recognition of local liability with a system of subsidised charity. The newer provinces of the dominion tend to adopt United States methods. Generally speaking, children and the aged are the principal objects of relief. Indoor medical aid consists in subsidies to voluntary hospitals. There appears to be no public system of domiciliary relief except in Ontario. An old age pension system operates in Australasia independently of the poor-law.

FOREIGN COUNTRIES.—The highly involved question of settlement can only arise where responsibility for relief is localised. In the British colonies, where official relief is either centralised or unorganised, it hardly exists. Settlement may

usually be acquired either by birth, residence, or, in the case of females, by marriage. The qualifying term of residence lies between one month, as in some of the United States, and five years, as in Denmark or Italy. The principle that destitution, when relievable, is to be immediately relieved at the spot where it occurs, regardless of settlement, is recognised in France and Germany, and in most of western and central Europe. The chief points of difference arise with regard to removability and chargeability. The laws of the New England states are especially rigid on these points. The liability of relatives to contribute is generally enforceable wherever the system of relief rests on local obligation. There is power to recover the cost of relief, when the pauper is in a position to pay, in France, Austria, Holland, and Denmark, but not in Belgium or Germany.

Austria.—The right to public relief is recognised by law of 1863. The administration is in the hands of the communal authorities in the first instance, and those wholly or partially unfit for work may be provided for in such manner as the commune judges propose. Besides poorhouses and out relief, the practice exists in certain provinces of quartering paupers on householders in fixed succession. Funds for poor-relief are derived from endowments, voluntary contributions, the third of the property left by intestate secular priests, certain percentages on the proceeds of voluntary sales, and in some provinces from hunting licences, dog certificates, theatre money, and in some large towns from percentages on legacies over a fixed amount. By act of 1920 unemployment insurance was introduced.

Belgium.—A law of 1891 enacts that 'public relief shall be furnished to poor persons by the commune.' Every communal council is made responsible for the existence of a *Bureau de Bienfaisance*, or committee for furnishing out-relief, within its jurisdiction. Another committee is formed for the management of hospices and other institutions in communes where such establishments exist. Neglected children and juvenile offenders are placed in state schools styled *Écoles de Bienfaisance*. The relief of the aged indigent rests with the *Bureau de Bienfaisance* and the committees of the hospices. Vagrants and, to a certain extent, the able-bodied poor are dealt with by the police. Habitual vagrants or drunkards are committed to the penal colonies at Merxplas and elsewhere, styled *Dépôts de Mendicité*, for a term of years.

Denmark.—The poor-law of 1891 affirms the duty of the relief authority to provide the destitute with necessities, and when sick with suitable treatment. The communal authority is the relief authority. Exclusive of municipalities, few communes possess institutions. In the towns there are almshouses (*fattighuse*) for the more respectable paupers, and penal workhouses (*tvangsarbejdsanstalten*) for vagrants and bad characters. Children are almost universally boarded out, and, by law of 1913, assistance is granted to children living with their widowed mothers. Poor-law institutions include very small infirmary accommodation. Hospitals are provided by charity and by municipalities, the cost not being included in poor-relief expenditure. An old age pensions system is in being. It is controlled by law of 1922, which in 1923 displaced the original law of 1891. The assistance granted may be in money, or in kind, or by residence in hospital.

France.—A general right to relief from the state is not recognised, except with regard to certain categories of indigents which have steadily increased in number and comprehensiveness from the date of the Directory till now. The principal

relief authorities are the *Direction de l'Assistance et de l'Hygiène publique* (aided by the *Conseil Supérieur de l'Assistance*, an advisory body of experts), corresponding to the Ministry of Health in England; the prefect and *Conseil Général* of the department, corresponding to the County Council in England; the mayor and council of the commune. Under the communal council are the *Bureau d'Assistance* for relief in sickness or old age, and the *Bureau de Bienfaisance* for out-relief in ordinary cases for which obligatory provision has not been made. The *Bureau de Bienfaisance* are quasi-independent charitable bodies enjoying a certain legal status. Relief is obligatory upon the authorities, though not enforceable by the applicant, as regards (1) orphan, deserted, and neglected children; (2) widows, single, or divorced women burdened with children whom they cannot support; (3) the sick; (4) persons above the age of sixteen suffering from infirmity or incurable disease; (5) persons above the age of sixty-five; and (6) the insane. The law on the subject of child-relief was consolidated by an act of 1904. Children may be taken over either permanently or temporarily. When permanently adopted, they are usually boarded out in rural districts, and apprenticed at the age of thirteen to some agricultural occupation under inspectorial supervision. Institutional care is avoided unless it is necessitated by the health or bad character of the child. On the other hand, if the mother is living and the home surroundings are satisfactory, she is granted out-relief for the child's support. No distinction is made between legitimate and illegitimate children. Medical relief, obligatory under a law of 1893, is dispensed through the *Bureau d'Assistance*, which draw up annual lists of persons 'who ought in the event of sickness to be admitted to free medical relief.' Domiciliary relief is preferred, whenever practicable, to hospital treatment. Paris and over 500 other towns, termed *communes autonomes*, are exempt from the general system. The cost of maintaining the insane poor is divided between the departments and the communes. The organisation of relief for the aged and infirm is on lines similar to that of free medical relief. Lists are drawn up and the benefit of the law is not confined to the destitute. An applicant may, with his consent, be maintained in a hospice, but out-relief is the rule, allowances varying within fixed limits. An old age pensions law of 1910, amended in 1912, provides for all wage earners old age pensions towards which both employers and workers contribute. The expense of relief is met by local and general taxation, supplemented by the proceeds of certain taxes on amusements specially allocated to this purpose, income from endowments, and gifts and charitable bequests. In Paris the administration of the poor-law is confided to an authority distinct from that of the rest of France, consisting of a director, assisted by a Council of Supervision and a staff of inspectors.

Germany.—The relief of the poor is governed by law of 1924. Under it relief is granted by District Unions (*Bezirksfuersorgeverbande*) or by Provincial and State Unions (*Landesfuersorgeverbande*); in the first are united the larger and smaller municipalities, in the second the provincial or state authorities. Relief is given in the ordinary place of residence of the recipient, usually by the District Union; but where the recipient has no ordinary place of residence the State Union makes the grant. The sick, the infirm, the unemployed, the aged poor are mainly provided for through the state system of insurance, and the burden on the poor-law system is thus lightened. Relief may be made dependent on labour. In most large towns the Elberfeld (q.v.) system of unpaid district almoners

is in force. The mode of raising funds for relief varies among the several states, but as a rule poor-rates are not levied. The cost may be defrayed out of revenues derived from general taxation or from certain fines, fees, and taxes specially allocated to the purpose; and in some localities the income from endowments is also available.

Holland.—Until 1912 public assistance was regulated by law of 1854, which lays down that no communal authority shall give relief until assured that the applicant is unable to obtain it from ecclesiastical or private sources. This law was profoundly modified by enactment of 1912, which decrees that relief is to be granted to those only who cannot provide for themselves, and are assisted neither by churches or charities, nor by persons legally liable for their support. Special provision is made for medical relief. No poor-rate is levied. Mendicancy and vagabondage are treated as offences and offenders may be placed in a state-work establishment. There are very few work-houses. Unemployment insurance was introduced in 1916.

Hungary.—The right to public relief is recognised by law of 1886. Administration is mainly communal. In the smaller communes orphans and the indigent are cared for by official guardians and overseers, while in the larger there are poorhouses. The funds are chiefly derived from fines and taxes. The church and charitable societies also provide assistance.

Italy.—A general right to public relief is not expressly recognised by law, which, however, requires local authorities to relieve the sick and children, and also 'persons incapable of work,' if a local charity cannot be required under its constitution to do so. In general public charity is exercised through the permanent charitable foundations known as *opere pie*. Sick-relief is administered on a system similar to that imposed by the law of 1893 in France.

Poland.—After the attainment in 1918 of independence the regulations and institutions of poor-relief in what had been Austrian and Prussian Poland continued as in Austria and in Germany; and in what had been Russian Poland, the care of the poor was by private charity. An act of 1923, however, relating to social welfare as a whole, made general regulations as to poor-relief. Provision was made for children, old persons, invalids, cripples, &c.; a campaign against begging and loitering was undertaken; and a scheme of co-operation with charitable institutions supported by private subscriptions was instituted. In principle the duty of social protection lies with local government; the state, however, covers expenses connected with the welfare of persons towards whom it owes a special duty, and also such expenditure as exceeds the financial capacity of a local government unit. The right to social care appertains to all citizens domiciled in one commune for at least one year. The national Ministry of Labour and Social Welfare (a Council of Social Welfare acts as an advisory body) is in the last instance the controlling authority. An old age pensions scheme, and health, accident, and unemployment insurance schemes are also in operation, most transferred with former Austrian and German territories, the later tendency being to extension and unification.

Russia.—The system existing before the Revolution was inaugurated by the Tsaritsas Catherine II. and Marie, the wife of the Tsar Paul I. The former appointed a Committee of Assistance in each province under the presidency of the governor; the latter founded hospices for children and other establishments. The law imposed on communal and municipal authorities, including the police,

the duty of suppressing mendicancy and of setting the able-bodied destitute to work. The efficiency of relief administration varied immensely. In provinces not possessing *Zemstvos* (provincial councils), and in towns below the rank of *chefs lieux*, the organisation of relief was very defective or else non-existent. Among the first acts of the Revolution was one for industrial insurance at the cost of the employer, but in the first phase of communism this was ended, the whole economic system implying the support by the state of the population. The expenditure so involved was ruinously large yet the individual did not receive as much as under the old system, and with the new economic policy a return was made to more usual methods of relief. There are rural relief committees with power to raise a rate; the state does not contribute though to some extent it controls. For all wage-earners there is compulsory contributory social insurance, and for the remainder state relief together with pensions.

Sweden.—According to ordinances of 1918, the communes are obliged to assist children under 16 years of age if their circumstances require it, and all who from age, disease, or physical or mental infirmity are unable to support themselves. Each commune and each town constitutes a poor district and in each is a board of public assistance. These boards possess workhouses and similar establishments, including cottages assigned as pauper dwellings.

United States.—There is no federal poor-law or poor-law system in the United States. Poor-relief is under the control of the individual state. There is great variety in the form of administration. The county system is probably the predominant system. Under it administration is in the hands either of the county court, or of specially elected county officers, or, more usually, of the board of county commissioners or supervisors, which is the general county authority. In the New England states the township is the unit of administration. In the large cities relief is usually administered by overseers or salaried officers, either appointed by the mayor or Town Council or else elected *ad hoc* by the citizens. An express recognition of the individual claim to relief appears in the legislation of some only of the states—e.g. Connecticut and New York. Supervision over poor-relief is exercised in many states through the State Boards of Charities, and in New York and New Jersey through the State Charities Aid Associations of those states, officially recognised. Out-relief, absolutely prohibited in only a very few areas, is generally much restricted both in amount and in the class of cases eligible for it. In some states, however, the numbers in receipt of out-relief exceed those in institutions. The almshouse, answering to the old English poorhouse, is provided in most of the states. Institutions for the insane and other special classes of defectives are increasing in number, and relieve the almshouses of the burden of defective paupers. A labour test for the able-bodied is common, and vagrants are dealt with penally. Generally speaking, there is no separate organisation of medical relief. In some localities separate hospital wards have been added to the almshouses. Pauper in-patients are, however, very commonly maintained in municipal or private hospitals at the expense of the poor-law authority. The retention of children in almshouses is restricted in many states, and in several, including New York, is prohibited. In some instances the state or county authorities establish institutions for such children; more usually they are maintained at the public expense in private charitable institutions, which in some cases are subjected to state inspection. Large numbers of children are boarded out for payment, or 'placed out' with-

out payment. This is sometimes done through the agency of Children's Aid Societies, sometimes through officers of the state or poor-law authority, who exercise supervision during the period of boarding out. Indiana and some other states have created Boards of Children's Guardians, which can bring delinquent or neglected children before the courts. The courts then transfer the children from the custody of their parents to that of the board. The funds required by poor-law authorities are in most instances raised by taxation. At the same time, the numbers of poor relieved by private charity, and particularly in charitable institutions, are exceptionally large when compared with charitable activity in other countries.

See, as to the British Isles, Sir George Nicholls's histories of the English, Scottish, and Irish Poor-laws; S. and B. Webb's *English Poor Law History* (Pt. 1, 1927); Glen's *Poor Law Statutes and General Orders*; Aschrott and Preston-Thomas's *English Poor Law System* (1901); *The Law relating to the Relief of the Poor* (1912, 2d ed. 1923), by the Editors of the *Poor-Law Officers' Journal*; rules reissued to parochial authorities by the Local Government Board for Scotland, 1897; Royal Commission on the Poor-laws, Majority and Minority Reports for England, Scotland, and Ireland (1909); Local Government Board (England) statements for 1st January and 1st July 1912; Annual Reports of the Local Government Boards, &c. See, as to the British colonies and foreign countries, C. F. A. Hore's Memorandum, Appendix vol. xxxiii., 1910, of the Royal Commission on the Poor-laws; and Reports of State Boards of Charities, U.S., and the official *Summary of State Laws relating to the Dependent Classes*, 1913 (Washington, 1914).

Poor's-roll. See IN FORMA PAUPERIS.

Popayán, a town in SW. Colombia, in an elevated and fertile plain, is an archbishop's see, with a college, seminary, and convent; pop. 20,000.

Pope. See RUFFE.

Pope (Gr. *pappas*, Lat. *papa*, 'father,' at first used of all bishops, from the 5th century gradually appropriated in the West to the Bishop of Rome, though still used of priests of the Greek Church), the Bishop of Rome, and supreme pontiff of the Roman Catholic Church. In this article an historic sketch will be given of the papacy as an institution. While the empire remained pagan the history of the bishops of Rome is obscure. Tradition confirmed by the faith of the church represents St Peter as the first Bishop of Rome. His immediate successors must have been recognised by Christians as the heads of Christ's church in the imperial city. Rome, the mistress of the world, was regarded by all men with reverence; all men came thither. So among Christians its bishop held a position of special dignity, and his judgment in ecclesiastical controversies was regarded as weighty. The heresy of Novatian, irregularly ordained Bishop of Rome during the lifetime of Cornelius (251), illustrated the importance of ecclesiastical unity, and so in the end tended to exalt the Bishop of Rome as the visible head of the church.

Under Constantine the empire became Christian, and Rome ceased to be the sole imperial city. The first of these changes vastly increased the dignity of its bishop; the second separated Latin from Eastern Christendom; the heresies of the speculative East found no acceptance in the West; the Bishop of Rome became the champion of orthodoxy, and was recognised by the Council of Sardica (347) as having appellate jurisdiction. Before the end of the 4th century Siricius, in publishing his decretal on clerical celibacy, assumed that the law of the Roman Church was binding everywhere. A great increase in power may be dated from the reign of Innocent I. (402-417), who claimed, as the successor of St Peter, superiority over western Christendom. The weakness of the western empire,

the sack of Rome by the Visigoths, and the reverence which they paid to all things Christian, combined to make Innocent the most powerful person in the Christian city which rose upon the ashes of pagan Rome. Leo I. (440-461) maintained the claim of his see to the patriarchate of the West, while in Rome and Italy his fearlessness and prudence during the invasions of the Huns and Vandals gave him commanding influence. In 476 the empire of the west came to an end; the sole emperor of the Romans reigned at Constantinople. As long as he left Italy alone the papal power was the stronger for his absence. Amid the political disintegration of the West the church remained a stable bond of union; its centre was Rome, and the head of Rome was the pope, who became more and more regarded as the leader and defender of the people. Though Theodoric the Ostrogoth, while master of Italy, abstained from interference with the bishops of Rome until shortly before his death, some trouble arose from disputed elections. The election anciently lay with the clergy and people of the city, but as the interference of the laity led to violence, Symmachus decreed (498) that thenceforward the election should be decided by the votes of the Roman clergy. The reconquest of Italy by the generals of Justinian impaired the papal power, for he treated the pope like a rebellious servant. As the imperial power waned in Italy before the invasion of the Lombards, the pope again became pre-eminent. Neglected by her emperor, Rome found a protector in Gregory the Great (590-604), who was forced by the sufferings of the people to deal with the Lombards as a temporal prince. Yet his work was chiefly spiritual. Under him the right to the patriarchate of the West was firmly established; his holiness, his writings, and his reforms were universally admired; he exercised ecclesiastical discipline over the bishops of other lands, and he resented the indignity put upon his see by the assumption of the title 'Universal Bishop' by the Patriarch of Constantinople. Under him the Arian invaders of Italy, the Lombards, were converted to Catholicism; so, too, were the Arian Visigoths of Spain; while the heathen English first received the gospel from missionaries whom he sent out. Gregory completed the work of Innocent and Leo, and was the greatest of the three founders of the papacy of the middle ages.

During the 7th century the popes were much troubled by the eastern emperors, who were still lords of Rome and some parts of Italy. The emperors caused elections to the papacy to be submitted to themselves for confirmation, tried to force the popes to concur in their heresy concerning the will of Christ, and treated them as mere officers of their state. Martin I. (649-654), a strenuous opponent of the Monothelite heresy, was seized, carried off to Constantinople, and, after suffering ill-usage, died in exile. Even when the emperors again became orthodox they still humiliated the popes. Meanwhile the papal power was growing in western lands: the English turned from Columban usages, and professed obedience to Rome (664); the Burgundians and Frieslanders received the gospel; and early in the 8th century Boniface won over a large part of Germany to the faith, acting on a commission from Gregory II. (715-731). In Gregory's time the Emperor Leo III. forbade the worship and even the use of images throughout his empire, whence he and his successors who adopted the same policy are called Iconoclasts (image-breakers). Gregory refused to obey his decree, and was upheld by the Italians and the West generally. The imperial governor in Italy, called the exarch, sought to compel the pope to obey his master, and the Italians rose in the pope's defence. The Lom-

hards took advantage of the confusion to conquer the exarchate. They threatened the lands of the church; no help was to be had from the emperor; Italy was virtually severed from the empire. In his distress, Gregory III. (731-741) appealed for help to the Catholic Franks. Twice Pepin brought an army of Franks to the pope's relief, and routed the Lombards; he won back from them all that had belonged to the exarchate in Northern Italy, and bestowed it on the Roman see (754). This was the beginning of the temporal power of the popes. In return Pepin accepted from the pope the title of Patrician of the Romans, an acknowledgment of his rights in Rome, and of his duty as the defender of the church. He had already received the papal sanction for the deposition of the Frankish king and his own coronation; the pope's action in this matter formed a precedent not forgotten by his successors. Pepin's son, Charles (Charlemagne), again routed the Lombards, and renewed his father's donation. At another visit he declared Leo III. (795-816) guiltless of certain crimes with which he was charged, and on Christmas Day, 800, Leo crowned him emperor. It was contrary to the feelings of the age that the church should lack an imperial protector; the breach with the eastern empire was complete, and the imperial throne at Constantinople was held to be occupied unlawfully. While Leo had allowed his cause to be judged by a temporal prince, and had accepted him as master of Rome and emperor, he had assumed as God's vicar the right to bestow the imperial crown, which carried with it the lordship of the world.

During the struggles that preceded the break-up of the Frankish empire the popes generally favoured the princes of the West (or Gaulish) Franks, rather than of the East (or German) Franks. The rise of separate nations threw political power into the hands of the great churchmen of the new states. The pontificate of Nicolas I. (858-867) was marked by the successful assertion of the authority of Rome in correcting the vices of princes, and compelling the submission of the most powerful prelates of the West, such as the Archbishop of Ravenna, certain German bishops who upheld their king in his evil ways, and even Hincmar of Rheims. His chief weapon against the bishops was a series of early decretals, now known to have been forgeries not emanating from Rome. The lofty policy of Nicolas was pursued, though with less success, by Hadrian II. (867-872). Meanwhile a dispute begun in the time of Nicolas was leading the Greek Church towards schism. During the papacy of John VIII. (872-882) the Saracens established themselves in Southern Italy and threatened Rome, and the courageous pope sought help on all sides against them and his Christian enemies. The anarchy in Italy which followed the extinction of the Carolingian empire had the worst effects on the papacy. Things were darkest in the first half of the 10th century. Competitors for power treated the popes as their tools, and elections to the papacy were decided either by the nobles of Rome, or the mob, or any foreign power which chanced to be master of the city. No reverence was paid to the papal office, and several of those raised to it were men of fierce and unholy lives. Pressed by enemies, John XII. sent for help to Otto the Great, king of Germany, and, by crowning him emperor in 962, revived the empire; he acknowledged Otto as his sovereign, and the Romans swore to elect no pope without the emperor's consent. Though Otto, his son, and his grandson did something towards restoring to the papacy its proper dignity, the attempt to regenerate it failed; and, after the death of Otto III., it was again degraded by falling under the control of the counts of Tusculum.

The emperor Henry III. regenerated the papacy by releasing it from the control of the Roman nobles, and conferring it on German churchmen of high character. One of these, Leo IX. (1049-55), commanded the respect of Christendom by his revival of ecclesiastical discipline. He was taken prisoner when attempting to check the Norman invaders of Italy, but the Normans revered their captive, and after his death acknowledged the pope as the feudal lord of their conquests, Sicily and Southern Italy. Under the guidance of Hildebrand (see GREGORY VII.) the papacy advanced rapidly in power and repute. By a decree of Nicolas II. (1059-61) in 1059 the right of election was vested in the cardinals. After a severe struggle clerical celibacy was enforced, and the clergy thus separated from worldly ties became devoted to the interests of their order and its earthly head. Simony was strictly repressed. A further advance was made when Gregory VII. (1073-86) forbade churchmen to receive investiture of their benefices from lay hands. This touched the sovereignty of lay princes. He was opposed by the Emperor Henry IV. (q.v.). The principle at stake was the church's independence of the lay power, its dependence on its own visible head, and its consequent salvation from feudal bonds and abuses. Gregory asserted the highest claims, and deposed the emperor, who made a humiliating submission at Canossa in 1077. Pope and emperor each found support, the pope in the discontent of the Germans and in the Normans. War broke out, an antipope and rivals to the emperor were set up. The struggle lasted beyond the lives of Gregory and Henry IV., and was decided in 1122 by the Concordat of Worms, which, though a compromise, was a substantial victory for the papacy. During the struggle the Crusades brought a vast increase of power to the pope, for they made him the head of Christendom in arms and the director of its forces. Though disturbed for a few years by a schism, the result of Roman faction, the reign of Innocent II. (1130-43) was a time of greatness. The religious orders had from the first rise of western monasticism been strong upholders of the papacy, and each order as it was founded laid its new-born zeal at the disposal of Rome. Innocent gained much from the support of St Bernard, backed by all the strength of the Cistercian order. Under Hadrian IV. (1154-59), a native of St Albans, named Nicolas Brakespear, the only Englishman who has been raised to the papal chair, the papacy entered on a struggle with the Emperor Frederick I., who was determined fully to enforce his imperial rights. In theory pope and emperor supplied each the complement of the other's power, the one being God's vicegerent in spiritual, the other in worldly things; but the limits dividing their spheres of action were undefinable, and when both were strong they were almost forced into hostility. Among the definite causes of dispute was the sovereignty of the pope over certain parts of Italy which had been bequeathed to the papacy by the Countess Matilda of Tuscany (died 1115). The popes were upheld by a league of the Lombard cities, which carried on a long war with the emperor; he was defeated, and in 1177 submitted to Alexander III.

The papal authority reached its greatest height under Innocent III. (1198-1216), who ruled as the head of a vast spiritual empire, founded on the reverence of mankind for righteousness. He was master in Italy. His strife with two emperors ended in the success of his ward, Frederick II., inheritor of the Sicilian throne, whom he crowned emperor. By excommunication he forced the king of France to put away his paramour; he deposed John of England, and compelled him to become his

vassal. The kings of many nations submitted to his rebukes. The Latin conquest of Constantinople brought the East for a while under the papal obedience, and a crusading army began to extirpate the heretics of Languedoc. More important than all was the foundation of the orders of St Dominic and St Francis, which gave the pope well-organised and generally devoted forces in every land. Innocent was the first pope that exercised full dominion over the States of the Church. Their position as temporal sovereigns brought his successors into collision with Frederick II., who, already king of Sicily and Naples, wished to gain Central Italy. Had he done so he would have made the papacy dependent on himself. Gregory IX. (1227-41) and Innocent IV. (1243-54) resisted him by every means, spiritual and temporal, at their disposal. The Italian cities of the Guelph or papal party were their strongest allies. Innocent declared the emperor deposed, and found allies against him in Germany. The papal resources were strained; money was extorted from foreign countries, especially from England, and the papacy lost in repute by its demands. The struggle was continued against Frederick's house until it was extinguished. All danger of subjection to the empire was past; but the papacy owed its final success to Charles of Anjou, who was invested with the kingship of Sicily and Naples. This gave France an interest in Italy, and led to the subjection of the papacy to the French king. The imperial power having fallen, Boniface VIII. (1294-1303) sought to take the emperor's place as head of Europe. His aims were secular and his temper violent. National monarchies were being built up in England and France by strong kings. The claims of Boniface were subversive of their domestic policy; they refused to admit them, and he quarrelled with both kings. The Italian partisans of Philip IV. of France seized him; he was brutally treated, and died soon afterwards.

Philip procured the election of a Frenchman, Clement V. (1305-16), who resided at Avignon in Provence, afterwards sold to the papacy. There the papal court remained for about seventy years, a period called the 'Babylonish Captivity,' during which the popes were much under the influence of their powerful neighbour of France. A long struggle with the Emperor Louis IV., in which the popes were successful, injured the reputation of the papacy. During its course men began to criticise the character and claims of the papacy. It was attacked on ecclesiastical grounds by the 'Spiritual Franciscans,' and by scholars like Ockham, and on political by the imperial legists. The court at Avignon was luxurious and venal. Little revenue came from the States of the Church, which fell into disorder during the pope's absence, and large sums were raised from national churches and by corrupt means. Fearing to lose all authority in Italy, Gregory XI. returned to Rome in 1378, but died there immediately afterwards. Urban VI. was elected, but the French cardinals, supported by the king of France and the Angevin queen of Naples, rebelled, and elected Clement VII. During the schism which ensued the obedience of Europe was divided between rival popes. In order to heal the schism the cardinals revived the long disused authority of a general council. The Council of Pisa (1409) failed of its object. The reformation as well as the reunion of the church was largely desired. In England Wyclif urged apostolic poverty as the only cure for abuses. His teaching was of little practical importance, save that it helped forward the revolt of Bohemia, where the Slavs regarded the Latin liturgy as a badge of German superiority. Many orthodox churchmen desired to see the abuses of

the papal court reformed and the churches of the several countries preserved from undue papal interference. By the Council of Constance the schism was closed, and Martin V. (1417-31) was elected pope; the council proved unequal to deal with reform. Martin's wise administration raised the papacy from its low estate; he regained its possessions, and made its power widely felt. The Bohemian war made another council inevitable; it met at Basel in 1432, it attacked Eugenius IV. (1431-47), raised up an antipope, and ended in contempt. Meanwhile the Greeks, hoping for help against the Turks, submitted to the holy see. In another respect the papacy was specially affected by the troubles of the Greeks. It readily adopted the learning and culture brought by the Greeks to Italy. The genius of Nicolas V. (1447-55) conceived a new ideal. The 15th century was an age of splendour; its magnificence was conspicuous in the lives not merely of princes, but even of nobles, merchants, and bankers. As the papacy outstripped all earthly powers in greatness, so in the mind of the pontiff was Rome its seat to impose on the imagination of all the world by an exterior grandeur which should outshine that of the city of any earthly potentate. But his was no vulgar ideal of mere magnificence; Rome to him was to be the protectress of the arts, the home of learning, the central point of culture in the Christian world; and all this was but to typify and render sensible the supremacy of religion.

Under Pius II. (1458-63) the pope again appeared as the natural head of the forces of Christendom united in arms against the infidel. Pius died when actually setting out on a crusade, and his plans failed, but they gave the papacy renewed importance in the eyes of Europe. His successors, inheriting generally the views of Nicolas V. in regard to Rome as the material expression of papal greatness, did not inherit the loftiness of his spirit. Whilst pursuing the idea of surrounding the papal dignity with pre-eminent splendour, some, like Paul II. (1464-71), betrayed a sympathy for the pagan renaissance which is unmistakable, and which cannot fail to have diminished the veneration due to the head of the church. Other popes, like Alexander VI. (1492-1503) or Julius II. (1503-13), were bent on founding in the Italian states princedoms either for their relatives or for the papal chair. This is specially true of Alexander (Borgia), whose earlier life had been immoral, and who as pope caused scandal by his undisguised love of worldly pleasures; whilst his son Caesar, an able, unscrupulous man, made matters worse by his crimes.

Meantime the idea of reform had not slept—witness the activity of such a man as Cardinal Nicolas of Cusa; but efforts like his were inspired by individual minds of a specially lofty turn, and at most had the countenance of supreme authority; however widespread, they were local and were not that general 'reformation in head and members' which had been so loudly and so earnestly called for. The inevitable day of reckoning came, but in a guise which none expected. In place of reform the Protestant Reformation effected a ruthless breach with the past, and instead of the enforcement of the law of the church that law itself was repudiated. Events now convinced, but too late, the most unwilling minds that what priests and bishops, regulars and seculars, theologians and zealous laymen had pressed for had been indeed the need of the time. Rome itself furnished a lamentable illustration of the ruin that had come upon the church. Clement VII. (1523-34), though he had his own political aims, was as a man not unworthy of his office, and by character the least able to bear the brunt of the storm; yet it was he who witnessed Rome ruthlessly sacked (1527), and

that by the troops of Charles V., who during the first half of the 16th century was the mainstay of the Catholic cause, and by his dignity as then emperor-elect the recognised protector of the Roman Church. The impression made by this event on all religious minds is well expressed in the measured but weighty words of Cardinal Sadoleto. 'If those,' he writes, 'had done their duty on whom the obligation chiefly rested (I speak not of the pontiff whose virtues, mildness, and uprightness are known not as great merely but as admirable), the priesthood would still be venerated as of old, and not now exposed to injury and contempt. I say what I feel, and God and man are my witnesses, that this best of pontiffs desired to cure these corrupt morals; but the thing needed the knife, not a salve, and his nature and kindly spirit shrank from strong measures.'

From this point the history of the papacy to the close of the 18th century falls naturally into three divisions. From 1530 to the early years of the 17th century there takes place a reconstitution of the papacy on the basis of Catholic reform; next follows a century of normal activity on the new basis thus formed; thirdly, a century of decline in influence, the term of which is marked by the conclave in Venice which resulted in the election of Pope Pius VII.

(1) No time was lost in setting about the work which now all recognised as the imperative need. The papacy was not prominent in the work of reform; but the countenance given by Rome to men like Contarini, Pole, and Ghiberti is sufficient evidence that the popes themselves did not intend to be behindhand. The pontificate of Paul III. (1534-50) witnessed two events of considerable importance to the future of the church—the institution of the Jesuits, and the commencement of the Council of Trent. In 1534 Ignatius of Loyola pronounced his vows in the presence of the pope, and thus laid the foundations of a society of men specially devoted to the service of the holy see, with which its fortunes have subsequently been intimately associated. The ideal conceived by Ignatius was that of an order governed by 'a general whom all should be bound to obey under vow, who should be perpetual, possessed of absolute authority, subject entirely to the pope, but not liable to be restrained by any chapters of the order.' Paul III., on September 27, 1540, by the bull *Regimen militantis*, gave the papal approval to the 'form of life' designed by the founder. The Council of Trent, whatever be the import of its dogmatic definitions, is essentially a council of disciplinary reform; but in this place it requires notice as being a council of which, though held at a distance from Rome, the control and effective action really vested in the pope. After long negotiations the council convoked by Paul III. met at Trent in December 1545. As early as 1542 the papal legates had reached that city; but the war between France and Germany which then broke out made the further delay inevitable. It is worth remarking, as showing the influence already possessed by the newly-founded Society of Jesus, that two of its members came to the council as papal theologians. On April 28, 1552, the sittings of the fathers were suspended for two years. On November 29, 1560, the then pope, Pius IV., convoked it for the following Easter. The decree of reformation of morals and government, consisting of eighteen chapters, was adopted in the 23d session. It contained a number of important provisions on the residence of bishops and parish priests, upon the qualifications for the priesthood, and for the erection of seminaries for clerical training. In the 25th session was passed a series of regulations for the regular clergy and nuns. The decrees of the council were formally confirmed by Pius IV. in

1564. By its declarations on dogmatic theology the council gave prominence to the differences existing between Catholics and non-Catholics, and thus more sharply divided Christendom into the spiritual subjects and the enemies of the papacy. The cause of Catholic reform dominated the policy of Paul IV. (1555-59), and from his time the constitution of the Roman see in its modern aspect progressed practically without a check. In this period, too, falls the establishment of administrative bodies called 'sacred congregations,' which henceforth are the recognised and usual organs for the exercise of papal power in the government of the church. Lesser objects were not neglected. If modern Rome has been for so long the city in Europe which has attracted and deserved to attract the curiosity and admiration of all men, this is largely due to the continuation during this period of the works begun under the inspiration of Nicolas V. It is often forgotten that St Peter's itself was not completed till 1626.

(2) By the beginning of the 17th century the papacy as an institution had reconstituted itself in accordance with the circumstances induced by the Protestant Reformation. Its history in this second period shows no such stirring events as had marked the preceding age. But for its future the transfer of the weight of political power from the House of Austria to that of France was of decisive importance. The full consequences of the change were not, of course, perceived immediately, but it is certain it was recognised in Rome as momentous, and was not viewed with satisfaction.

(3) The conclave which assembled in Rome in the year 1700 determined the history of the papacy in the third period. Among the cardinals the one who enjoyed the most respect was the Dominican Cardinal Orsini, the head of a body of cardinals whose views are sufficiently indicated by the name given to them—the *Zelanti*. He was a man of illustrious family, dominated by a sense of duty in all things great and small, of slender intellectual capacity indeed, but endowed with a rare gift of discerning merit and capacity in others; free from petty jealousy, he knew how to gather round him men of ability, and how to use them when he had them. But the change in the balance of power effected during the 17th century determined the election of Cardinal Albani, to whom was given the whole weight of the influence of France. As Clement XI. (1700-21) he was in the most important acts of his reign inspired by Louis XIV. To outward appearance, in the first half of the 18th century, the position of the papacy in its relations with princes and peoples remained as it had been before. To some extent also it is certain that Benedict XIV. (1740-58), by a charm of character which impressed even one so keenly alive to the weak side of humanity as Walpole, staved off the evil day. But before his death the signs of disintegration were unmistakable. Throughout Europe luxury and an accompanying dissoluteness of manners had increased to shamelessness, whilst the school of infidelity in France was now fully organised and confident of victory. The full effect, moreover, of the displacement of the imperial House of Austria as the political prop of the church in favour of France now made itself manifest, and the Jansenist troubles of the 17th century bore bitter fruit. The whole church of France had become involved in the quarrel. On the one side the bishops nominated by the king insisted, as in duty bound, upon the acceptance of the bull *Unigenitus* issued by Clement XI. in 1713, whilst on the other a large body of the clergy and a not less large body of the laity resisted a bull involving assent to a lengthy series of abstract theological propositions. Of the violence of these

theological quarrels it is now almost impossible to form an idea, and more than one cool observer believed schism in France to be imminent. Thus, whilst the papacy needed every aid to stem the rising tide of infidelity, it found those on whose help it should have been able to depend involved in intestine conflict. The second half of the 18th century was for the papacy a slow agony, the successive stages of which do not call for notice here. By the suppression of the Jesuits the papacy not merely deprived itself of an able body of strenuous defenders, but cast by the very act dismay among the ranks of many devoted to the church. Moreover, the manner of the fall of the Society of Jesus was not calculated to lessen the weight of responsibility, or it may be said the odium, attaching to so grave an act. It fell with dignity, and the cruelties inflicted upon many of its members called forth in unlikely quarters sympathy for the victims. It was natural that onlookers should be more impressed by these more recent occurrences than by the long chain of events which had brought the holy see to view the suppression of the Order as inevitable.

Even the faithful House of Austria now fell away, and the Emperor Joseph II. assumed to himself and exercised functions which the popes had ever claimed as pertaining to the supreme ecclesiastical power. The fruitless journey of Pius VI. (1775-99) to confer with Joseph II. at Vienna in 1782 is the outward evidence of the humiliation of the papacy. Before long the Revolution which broke forth in France swept away king and priest and all established institutions in church and state, involving Catholic Europe in disorder. An outbreak in Rome, fomented by the agents of the French ambassador, forced the pope from Rome as a prisoner (1798); and, after his removal from one place of confinement to another, Pius VI. died at Valence on 29th August 1799, Napoleon having, two years before, in anticipation of his death, given orders that no successor should be elected, and that the papacy should be abolished.

A few words must still be given to the present and fourth period of the modern age of the papacy. Through the instrumentality of schismatic Russia, the conclave of cardinals met in the monastery of St Giorgio Maggiore at Venice on the 1st of December 1799. The conclave lasted for nearly four months. Just as the conclave of 1700 was decisive as regards the fortunes of the papacy in the 18th century, so was this of 1800 as regards the 19th century. The possible candidates were numerous; the choice finally rested on the Benedictine cardinal, Chiaramonti. Nothing better illustrates the confusion of ecclesiastical ideas in the 18th century, or a chief source of the weakness of the church, induced by universal suspicion, than an accidental expression used by a member of the conclave, Cardinal Langini, in his private diary. Explaining the objections felt by some in the conclave to Chiaramonti, he notes under 12th March 1800, only two days before the election, 'Chiaramonti, as a Benedictine, being suspected of Jansenism.'

No one who reviews the history of the 19th century can doubt that events have justified the choice of the cardinals. After enduring shocks which to human eyes seemed to threaten its very existence, the papacy has become once more a factor of the greatest potency in the civilised world. That this is so is largely the result of the personal character of Chiaramonti, the new pope, who as Pius VII. (1800-23) combined a conciliatory temper with an unconquerable inflexibility when vital principles were involved. The history of his relations with Napoleon I. is sufficient of itself to explain how he, destitute apparently of all human help, won for himself the respect

of those who would naturally have been the first to contest his spiritual authority. In the space of his pontificate he was able to restore the papacy to the position which it had held a hundred years before. Under him began that restoration of Catholic life and Catholic aim which has attracted some of the ablest intellects and most statesmanlike minds of the century to the service of the church; and under him and his successors was accumulated a reserve of Catholic strength which is one of the most interesting and remarkable features of the 19th century.

The successors of Pius VII. by the personal purity of their lives contributed greatly to advance this Catholic revival. The reigns of Leo XII. (1823-29), Pius VIII. (1829-30), and Gregory XVI. (1831-46) witnessed an increase of zeal on the part of the Roman Catholic clergy everywhere, and a marked development of the spirit of loyalty to the holy see both in them and in the ranks of the Catholic laity. In France the exertions of Montalembert, Lamennais, and others firmly established a new school, which, whilst professing enlightened liberal doctrines, was founded on the principle that complete and loyal submission to the teachings and direction of Rome was the first duty of every Catholic. In England the passing of the act for Catholic emancipation in 1829 gave liberty, and with it new life, to Roman Catholics.

Pius IX. (1846-78) was chosen to succeed Gregory XVI. He had generally been credited with advanced liberal views, and had exerted himself during the civil disturbances under his predecessor to secure some mitigation of the punishments meted out to the political prisoners. He began his rule with a proclamation of general amnesty for such offenders, and for the first two years he maintained a policy of liberal political reform. At the end of that time he had practically become a prisoner in the hands of the revolutionary party, and on November 24, 1848, he escaped in disguise from Rome to Gaeta. Here he remained till in April 1850 he was brought back to Rome by the French troops. On September 29, 1850, he took the important step, as regards the English Catholics, of establishing a hierarchy of bishops in communion with the Roman see. On December 8, 1854, he issued the bull *Ineffabilis Deus*, by which the doctrine of the Immaculate Conception of the Blessed Virgin Mary was declared to be a dogma of the Christian faith. Ten years later (December 1864) he published the famous encyclical *Quanta cura*, together with the *Syllabus*, or catalogue of errors of the day which called for special condemnation. Romagna, a portion of the pontifical states, was occupied by the Sardinian troops in 1860, and in September of the same year, after a stubborn resistance made by the pope's troops at Ancona, most of the States of the Church were annexed to the kingdom of Victor Emmanuel. From that time till 1870 Pius IX. was maintained in Rome by a French garrison. On the 18th of July of that year (1870) the Vatican Council, which the pope had assembled at Rome, decreed the dogma of Papal Infallibility part of the faith of the church. Upon the outbreak of the war between France and Prussia the French garrison was withdrawn from Rome, and on the news of the defeat of the French the Sardinian troops moved upon Rome. After a slight show of resistance Victor Emmanuel's army entered the city on the 20th September 1870, and from that time the temporal power of the pope has ceased to exist. Pius IX. for the rest of his life remained in the Vatican, refusing to recognise what had been done. See the article PIUS.

Leo XIII. (1878-1903) continued to maintain towards the kingdom of Italy the attitude taken up by Pius IX., secured an influence which made itself felt, and won for himself the respect of Euro-

pean powers. In Germany his wise diplomacy brought about a mitigation of the anti-Catholic 'May Laws.' In a question of disputed rights over the Caroline Islands his arbitration was sought by Germany and Spain, and his award accepted as final. The state of Ireland caused him to despatch thither a special envoy to study on the spot and report to him the nature of the agrarian difficulties which had arisen there, and in 1888 he condemned boycotting and the Plan of Campaign. In 1891 came the encyclical on capital and labour. Other facts are recorded in the article LEO.

Pius X. (1903-14) forbade the use in church services of any music later than Palestrina; appointed a commission to codify the canon law (1904), and another to restore the text of the Vulgate (1907); refused to allow the French bishops to accept the church policy of the French republic; condemned Loisy's works and 'modernism' in every form. See PIUS.

Benedict XV. (1914-22) attempted, unsuccessful-

ly, to open peace negotiations during the Great War. See BENEDICT.

Pius XI. began his pontificate (1922) with the reputation of a cultured and capable administrator, imbued with liberal ideas.

See Ranke's *History of the Popes*; Milman's *Latin Christianity*; Bryce's *Holy Roman Empire*; Creighton's *History of the Papacy during the Reformation*; Gregorius, *History of the City of Rome in the Middle Ages* (1859-72; trans. 1895-98); Pastor, *History of the Popes from the Close of the Middle Ages* (1886 et seq.; trans. 1892 et seq.); Grisar, *Rome and the Popes of the Middle Ages* (trans. 1911 et seq.); A. E. MacKillop, *Chronicle of the Popes* (1912); J. McCabe, *The Popes and their Church* (1918); A. Fortescue, *Early Papacy* (1920); and various collections of documents, such as the *Regesta Pontificum Romanorum* (ed. Jaffé and Potthast). See also the articles BULL, ENCYCLICAL, INFALLIBILITY, ITALY, REFORMATION, ROMAN CATHOLIC CHURCH, and the books there cited; and the separate articles on the chief popes. In the following list the order and dates of accession are taken from P. B. Gams's *Series Episcoporum*, the names of the antipopes being given in italics.

St Peter.....	41	Boniface V. (Neapolitan).....	619
Linus.....	67	Honorius I. (Italian).....	625
Cletus, or Anacletus.....	79	Severinus (Roman).....	640
Clement I.....	91	John IV. (Dalmatian).....	640
Evaristus.....	100	Theodorus I. (Greek).....	642
Alexander I.....	109	Martin I. (Tuscan).....	649
Sixtus I. (Roman).....	110	Eugenius I. (Roman).....	654
Telesphorus (Greek).....	128	Vitalianus (Italian).....	657
Hyginus (Greek).....	138	Deusdedit II. (Roman).....	672
Pius I. (Italian).....	142	Domnus I. (Roman).....	676
Anicetus (Syrian).....	157	Agathon (Sicilian).....	678
Soter (Greek).....	168	Leo II. (Sicilian).....	682
Eleutherus (Greek).....	177	Benedict II. (Roman).....	684
Victor I. (African).....	190	John V. (Syrian).....	685
Zephyrinus.....	202	Conon (Greek).....	686
Callixtus I. (Roman).....	213	Sergius I. (Sicilian).....	687
Urban I. (Roman).....	222	John VI. (Greek).....	701
Pontianus (Roman).....	230	John VII. (Greek).....	705
Antherus (Greek).....	235	Sisinius (Syrian).....	708
Fabianus (Roman?).....	236	Constantine (Syrian).....	708
Cornelius (Roman).....	251	Gregory I. (Roman).....	715
<i>Novatianus</i>		Gregory II. (Syrian).....	731
Lucius I. (Roman).....	253	Zacharias (Greek).....	741
Stephen I. (Roman).....	254	Stephen II. (Roman).....	752
Sixtus II. (Roman).....	257	Stephen III. (Roman).....	753
Dionysius (Greek).....	258	Paul I. (Roman).....	757
Felix I. (Roman).....	269	Constantinus II.....	767
Eutychianus (Tuscan).....	275	Stephen IV. (Sicilian).....	768
Celus (Roman).....	283	Hadrian I. (Roman).....	772
Marcellinus (Roman).....	286	Leo III. (Roman).....	796
Marcellus I. (Roman).....	307	Stephen V. (Roman).....	816
Eusebius (Greek).....	309	Paschal I. (Roman).....	817
Melchades (African).....	310	Eugenius II. (Roman).....	824
Sylvester I. (Roman).....	314	Valentinus (Roman).....	827
Marcus (Roman).....	336	Gregory IV. (Roman).....	827
Julius I. (Roman).....	337	Sergius II. (Roman).....	844
Libertus (Roman).....	352	Leo IV. (Roman).....	847
<i>Felix II.</i>		Benedict III. (Roman).....	855
Damasus I. (Spaniard).....	366	Nicolas I. (Roman).....	858
<i>Ursicinus</i>		Hadrian II. (Roman).....	867
Siricius (Roman).....	384	John VIII. (Roman).....	872
Anastasius I. (Roman).....	398	Marinus I.....	882
Innocent I. (Italian).....	402	Hadrian III. (Roman).....	884
Zosimus (Greek).....	417	Stephen VI. (Roman).....	885
Boniface I. (Roman).....	418	Formosus.....	891
Celestinus I. (Roman).....	422	<i>Sergius</i>	
Sixtus II. (Roman).....	432	Boniface VI. (Roman).....	896
Leo I. (Tuscan).....	440	Stephen VII. (Roman).....	896
Hilarius (Sardinian).....	461	Romanus (Tuscan).....	897
Simplicius (Italian).....	468	Theodorus II. (Roman).....	897
Felix III. (Roman).....	483	John IX. (Italian).....	898
Gelasius I. (Roman).....	492	Benedict IV. (Roman).....	900
Anastasius II. (Roman).....	496	Leo V.....	908
Symmachus (Sardinian).....	498	Christopher (Roman).....	908
Hormisdas (Italian).....	514	Sergius III. (Roman).....	904
John I. (Tuscan).....	523	Anastasius III. (Roman).....	911
Felix IV. (Italian).....	526	Lando (Roman).....	913
Boniface II. (Roman).....	530	John X. (Roman).....	914
John II. (Roman).....	532	Leo VI. (Roman).....	928
Agapetus I. (Roman).....	535	Stephen VIII. (Roman).....	929
Sylvester II. (Italian).....	536	John XI. (Tuscan).....	931
Vigilius (Roman).....	537	Leo VII. (Roman).....	936
Pelagius I. (Roman).....	555	Stephen IX. (Roman).....	939
John III. (Roman).....	560	Marinus II.....	942
Benedict I. (Roman).....	574	Agapetus II. (Roman).....	946
Pelagius II. (Roman).....	578	John XII. (Roman).....	955
Gregory I. (Roman).....	590	Leo VIII.....	963
Sabinianus (Tuscan).....	604	Benedict V. (Roman).....	964
Boniface III. (Roman).....	607	John XIII. (Roman).....	966
Boniface IV. (Italian).....	608	Benedict VI. (Roman).....	973
Deusdedit I. (Roman).....	615	Benedict VII. (Roman).....	974

John XIV.....	983	Innocent VI. (French).....	1352
Boniface VII. (Roman).....	984	Urban V. (French).....	1362
John XV. (Roman).....	985	Gregory XI. (French).....	1370
Gregory V. (German).....	986	Urban VI. (Neapolitan).....	1378
Sylvester II. (French).....	999	<i>Clement VII.</i>	
John XVII. (Italian).....	1002	Boniface IX. (Neapolitan).....	1389
John XVIII. (Roman).....	1003	<i>Benedict XIII.</i>	
Sergius IV. (Roman).....	1009	Innocent VII. (Italian).....	1404
Benedict VIII. (Italian).....	1012	Gregory XII. (Venetian).....	1406
John XIX. (Roman).....	1024	Alexander V. (Italian).....	1409
Benedict IX. (Italian).....	1033	John XXIII. (Italian).....	1410
<i>Sylvester</i>		Martin V. (Roman).....	1417
Gregory VI. (Roman).....	1045	Eugenius IV. (Venetian).....	1431
Clement II. (Saxon).....	1046	<i>Felix</i>	
Damasus II.....	1048	Nicolas V. (Italian).....	1447
Leo IX. (German).....	1054	Callixtus III. (Spaniard).....	1455
Victor II. (German).....	1056	Paul II. (Italian).....	1458
Stephen X. (Italian).....	1057	Paul III. (Venetian).....	1464
Benedict X. (Italian).....	1058	Sixtus IV. (Italian).....	1471
Nicolas II. (French).....	1059	Innocent VIII. (Italian).....	1484
Alexander II. (Tuscan).....	1061	Alexander VI. (Spaniard).....	1492
Gregory VII. (Tuscan).....	1073	Pius III. (Italian).....	1503
<i>Clement III.</i>		Julius II. (Italian).....	1503
Victor III. (Italian).....	1086	Leo X. (Italian).....	1513
Urban II. (French).....	1088	Hadrian VI. (Dutch).....	1522
Paschal II. (Tuscan).....	1099	Clement VII. (Italian).....	1523
<i>Albert</i>		Paul III. (Roman).....	1534
<i>Theodoric</i>		Julius III. (Roman).....	1550
Gelasius II. (Italian).....	1113	Marcellus II. (Italian).....	1555
Callixtus II. (French).....	1119	Paul IV. (Neapolitan).....	1555
Honorius II. (Italian).....	1124	Pius IV. (Italian).....	1559
Innocent II. (Roman).....	1130	Pius V. (Italian).....	1566
<i>Anacletus</i>		Gregory XIII. (Italian).....	1572
Celestinus II. (Tuscan).....	1143	Sixtus V. (Italian).....	1585
Lucius II. (Italian).....	1144	Urban VII. (Italian).....	1590
Eugenius III. (Italian).....	1145	Gregory XIV. (Italian).....	1590
Anastasius IV. (Roman).....	1163	Innocent IX. (Italian).....	1591
Hadrian IV. (English).....	1164	Clement VIII. (Italian).....	1592
Alexander III. (Italian).....	1169	Leo XI. (Italian).....	1605
<i>Victor</i>		Paul V. (Roman).....	1605
<i>Paschal</i>		Gregory XV. (Italian).....	1621
<i>Callixtus</i>		Urban VIII. (Italian).....	1623
Lucius III. (Italian).....	1181	Innocent X. (Roman).....	1644
Urban III. (Italian).....	1185	Alexander VII. (Italian).....	1655
Gregory VIII. (Italian).....	1187	Clement IX. (Italian).....	1667
Clement III. (Roman).....	1187	Clement X.....	1670
Celestinus III. (Roman).....	1191	Innocent XI.....	1676
Innocent III. (Italian).....	1198	Alexander VIII. (Vene-	1689
Honorius III. (Roman).....	1216	<i>tian)</i>	
Gregory IX. (Italian).....	1227	Innocent XII. (Neapoli-	1691
Celestinus IV. (Italian).....	1241	<i>tan)</i>	
Innocent IV. (Italian).....	1243	Clement XI. (Italian).....	1700
Alexander IV. (Italian).....	1254	Innocent XIII. (Roman).....	1721
Urban IV. (French).....	1261	Benedict XIII. (Roman).....	1724
Clement IV. (French).....	1265	Clement XII. (Italian).....	1730
Gregory X. (Italian).....	1271	Benedict XIV. (Italian).....	1740
Innocent V. (Italian).....	1276	Clement XIII. (Vene-	1758
Hadrian V. (Italian).....	1276	<i>tian)</i>	
John XXI. (Portuguese).....	1276	Clement XIV. (Italian).....	1769
Nicolas III. (Roman).....	1277	Pius VI. (Italian).....	1775
Martin IV. (French).....	1281	Pius VII. (Italian).....	1800
Honorius IV. (Roman).....	1285	Pius VIII. (Italian).....	1823
Nicolas IV. (Italian).....	1288	Pius VIII. (Italian).....	1829
Celestinus V. (Italian).....	1294	Gregory XVI. (Italian).....	1831
Boniface VIII. (Italian).....	1294	Pius IX. (Italian).....	1846
Benedict XI. (Italian).....	1303	Leo XIII. (Italian).....	1878
Clement V. (French).....	1305	Pius X. (Italian).....	1903
John XXII. (French).....	1316	Benedict XV. (Italian).....	1914
<i>Nicolas</i>		Pius XI. (Italian).....	1922
Benedict XII. (French).....	1334		
Clement VI. (French).....	1342		

Pope, ALEXANDER, the greatest poet of his age, and the most brilliant satirist that England, or perhaps the world, has ever produced, was born in London on the 21st of May 1688. He was of good middle-class parentage, but not, as he afterwards characteristically endeavoured to make out, of aristocratic descent. His grandfather, Alexander Pope the elder—whose pedigree he attempted to derive, though on very inadequate evidence, from the earls of Donne—was a clergyman of the Church of England. His son, the poet's father, was placed with a merchant at Lisbon, where he became a convert to the Roman Catholic Church. On his return from Lisbon he seems to have followed the trade of a linen-draper in Broad Street, whence, after his marriage with Edith Turner, the poet's mother, he migrated to Lombard Street. There Alexander the younger first saw the light. In his infancy, and indeed up to the age of ten, he does not seem to have been either weakly or deformed. In the opinion of a kinsman, 'it was the perpetual application he fell into in his twelfth year that changed his form and ruined his constitution'; and it is possible that this may have contributed to and aggravated a misfortune which could hardly have been due to any such cause alone. It is at any rate certain that Pope's application to study must have been both early and intense, for deep traces of thought and culture are no less conspicuous than natural precocity of genius even in his most juvenile poems; and he certainly owed little to his teachers. His education, thanks no doubt to the disabilities created by his inherited creed, was unmethodical and imperfect to the last degree. He seems to have passed from one incapable Catholic priest and ill-ordered Catholic seminary to another, until at twelve years of age he was removed, knowing little more apparently than the Latin and Greek rudiments, to Binfield near Wokingham, to which place his father had by that time retired. Yet in this very year he wrote his *Ode on Solitude*, an insignificant but not unpromising performance, and at fourteen, according to his own account, he composed the poem on *Silence*, in imitation of Rochester's *Nothing*, which both in manner and matter is astonishingly mature. It was at the same age that he produced the first of his works which attracted attention, a *Translation of the First Book of the Thebais of Statius*, a poem memorable above its intrinsic merits from the fact that in it the English heroic couplet is already beginning to take the new mould into which, in his hands, it was destined to be recast. It is during the next two years, that is to say, at the marvellously early age of from sixteen to eighteen, that Pope's career as a recognised English poet may be said to begin. For it was at some time during these years (1704-6) that he wrote his *Pastorals*, which, though not published till 1709, were shown to and highly commended by all the leading critics of the day, and were the means of bringing their young author acquainted with the dramatist Wycherley, then advanced in years, with whom he commenced a singular correspondence, the tenor of which he audaciously misrepresented in later life.

It was to Wycherley, too, that Pope owed his first introduction, which took place a little later, to London life, where the youth's extraordinary talents were quickly recognised, and where he was not long in establishing a friendship with Addison, Steele, Swift, Arbuthnot, and other famous wits and poets of the day. In 1711 he published his *Essay on Criticism*, a poem which, whether written in 1709 or 1707—and it may have been his invincible habit of committing small acts of dishonesty for still smaller gains that suggested the antedating of the composition—was a sufficiently splendid achievement for the age either of nineteen or

twenty-one. It at once, or nearly at once—for it hung for a little at first at the booksellers—placed him in the front rank of the men of letters of his time. Critical opinions differed; and down to our own day have continued to differ, as to the degree of merit possessed by this remarkable poem in respect of its matter—some depreciating its critical aphorisms as platitudes, others elevating them into utterances of gnomic wisdom; but its excellences of form and maturity of style are not open to question in any competent judgment. The year 1713 witnessed the publication of *Windsor Forest* (written, according to Pope's account adopted by Warburton, in 1709), and this was succeeded in the following year by the poem on which Pope's claim to the gift of poetic imagination may perhaps be most securely rested, *The Rape of the Lock*. Necessarily precluded by the deliberate triviality of its subject from appealing to the higher emotions which imaginative poetry of the serious order arouses, this piece displays, in addition to the exquisite charm of its versification, a grace of delicate fancy which at times almost recalls the creator of Puck and Ariel, and the diviner of the dream-whispers of Queen Mab.

We now reach the commencement of what was probably the happiest and most prosperous period of the poet's life. His brilliant success had not yet brought with it much pecuniary profit, but in the year 1713 a project was set on foot by him, and warmly supported by Swift and others of his friends, which was destined not only to add to his fame, but to place his fortunes on a substantial basis for life. This was the translation of the *Iliad*, a work published by subscription, of which the last volumes were issued in 1720. The time of its composition was among the fullest and busiest of Pope's life. In 1716 his father removed from Binfield to a house at Chiswick, where he resided till his death in the following year. Pope was now the foremost of the literary lions of fashionable London, and almost as conspicuous a personage in the drawing-rooms of ministers and magistrates as in the coffee-houses of the wits. Political differences, aggravated by well or ill-founded suspicions of the elder writer's jealousy of the younger, had alienated Pope from Addison; but, though he had already begun his almost lifelong quarrel with the eccentric John Dennis, it had not yet taken on a character of any very extreme virulence. In 1718 he purchased out of the early profits of the *Iliad* the famous villa and grounds of Twickenham, which he occupied till his death.

A translation of the *Odyssey*, less successful because largely 'farmed out' to inferior hands, was published in 1725 and the following years; and in 1727 appeared the first two volumes of a collection of *Miscellanies*, from the joint authorship of Pope and Swift, a work famous as being the first shot fired in the war between the poet and 'the Dunces.' In March 1728 the third volume appeared, and the furious and scurrilous retorts wrung from the persons ridiculed in it elicited the retaliatory publication of the first three books of the *Dunciad*. This work Pope represented as having been written in reply to their attacks, but it (or a first draft) has been ascertained to have been in existence as early as 1725, and to have been merely withheld until its author had deliberately stung his enemies into a blind and headlong charge. 'Martinus Scriblerus,' in fact, played the part of the lance with which the Spanish picador irritates the bull to frenzy; the *Dunciad* was the blade poised ready to transfix him. In this immortal lampoon—for it is too personal in all senses of the word to deserve the title of satire—Pope has rescued the names of a host of insignificant enemies from oblivion. The fourth book, added twelve years later, is of a more serious cast

and of a more general application, and it contains one at least of the poet's most admired passages. But its incorporation with the earlier poem, with its infelicitous substitution of Cibber for Theobald as the personification of Dullness, is to be regretted. The *Essay on Man*, the first part of which was published in 1733, the *Moral Essays*, and *The Imitations of Horace* conclude the catalogue of Pope's poetic works. The first, a didactic poem, intended to commend to the world the not very profound philosophy which Pope had borrowed from Bolingbroke, is from the point of view of execution a masterpiece of weight and wit. The poet's mastery of terse and epigrammatic expression is here seen at its highest; and it has been declared, no doubt with truth, that the *Essay on Man* contains more lines which have won their way to the rank of universally familiar quotation than any poem of equal length in the language. The *Moral Essays* and the *Imitations* exhibited the same qualities exercised upon a series of selected subjects of, for the most part, a lighter order.

The last few years of Pope's life were marked by no new creative activity, but devoted to the revision of his published works. He suffered during this period from asthma, which in time developed dropsy, a disease which ultimately proved fatal to him. He died on the 30th of May 1744. As a man the figure which he presented to all but a few close friends was always an unamiable one, and modern research into the facts of his life has unfortunately only tended to deepen the impression. It cannot be denied that many of the smaller and meaner vices of humanity were painfully prominent in the character of Pope. His vanity was insatiable, and his vindictiveness came near to be so: he committed acts of treachery to men, brutality to women, and ingratitude to both. He showed an extraordinary and at times an almost ludicrous preference for the crooked to the straight path, and much of his time was occupied in laying elaborate plots for the deception of posterity and his contemporary public, including sometimes his most intimate friends. Yet it is certain that to these last he must have revealed many lovable qualities. He was undoubtedly capable of warm attachment, and his disposition when appealed to by the sight of want or suffering was genuinely benevolent. It should be remembered, too, in excuse for the acrimony of his satire, that physical misfortune and accidents of bringing up had combined to render him morbidly sensitive to the insults of his adversaries, and that his revenge was not more cruel than his sufferings.

The position of Pope in the history of poetry is easier to fix than his rank among English poets, for the importance and splendour of Pope's contribution to the development of English poetic art are beyond the denial of anyone conversant with the facts. It is a truth superior to and independent of the endless and irreconcilable controversy as to the essence and 'true inwardness' of poetic matter. The poets of the naturalist revival at the end of the 18th century regarded Pope as the brilliant exponent of a false and artificial theory of poetry who had systematically, though of course unconsciously, led men away from the contemplation of the 'true truth' of things. It has on the other hand been contended with much learning and ingenuity by W. J. Courthope that Pope's theory of poetry, if compared with that which it displaced, was a no less distinct and salutary return to nature than that of which Cowper became the pioneer in the later half of the century, and which Wordsworth preached and practised with such notable results towards its close. But even if this contention leaves us unconvinced, we can still find abundant reason for recognising as invaluable the services rendered by Pope to English poetry.

Considered from the point of view of its descriptive and emotional capabilities, the heroic couplet as he received it from the hands of Dryden was an instrument of vast compass but of modulations few and rude. By force of exquisite sensibility wedded to untiring study Pope theoretically deduced and practically educed its hidden powers; discovered, formulated, and inimitably applied the rules for 'discoursing' upon it; and handed it on to posterity in a form whose easy mechanical perfection is attested by the fact that its powers are but too much within the reach of the inferior performer. Considered as a weapon of expression, the heroic couplet of Dryden was a mediæval broadsword which only the mighty thews of its master could wield with any effect. In the hands of Pope it became a rapier of perfect flexibility and temper; and he himself discovered, and acquired mastery over, every trick of fence which it was capable of executing. To have accomplished this alone would have sufficed to perpetuate his name; but Pope has lived and will live in English literature, not only as the virtual inventor of a new poetic form, but as an artist without a rival in any age or language in the adaptation of speech to thought. No one who brings a fairly sympathetic mind to the perusal of the *Epistle of Eloisa to Abelard* will deny to Pope a measure of the lyrical gift and no mean power over the softer emotions. But one must admit that to the taste of the present age there occurs a certain coldness and artificiality in his portrayals alike of the face of nature and of the passions of man. He appeals rather to the brain than to the heart. Ideas and not emotions are his province; but to the metric presentment of ideas he imparts a charm of musical utterance unachieved before his time, and a lucidity of illustration, a brilliancy of wit, a command of apt and terse expression, and a combined ease and dignity of manner which have never been equalled since. To have done this is to have well deserved immortality as a man of letters; whether it is also to have established a title to the name of 'poet,' as understood in these days, every man who frames his own definition of poetry must decide for himself.

The editions of Pope have been fairly numerous. The first, by his friend Bishop Warburton, was an answer to Bolingbroke's attack on Pope's memory, and appeared within a few years of his death. Dr Joseph Warton's was virtually a reply to Warburton's; and the controversy on the power of the poet was revived in the 19th century by Bowles and Roscoe, who each published an edition of his works, and in whose polemics Byron took a memorable part. All other editions, however, were superseded by that of Elwin and Courthope, which was founded on a mass of documentary material collected by J. W. Croker; the concluding volume, containing Courthope's biography of the author, was published in 1889. See also George Paston, *Mr Pope, his Life and Times* (1909). Mr Case (*London Mercury*, October 1924) attributes to Pope a number of pieces in *Poems on Several Occasions* (1717).

POPE, JOHN (1822-92), an American general, was born in Louisville, Kentucky, graduated at West Point in 1842, and entered the engineers. He served in Florida (1842-44) and in the Mexican war, and was breveted captain for gallantry. He was afterwards employed in exploring and surveying in the west, until the outbreak of the civil war, when he was appointed brigadier-general of volunteers. In 1861 he drove the guerillas out of Missouri; in 1862 he captured New Madrid in March and was made major-general, commanded the Army of the Mississippi in the operations against Corinth, and was assigned to the command of the Army of Virginia, with the rank of brigadier in the regular army. For fifteen days in August he faced Lee, but was defeated at the second battle of Bull Run, on the 29th and 30th. He then requested to be relieved, and was transferred to Minnesota, where he kept the Indians in check.

He held various commands until 1886, when he retired. In 1882 he became major-general. Pope attributed his defeat at Bull Run to the conduct of General Fitz-John Porter, who was tried by court-martial and cashiered; but this verdict occasioned much controversy, in which General Grant ultimately took Porter's side (*American Review*, December 1882), and in 1886 the latter was restored to the army with the rank of colonel.

Poperinghe, an old commercial town of Belgium, in the province of West Flanders, 4 miles from the French frontier, and 8 miles W. of Ypres by rail. The town has manufactures of lace, linens, and woollen cloths. It figured prominently in the World War (q.v.). Pop. 12,000.

Popinjay (Fr. *papegai*, Ital. *papagallo*, Low Gr. *papagas*), a parrot; a figure of a bird put up as a mark for archers to shoot at (*papingo* being a Scottish form for this sense); see KILWINNING. The green woodpecker is also sometimes called popinjay.

Popish Plot, the name given to an imaginary plot on the part of the Roman Catholics in England during the reign of Charles II., the object of which was believed to be a general massacre of the Protestants. See OATES.

Poplar, a metropolitan and parliamentary borough in east London, between Stepney and West Ham, has two parliamentary divisions (Bow and Bromley, South Poplar); pop. (1921) 162,618.

Poplar (*Populus*), a genus of trees, forming along with willows the family Salicaceæ, and having dioecious flowers arranged in catkins, both male and female flowers with an oblique cup-shaped perianth. The seeds have silky hairs, as in willows, and are readily wafted about by the wind. The species are chiefly natives of the temperate and cold regions of the northern hemisphere. They are large trees of rapid growth, with soft wood, and broad, heart-shaped, ovate, triangular, or lozenge-shaped, deciduous leaves, on rather long stalks.

Many of them are very beautiful trees. The catkins appear long before the leaves. Few poplars are of much value for their timber, which is generally white, soft, and light; but from their rapid growth they are useful as yielding firewood, where the scarcity of other fuel renders it necessary to plant trees for this purpose, and they are often planted as ornamental trees, producing an immediate effect of embellishment in a bare situation more readily than almost any other kind of tree. Besides the species known by the name Aspen (q.v.), or Tremulous Poplar, the following seem the most worthy of notice. The White Poplar, or Abele



Branch and Male Catkin of
Populus alba canescens.

(*P. alba*), a native of the southern parts of Europe, and reckoned among British trees, but probably not indigenous in Britain, is a tree of 80 feet or upwards, with a fine spreading head, and roundish, heart-shaped, lobed, and toothed leaves, which are smooth, shining, and dark-green above, downy and silvery-white beneath. The tree loves low situations and clay soils. Its variety, the Gray

Poplar (*P. alba canescens*), is of more vigorous growth, a large spreading tree, the leaves not so dark green above or so white beneath. It is not of so rapid growth as the white poplar; and its wood is harder and better. The tree generally begins to rot in the heart when forty or fifty years old. Like most of the other poplars, it fills the ground around it with suckers. The Black Poplar (*P. nigra*), a native of most parts of Europe, and perhaps of England, is a tree 50 to 80 feet high, with an ample spreading head, viscous leaf-buds, and deltoid or unequally quadrangular, perfectly smooth leaves. The 'cotton' from the seeds has been tried (unsuccessfully) in France and Germany for making cloth hats and paper. The Lombardy Poplar (*P. nigra*, var. *pyramidalis*) has erect instead of spreading branches. It attains a height of 100, or even 150 feet, and is remarkable for its erect form, contracted head, and very rapid growth. It is often planted as an ornamental tree, although not so generally as in the end of the 18th century, when it was thought preferable for ornamental purposes to every other tree. *P. diversifolia* forms forests along the rivers of Turkestan. Widely distributed on the Pacific coast of Asia, *P. Maximowiczii* attains 100 feet in height and 6 feet in diameter of trunk. Perhaps most interesting of all poplars is *P. euphratica*, a polymorphic species which some divide into many sub-species, showing a wonderful variety, especially in leaf-form. Its geographical range is extraordinary. It extends from northern China through Tibet (where it is the chief tree planted), India (whose only indigenous poplar it is), Afghanistan, Turkestan, Mesopotamia, Syria, and Egypt, whence it branches southwards to Kenya and westwards by the oases of the Sahara to Algeria and south-east Spain. It is held to be the tree on which the Jews hung their harps in their exile. 18 to 30 feet high, its branches low enough for this to be quite easy. (There is, indeed, a weeping willow called *Salix babylonica*, but it comes not from Babylon, but from China and Japan.) The wood is almost of no value. It is generally propagated by layers. The Cottonwood of North America, absurdly known as Black Italian Poplar (*P. monilifera*), particularly abundant on the upper parts of the Mississippi and Missouri, is valued as a timber-tree, and has been pretty extensively planted in Britain. The female catkins resemble a string of pearls. The leaves are deltoid. It is of very rapid growth, and attains a height of 100 to 120 feet. The Balsam Poplar, or Tacamahac (*P. balsamifera*), a common ornamental tree in Britain, is a native both of North America and of Siberia, and has ovate-oblong leaves, which in spring are of a delicate yellow tint, and have an agreeable fragrance. The leaf-buds are viscid. In size of leaf no other species equals Swamp Cottonwood (*P. heterophylla*), a native of the southern states of North America, the leaves of which are often 6 inches long. See ASPEN, TACAMAHACA.

Poplin (Fr. *papelaine*; possibly from the papal town of Avignon, where it was formerly made), a fabric which has been long made in France, from which country the manufacture was introduced into England and Ireland in the 17th century by Protestant refugees. Poplin consists of a warp of silk and a weft of worsted, and the latter being thicker than the former produces a corded appearance. The worsted yarn gives substance to the fabric, and a soft silky face is produced by the way in which it is woven. Poplins may be either plain or figured. The latter were much used about 1870 for curtains and for covering furniture.

Popocatepetl ('smoking mountain'), a volcano about 40 miles SE. of the city of Mexico. It

ises in the form of a cone to a height of 17,784 feet above the sea-level. No great eruption has been recorded since 1540; it still smokes, however. It is often scaled, and in and around its crater (5165 feet in diameter, and nearly 1000 deep) a good deal of sulphur is obtained.

Poppy (*Papaver*), a genus of *Papaveraceæ*, with two (rarely three) sepals, which very soon fall off; four (rarely six) petals; numerous stamens seated on a receptacle; the stigma crowning the ovary (without a style) in the form of 4 to 20 rays; the capsule opening by pores under the persistent stigma, imperfectly divided into cells by partitions as numerous as the rays of the stigma, but which do not reach the centre, and the seeds extremely numerous. There are numerous species of poppy, mostly natives of Europe and Asia, some of them found even in very northern regions, but most of them in the warmer temperate parts. They are herbaceous plants, annual, biennial, or perennial, mostly sprinkled with bristly hairs. They have a white milky juice; a disagreeable narcotic smell, particularly when bruised; pinnatifid or bipinnatifid leaves, more rarely jagged or toothed leaves; and large showy flowers, which readily



Opium Poppy (*Papaver somniferum*):

a. whole plant; b. flower and leaf; c. ripe capsule; d. seed and section of do. enlarged. (Bentley and Thimen.)

become double by cultivation. The capsules are curious from the manner in which they fling out their seeds when the plant is shaken by the wind; each capsule being somewhat like a round or oval pepper-box, with holes, however, not in the top, where rain might get in by them, but under the projecting rim. By far the most important species is that known as the Opium Poppy (*P. somniferum*), also called the White Poppy and the Oil Poppy (see *OPUM*). But the same species is important on account of the bland fixed oil of the seeds, and is much cultivated as an oil-plant. *Poppy-oil* is as sweet as olive-oil, and is used for similar purposes. It is imported into Britain in considerable quantities from India. The poppy is also extensively cultivated for it in France, Belgium, and Germany. The seed contains no opium or any narcotic principle, and was well known to the ancients as a pleasant article of food, fit to be eaten by itself or with bread; some German cakes have poppy-seed

plentifully sprinkled on the top. The seeds yield 30 to 40 per cent. or more of oil, and the oil-cake is useful for manure or for feeding cattle. The oil is sometimes used by painters and by soap-boilers. Some farmers in Flanders sow poppies in alternate rows with carrots. The variety chiefly cultivated as an oil-plant has dull reddish flowers, large oblong capsules, and brownish seeds; but the white-flowered variety, with globular capsules and white seeds, is also used. The Oriental Poppy (*P. orientale*), a native of Armenia and the Caucasus, a perennial species, is often planted in gardens on account of its very large, fiery-red flowers. Its unripe capsules have an acrid, almost burning taste, but are eaten by the Turks, and opium is extracted from them. Several species are British, all of them local, rare in some places, and troublesome corn-field weeds in others. Among them is the Corn Poppy or Common Red Poppy (*P. Rhoeas*), with bright-red flowers, and deeply pinnatifid leaves. A variety with double flowers is cultivated in flower-gardens under the name of *Carnation Poppy*. Among the ancients the poppy was sacred to Demeter.

Poppy-head. See *PEWS*.

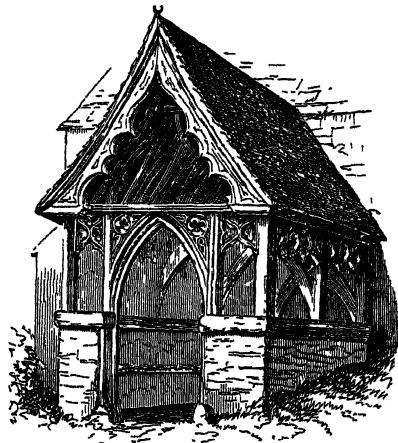
Populonia, an ancient city of Etruria (q.v.), near Piombino (q.v.).

Porbeagle, sometimes called 'Beaumaris Shark' (*Lamna cornubica*), is a shark found on the British coasts, in the Atlantic, Mediterranean, on the American coast, and in Japanese waters. Its usual length is 4 feet, but it sometimes attains a length of 10 feet, and is sometimes caught in mackerel and salmon nets, and even on haddock lines. It lives on cuttle-fish, pilchards, herrings, hake, and smaller cartilaginous fishes. In Mediterranean countries it is eaten as human food.

Porcelain. See *POTTERY*.

Porcellanite, a very hard, impure, jaspideous rock, frequently met with in the immediate vicinity of intrusive eruptive masses. In most cases porcellanite is simply a highly baked and altered argillaceous rock—shales being frequently converted into porcellanite along their line of junction with an igneous rock.

Porch, a building forming an enclosure or protection for a doorway. In mediæval and Elizabethan architecture the porch was very common in domestic architecture. In churches it was almost universal in England, most often on the south side

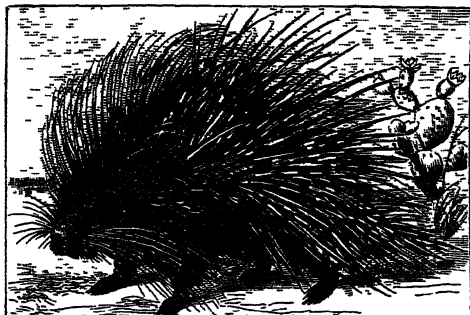


Porch of Aldham, Essex (1350).

of the nave, of stone or flint-work (in East Anglia), but sometimes also of wood. See also *GALLILEE*.

Porcupine, the chief gold-producing district of Canada, in Ontario, 150 miles N.W. of Cobalt.

Porcupine is the name given to a large family of Rodentia—the Hystriidae—with numerous well-defined genera and species. The Common Porcupine (*Hystrix cristata*) is found in southern Europe, as well as in Asia and Africa, and is one of the largest of rodents; it has a heavy aspect and a grunting voice, whence the name Porcupine (from Old French *porc*, 'a hog,' and *espin*, 'a spine'). The porcupines of the New World are sometimes included in a separate family; they comprise two well-marked forms—the Urson (*Erethizon dorsatus*) of North America and the Prehensile-tailed Tree Porcupines (Cecolabes) of South America. The most marked peculiarity of the porcupine is of course the presence of the quills, which are simply thickened hairs; gradations between ordinary hairs and the thickest and longest spines exist to prove this statement. Occasionally the spines end in a peculiar cup-shaped extremity. The armature of spines is of the greatest value to the porcupine, though their use is entirely for defensive purposes. It is hardly necessary to deny the popular belief that the animal can shoot out its quills like so many arrows; the notion has arisen from the fact



Common Porcupine (*Hystrix cristata*).

that when the animal erects its spines loose ones sometimes fall out. See ECHIDNA, GLOBE-FISH.

Pordage. See PHILADELPHIANS.

Pordenone, IL, a name for the religious painter Giovanni Antonio Licinio (1483-1539), born near Pordenone in Venetia.

Pori. See BJORNEBERG.

Porifera. See SPONGES.

Porism is defined by Simson as a proposition to demonstrate that some one thing or more things are given, to which, as also to each of innumerable other things, not indeed given, but having the same relation to those which are given, it is to be shown that there belongs some common affection described in the proposition. Playfair defined a porism to be a proposition affirming the possibility of finding such conditions as will render a certain problem capable of innumerable solutions. Owing to the loss of Euclid's three books on porisms, and the obscurity of the account given by Pappus of their contents, there has been much discussion among geometers as to the nature of a porism. The two most important books on the subject are Simson's *De Porismatibus* in his *Opera Reliqua* (1776), and Chasles's *Les trois livres de Porismes d'Euclide* (1860). Chasles is of opinion that the porisms were closely allied to the modern theories of anharmonic ratio, homographic division, and involution.

Pork. See PIG, CHICAGO, DIET, FOOD, HAM, TRICHINOSIS.

Porosity. By this term we express the experimental fact that no kind of matter completely fills the space it occupies. On the atomic theory it is obvious that this must be the case if the atoms of matter have any form save one or two special ones, such as cubes or rhombic dodecahedrons. The Florentine Academicians, in their attempts to compress water, proved the porosity of silver by flattening a sphere of that metal, filled with water and soldered. The water escaped through the silver, and stood in fine drops on its surface. The porosity of liquids is easily shown by mixing alcohol and water. The bulk of the mixture is considerably less than the sum of the bulks of the components.

Porous Jars. See REFRIGERATION.

Porphyrite, a petrographical term the precise limitation of which, owing to diversity of usage, is somewhat difficult to define. By geologists who favour a classification of igneous rocks in which the time factor is recognised, it has been used to designate Andesites (q.v.) of pre-Tertiary age. Others use it as meaning merely a more or less highly-weathered andesite. In recent petrographical literature it is applied to hypabyssal igneous rocks in which the dominant colourless porphyritic constituents are soda-lime felspars, types with porphyritic orthoclase being designated porphyry. Most porphyrites have the same chemical and mineralogical characters as diorites and andesites, but differ in texture. They are, as a rule, strongly porphyritic, and the ground-mass of the rock is usually holocrystalline. Some ferro-magnesian mineral is always a prominent constituent, and thus one may distinguish mica-, hornblende-, and augite-porphyrites; other types contain quartz in addition, and those are named quartz-mica-porphyrite, &c.

Porphyrogenitus (Gr., 'born in the purple'), a title given to the Byzantine emperor Constantine VII. (912-959).

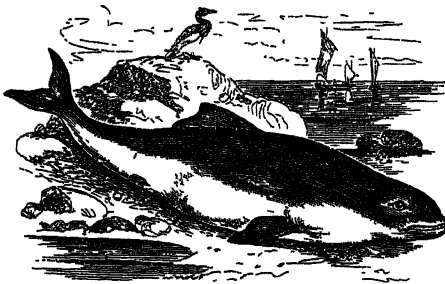
Porphyry (Gr., 'purple'), a term originally confined to an Egyptian rock used in sculpture and known as *porfido rosso antico*. It occurs as a dyke or vein some 65 to 85 feet thick in the granite of Jebel Dokhan (formerly called *Mons Porphyrites*) in Egypt, between Siout and the Red Sea. It is composed of a felspathic base, in which are disseminated crystals of oligoclase felspar, with some plates of dark hornblende, and grains of an iron oxide. The beautiful pink or red colour of the porphyritic felspar and the fine-grained base is due to the diffusion of the red variety of epidote, called Withamite or Piedmontite. The term porphyry is not now used to denote any particular rock, but is applied by architects and others to any igneous rock which, like the *porfido rosso antico*, has a homogeneous, compact base or fine-grained ground-mass, through which are scattered distinct crystals of one or more minerals. By geologists the term porphyry is seldom used without some descriptive word bracketed with it, as quartz-porphyry, orthoclase-porphyry, augite-porphyry, &c. See PORPHYRITE.

Porphyry, one of the greatest Neoplatonist philosophers, was born at Tyre, or at Batanea, in the year 233 A.D. His original name was Malchus (Heb. *Melech*, 'king'); and *Porphyrius* ('one clad in purple') is but a kind of playful synonym for this royal name. He is said by Socrates the historian and by St Augustine to have been originally a Christian; but this seems improbable, although it is certain that in his youth he was a hearer of Origen, or at least held some intercourse with him at Cæsarea in Palestine. What is more certain is that he passed at a later time to Athens, where he studied rhetoric under Longinus, the well-known author of the treatise *On the Sublime*.

It was at Rome, however, whither he repaired about 263, that he found the master who permanently moulded his life. Here he became the most trusted of the disciples of the Neoplatonist Plotinus. After a few years in Rome he went to Sicily, where, if St Jerome's account is to be relied on, he wrote his once celebrated treatise in fifteen books against the Christians, now known only from the replies—themselves lost—which it elicited from Methodius of Tyre, Eusebius of Cæsarea, and Apollinaris of Laodicea. His book itself was burned by order of the emperors Theodosius II. and Valentinian in 448. He then returned to Rome, and taught there, where he is said to have died, probably about 303. His own most famous pupil was Iamblicus. For a view of Porphyry's position in the history of the Neoplatonic school, see NEOPLATONISM. He was a very voluminous writer, and, though no very profound thinker, a learned, capable, earnest, and high-minded man. His philosophy keeps close to life and practical duties, its object the salvation of the soul, to be effected by the extinction of impure desires through strict asceticism together with knowledge of God. He was a determined opponent of Christianity, and in his trenchant criticism exposed many of its supposed errors and imperfections.

Of his writings the chief are the *Lives of Plotinus and Pythagoras*; *Sententia*; *De Abstinencia*; and the *Epistola ad Marcellam*, addressed to his wife. There is a complete list in Fabricius' *Bibliotheca Græca*, v., ed. Harless. See the works on the Alexandrian school by Vacherot and Jules Simon, and Zeller's *Philos. der Griechen*, vol. ii.; also the monograph by Bouillet (Paris, 1864).

Porpoise (*Phocæna*), a genus of Cetacea in the family Delphinidae. The species are like dolphins, but have shorter snouts. The Common Porpoise (*P. communis*) is the most familiar Cetacean on the British coasts, especially to the west of Ireland and Scotland. It is found also on all the coasts of Europe from the Mediterranean



Porpoise (*Phocæna communis*).

northwards, on the coasts of North America, and in the Arctic regions. It is one of the smallest of the Cetacea, its average length not exceeding four feet, although individuals may measure six feet in length. The body is spindle-shaped, its greatest diameter being near the triangular dorsal fin. The skin is perfectly smooth, and destitute of hair. The upper surface is black with a bluish shimmer, but the under side is grayish white. There are from forty to fifty teeth in each jaw, not conical, as in most of the Cetacea, but compressed. The eye is small; the opening of the ear is very minute, like a hole made with a pin. The crescent-shaped blow-hole, with the horns of the crescent directed forwards, is situated exactly over the eyes.

The porpoise is gregarious, and large numbers are often seen together, sometimes swimming in file, when their backs, appearing above the surface of the water, suggest the idea of a great sea-serpent; sometimes gamboling in fine weather, or when a

storm is approaching, or even in the midst of a storm. They feed on fish, which the teeth are admirably adapted to catch, and schools of porpoises pursue the vast shoals of herring, mackerel, &c. into bays and estuaries. They sometimes ascend rivers, apparently in pursuit of salmon, as far as the water is brackish, and are not unfrequently caught on such occasions. The skin, the oil, and the flesh are all useful. The skin is nearly an inch thick, but is planed down until it becomes translucent, and is made into excellent leather, which is used for covering carriages and for other purposes. But much 'porpoise' leather is obtained from the Beluga (q.v.), or white whale, whence come also the so-called 'porpoise laces.' Under the skin is a layer of fat, about an inch in depth, which yields oil of the finest quality. The flesh was in former times highly esteemed, and reckoned fit for the table of royalty, perhaps partly because among Roman Catholics it was accounted *fish*. In the time of Queen Elizabeth it was still used by the nobles of England, and was served up with bread-crumbs and vinegar. It is now used only in very northern regions. An entirely black Porpoise (*P. melas*) from Japan has no dorsal fin and only seventy-two teeth in all. The name porpoise is from the old French *porpeis*, from the Latin *porcus*, 'hog,' and *piscis*, 'fish,' corresponding therefore in meaning to the modern French *marsovin*, a corrupt form of the German *meerschwein* ('sea-hog').

Porpora, NICCOLA, musical composer, was born at Naples, on 19th August 1686, trained there in music, and, having produced some successful operas, was appointed master of the conservatorio of San Onofrio (1722). Shortly before that he had established a school for singing, from which came some of the greatest singers the world has known, as Farinelli, Caffarelli, Salimbeni, and Uberti. From 1725 to after 1755 he led an unsettled life, though he stayed some time at Dresden, at Venice, in London (with Farinelli, 1734-36), and in Vienna, composing music, chiefly operas (though none rises above the level of conventional respectability), and teaching singing; at Vienna he taught Haydn. Of his other musical compositions a series of cantatas (twelve published in London in 1735), several sonatas for the violin, and six fugues for the clavichord are written with considerable freshness. He died at Naples in 1766 or 1767, and now is chiefly known through George Sand's *Consuelo*.

Porridge, a highly nutritious kind of food made by boiling oatmeal in water, formerly at least one of the chief elements of diet of the Scottish peasantry. Besides oatmeal, porridge may be made of barley, beans, or the like, and instead of water milk may be used.

Porrigo. See FAVUS, and RINGWORM.

Porsena. See ETRURIA. The story of the defence of the bridge across the Tiber at Rome against Lars Porsena of Clusium in the time of Tarquin has been told in spirited verse by Macaulay in his *Lays of Ancient Rome*.

Porson, RICHARD, perhaps our greatest Greek scholar, was born on Christmas Day 1759, at East Ruston in Norfolk, where his father was parish clerk. The Rev. T. Hewitt, curate of the parish, noticing the boy's omnivorous appetite for books and his marvellous memory, had him educated along with his own sons, and brought him under the notice of a neighbouring squire, Mr Norris, the founder of the Norrisian professorship at Cambridge, who sent him to Eton in August 1774. Here he remained four years, and in 1778 was entered at Trinity College, Cambridge, mainly by the help of the physician Sir George Baker. He was elected a scholar in 1780, next year won the Craven Scholarship, and subsequently the first

chancellor's medal. In 1782 he was elected a Fellow of Trinity. He now began to contribute to *Maty's Review*, his first critique being on Schütz's *Æschylus*, and his finest on Brunk's *Aristophanes*. He also opened a correspondence with the veteran scholar David Ruhnken of Leyden. His *Notæ breves ad Toupii Emendationes in Suidam* (1790) first carried his name beyond England as a scholar of the highest rank. In 1787 appeared in the *Gentleman's Magazine* his three sarcastic letters on Hawkins' *Life of Johnson*; and during 1788 and 1789, in the same periodical, his far more famous and trenchant *Letters to Archdeacon Travis, on the Spurious Verse 1 John v. 7* (coll. 1790)—'the most acute and accurate piece of criticism since the days of Bentley,' says Gibbon. Porson naturally incurred great odium on account of the side which he took in this controversy, and it is said that one old Norwich lady, who had him in her will for a legacy of £300, cut it down to £30 when she heard that he had written a book against Christianity. In 1792 his fellowship ceased to be tenable by a layman, whereupon some friends raised a fund to preserve him from want, and about £100 a year was secured. This he accepted on condition that after his death the money should be returned to the donors, but when they refused to take it back it was used to form a foundation for the Porson prize at Cambridge. He was also appointed to the regius professorship of Greek in the university of Cambridge, an office worth £40 a year. In 1795 he edited the plays of *Æschylus* for the Foulis press at Glasgow, and between 1797 and 1801 four of Euripides, the *Hecuba*, the *Orestes*, the *Phœnisæ*, and the *Medea*. He also collated the Harleian MS. of the *Odyssey* for the Grenville *Homer*. He married in 1796, but his wife died five months later, too soon to cure him of his dilatory and slovenly habits and his thirst for drink. In 1806 he was appointed librarian of the newly-founded London Institution, with a salary of £200, but neglected his duties. He was suddenly struck down with apoplexy in the Strand, 19th September 1808, and died six days later. He was buried in the chapel of Trinity College, Cambridge. Porson possessed a stupendous memory, unwearied industry, great acuteness, fearless honesty, and masculine sense, but was hindered all his life by poverty, ill-health, dilatoriness, and fits of intemperance. With all his powers he achieved but little, and to justify contemporary admiration there remain, besides the works already named, but a few *bons-mots*, some brilliant emendations, the posthumous *Adversaria* (1812), and notes on *Aristophanes* (1820), the lexicon of *Photius* (1822), *Pausanias* (1820), and *Suidas* (1834). His *Tracts and Criticisms* were collected by Kidd (1815).

See 'Porsonian' in Rogers's *Table-Talk* (1856), H. R. Luard in *Cambridge Essays* (1857), and the Rev. J. Selby Watson's *Life* (1861). His *Correspondence* was edited by Luard for the Cambridge Antiq. Soc. (1867).

Port. See STEERING; also PORT WINE.

Porta, GIAMBATTISTA DELLA (1543-1615), Neapolitan physician, wrote numerous works on physiology, gardening, arboriculture, pneumatics, and refraction, besides several comedies; his best-known books being *Magia Naturalis* (1569) and *De Humana Physiognomonica*.—For Baccio della Porta, see BARTOLOMMEO.

Port Adelaide. See ADELAIDE.

Portadown, a market-town of Armagh, Ireland, on the Bann, 6 miles S. of Lough Neagh and 25 miles by rail SW. of Belfast. It is a place of considerable trade in agricultural produce, and manufactures linen, cambric, and sheeting. Pop. (1926) 11,991.

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Portage, capital of Columbia county, Wisconsin, is at the head of navigation on the Wisconsin River, and on the ship-canal which connects it with the Fox River, 37 miles N. of Madison. Portage trades in grain, and has hosiery and iron-works, &c. Pop. 5600.

Portage la Prairie, the market-town of a rich agricultural district in Manitoba, on the Assiniboine River, 56 miles by rail W. of Winnipeg. It has flour-mills and grain-elevators, railway shops, brick-yards, &c. Pop. 6800.—In North America *portage* means a place where boats or canoes have to be carried past rapids or across from one navigable stream to another.

Portalis, JEAN ÉTIENNE MARIE (1745-1807), jurist, practised law in Paris, was imprisoned during the Revolution, but under Napoleon was chief author of the *Code Civil*. See CODE.

Portal Vein. See LIVER, CIRCULATION.

Portarlington, a market-town of Ireland, partly in King's County, partly in Queen's County, on the Barrow, 44 miles by rail SW. of Dublin. It was granted by Charles II. to the Earl of Arlington; and here William III. planted a colony of French and Flemish Protestants. Pop. (1926) 1951.

Port Arthur, a city of Texas, on Sabine Lake, 20 miles SE. of Beaumont, is an oil-refining and shipping centre, in a rice-growing district; pop. (1900) 900; (1920) 22,251.

Port Arthur, the terminus of the eastern division of the Canadian Pacific Railway, on Thunder Bay, Lake Superior, 993 miles WNW. of Montreal; pop. 15,000.

Port Arthur, by the Chinese called LU-SHUN-KOW, a fortress and port on the Manchurian peninsula of Liao-tung, stretching south into the Gulf of Pe-chi-li, opposite that of Wei-hai-wei, on the Shantung promontory to the south. The English name is derived from a naval lieutenant on a ship engaged in surveying here in 1860. The port, which had been fortified and provided with docks by German engineers, was taken by the Japanese in 1894; and in 1898 it and Ta-lien-wan (Dairen), on the east coast of the peninsula, were 'leased' to Russia. The ice-free harbour, surrounded by rocky hills, and with a very narrow entrance, was deepened by dredging and blasting. Docks, barracks, and warehouses had been built, and the place, elaborately fortified, became a great Russian naval station, and a terminus of the Manchurian section of the great Trans-Siberian Railway. The war of 1904 began (8th February) with the successful Japanese attack by torpedoes on the Russian fleet in the outer harbour; in June the town was invested by Nogi's troops; while at sea it was blockaded by Togo; in spite of stubborn resistance by the Russians under Stoessel, the Japanese by desperate valour, and at fearful sacrifices, took defence after defence; and on 2d January 1905 the place surrendered. See DAIREN, JAPAN.

Port-au-Prince, the capital of Hayti (q.v.), on a large bay on the west of the island, has an excellent harbour. Pop. 125,000, mostly negroes.

Port Darwin, a magnificent landlocked deep-water harbour of North Australia. Darwin, or Palmerston, the chief town and port on its shores, is the terminus of the overland telegraph, 2230 miles from Adelaide, and of the cable to Java, and the starting-point of a railway (200 miles) to Emungalen. Extension to Daly Waters (365) has been authorised by the Commonwealth, which, in taking over the territory, undertook to connect Darwin with Adelaide. Pop. 2600.

Porte, SUBLIME. See CONSTANTINOPLE.

Port Elizabeth, a seaport of the Cape Province of the Union of South Africa, founded in 1820, stands on the western shore of Algoa Bay, by rail 85 miles SW. of Graham's Town and 350 S. of Kimberley. It is the principal seaport for the east part of the Cape Province, and also of the Orange Free State. Its public buildings, solid and substantial edifices, are the town-house, the provincial hospital, churches, the Grey Institute, a college, a library, a museum, &c. There are parks and tree-planted squares. The harbour is under the Harbour and Railway Board of the Union. A great outer harbour was begun in 1922. An aqueduct, 28 miles long, has brought good water to the town since 1878. Pop. (1875) 13,049; (1921) 46,094 (one-half white).

Porteous Mob. At Pittenweem in Fife, on the night of 9th January 1736, three smugglers, Andrew Wilson of Kirkcaldy, George Robertson, an Edinburgh innkeeper, and William Hall, robbed the Kirkcaldy excise-collector of over £100. All three were at once arrested, and on 11th March were sentenced to death. In an attempt to break out of the Edinburgh Tolbooth (the 'Heart of Midlothian'), Wilson, 'a squat round man,' stuck fast in a grating, preventing also the escape of Robertson; but the following Sunday, being taken with him to hear the condemned sermon in St Giles' Church, he suddenly seized two of the four soldiers guarding them, and fastened with his teeth upon a third, at the same time crying, 'Run, Geordie, run for your life.' Robertson did get clear off; Wilson on 14th April was hanged in the Grassmarket. There was some disturbance and stone-throwing, when Captain John Porteous, the brutal commander of the City Guard, fired on the crowd, and killed or wounded sixteen or more men and women. For this he himself was tried and sentenced to death (20th July), but on 26th August was respited by Queen Caroline. However, on the night of 7th September an orderly mob burst open the tolbooth, dragged Porteous out, bore him, pleading for mercy, to the Grassmarket, and lynched him—hanged him from a dyer's pole, and slashed at him with Lochaber axes. A drunken footman of Lady Wemyss and one other man were tried next year for their share in the riot; but both were acquitted, and none of the ringleaders ever was brought to justice. A bill passed the Lords to disqualify the Lord Provost of Edinburgh from ever again holding office, to imprison him for a twelvemonth, to abolish the City Guard, to raze the Nether Port, and to fine the city in £1500 for Porteous' widow; but only the first and last clauses were carried in the Commons, and these only by a casting vote and after the fiercest opposition from all the Scottish members. Indeed, the Porteous Riot paved the way for the rebellion of the '45.

See vol. xvii. of the *State Trials* (1815); Scott's *Heart of Midlothian* (1818); Roughead, *Trial of Captain Porteous* (1909).

Porter, a kind of Beer (q.v.) favoured by London porters, hence so called about 1750.

Porter, DAVID, an American naval officer, was born at Boston, Massachusetts, 1st February 1780, the son of a naval officer who fought through the Revolution. He was appointed midshipman in 1798, and lieutenant the year after; saw service against privateers in the West Indies, and against Tripoli in 1801-3: became captain in 1812, and captured the first British war-ship taken in the war. In 1813, with the *Essex* (32 guns), he nearly destroyed the English whale-fishery in the Pacific, and took possession of the Marquesas Islands; but in March 1814 his frigate was destroyed by the British in Valparaiso harbour, and Porter returned

home on parole. He afterwards commanded an expedition against pirates in the West Indian waters, and was court-martialled for compelling the authorities at Porto Rico to apologise for imprisoning one of his officers. Porter resigned in 1826, and was for a time at the head of the Mexican navy. In 1829 the United States appointed him consul-general to the Barbary States, and then minister at Constantinople, where he died, 3d March 1843. Farragut, it is worth noting, was his adopted son. See the *Life* (1875) by his son.

DAVID DIXON PORTER, admiral of the American navy, his son, born at Chester, Pennsylvania, 8th June 1813, accompanied his father on his cruise against the pirates, and afterwards was for some time a midshipman in the Mexican service. He entered the United States navy in 1829, was employed on the coast survey from 1836 to 1841, when he became lieutenant, and then served till 1845 on the Mediterranean and Brazil stations, afterwards returning to the coast survey. From 1849 to 1853 he was engaged in command of the California mail-steamers. At the commencement of the civil war he was appointed commander of the steam-frigate *Powhatan*, and ordered to Pensacola; but afterwards he was placed in command of the mortar flotilla, joined Farragut, and in April 1862 successfully bombarded the New Orleans forts. In command of the Mississippi squadron, he assisted to bring about the fall of Vicksburg (July 1863). A rear-admiral, he bombarded and silenced Fort Fisher in December 1864. Till 1869 superintendent of the naval academy at Annapolis, he was made vice-admiral in 1866, and in 1870 succeeded Farragut as admiral of the navy. He died at Washington, 13th February 1891.

He was the author of three romances, of *Incidents and Anecdotes of the Civil War* (1885), and of a *History of the Navy in the War of the Rebellion* (1887).

Porter, ENDYMION (1587-1649), groom of the bedchamber to Charles I., whom he accompanied (with Buckingham) to Spain, and attended on the field during the Civil War—without actually fighting, it would appear. He was a patron of poets and artists, and wrote many verses. See his *Life and Letters* by Miss Townshend (1897).

Porter, JANE, authoress of *The Scottish Chiefs*, was born at Durlin in 1776, daughter of an army surgeon who died during her childhood. She was brought up at Edinburgh and in London, and made a great reputation in 1803 by her high-flown romance, *Thaddeus of Warsaw*, which was distanced in its kind in 1810 by *The Scottish Chiefs*. The hero of the latter is a stilted and preposterous figure enough—as little of the historical Wallace as could well be. *Sir Edward Seaward's Narrative of his Shipwreck and Consequent Discovery of Certain Islands in the Caribbean Sea* (1831), a clever fiction, edited by her, was almost certainly written by her eldest brother, Dr William Ogilvie Porter (cf. *Notes and Queries*, 1880). With this brother she spent some years at Bristol, and there she died, 24th May 1850.—Another brother, ROBERT KER PORTER (1775-1842), was a clever battle-painter, and led a wandering life. He visited Russia on the emperor's commission in 1804, accompanied Sir John Moore's expedition in 1808, became knight commander of the order of Hanover in 1832, was afterwards British consul in Venezuela, and died at St Petersburg, whither his sister Jane had gone to join him, 4th May 1842. He published books of travel in Russia, Sweden, Spain, Portugal, Georgia, Persia, and Armenia.—Her younger sister, ANNA MARIA PORTER (1780-1832), blossomed precociously into *Artless Tales* (1793-95), followed by a long series of works, among which need only be named *Octavia* (1798), *The Lake of*

Killarney (1804), *The Hungarian Brothers* (1807), *The Recluse of Norway* (1814), *The Fast of St Magdalen* (1818), *Honor O'Hara* (1826), and *Barony* (1830).

Porter, NOAH, philosophical writer, was born 14th December 1811, at Farmington, Connecticut, graduated at Yale in 1831, studied theology, and was for ten years a Congregational pastor. In 1846 he became professor of Moral Philosophy at Yale, and from 1871 to 1886 he was president of the college. His works are numerous. He died 4th March 1892.

Porter, WILLIAM SYDNEY. See HENRY (O.).

Port Erin, a port on the south-west coast of the Isle of Man, on Port Erin Bay, $5\frac{1}{2}$ miles W. of Castletown. Liverpool University Marine Biological Station is there. One mile to the north-east there is an ancient monumental cross.

Port Essington, an inlet in the Coburg Peninsula on the north coast of Australia, forming a fine harbour. On its shores there was from 1831 to 1850 a penal settlement.

Port Famine, the name given by Cavendish in 1587 to a spot in Patagonia on the north coast of the Straits of Magellan. From 1843 to 1853 it was a Chilean penal colony.

Port-Glasgow, a town of Renfrewshire, on the southern shore of the Firth of Clyde, 3 miles ESE. of Greenock and 20 WNW. of Glasgow. It was founded in 1668 by the magistrates of Glasgow as a harbour for their city, the deepening of the Clyde (q.v.) not having yet been thought of. In 1710 it was constituted the head custom-house on the Clyde, and for a while took the lead of Greenock; in 1775 it was incorporated as a municipality; and from 1832 to 1918 it was a parliamentary burgh of the Kilmarnock group. Built on low alluvial ground, and backed by hills 700 feet high, it has a Doric town-house (1805), a public hall (1873), the ruined Newark Castle (1597), a wet-dock (formed since 1834), a large graving-dock (1874), extensive timber-ponds, shipbuilding-yards, rope, canvas, and sailcloth works, iron and brass foundries, &c. Pop. (1841) 6938; (1881) 10,802; (1921) 21,022.

Port Hamilton, a spacious, well-sheltered harbour, formed by three islands of the Nan-how group, 30 miles S. of Korea and 45 NE. of Quelpart (q.v.). It was annexed by Britain for a coaling station in 1885, but abandoned next year. It was discovered and named by Belcher in 1845.

Port Harcourt, a port of Nigeria on the New Calabar estuary, 25 miles N. of Bonny, is the terminus of a railway to the Udi coalfield.

Port Huron, capital of St Clair county, Michigan, is on the St Clair River where it issues from Lake Huron, and at the mouth of the Black River, 59 miles by rail NNE. of Detroit. The rivers are crossed by iron bridges. The city has a fine custom-house (1877), shipyards and dry-docks, sawmills, grain-elevators, paper-mills, machine and railroad shops and salt works. Much pine timber is brought down by the Black River. A railway tunnel passing under the St Clair River connects the town with Sarnia, in Canada (see ST CLAIR); there is also a steam-ferry to Sarnia, and steamboats ply daily, except in winter, between Port Huron and Detroit. Pop. (1880) 8883; (1890) 13,543; (1920) 25,944.

Portici, a town of Italy, on the slope of Vesuvius, 5 miles by rail SE. of Naples. Its environs are delightful, and are dotted over with country-houses. The royal palace built (1738) by Charles III. is now an agricultural college. There are a small fort, fishing, and sea-bathing. Silkworms are reared and ribbons made. Pop. 21,500.

Portioners. See HEIR.

Port Jervis, a city of New York, on the Delaware River, 88 miles by rail NW. of New York City. It contains railroad shops, foundries, glass-works, and glove factories, &c. Pop. 10,000.

Portland, (1) the largest city and chief seaport of Maine, and capital of Cumberland county, on Casco Bay, 108 miles by rail NE. of Boston. It is situated on a narrow peninsula, embracing $2\frac{1}{2}$ sq. m., with broad shaded streets, and handsome public and private edifices, including a court and custom-house, post-office, city hall, observatory, and Baxter and Mechanics' Halls. There are shipyards, rolling-mills, canneries; and locomotives, machinery, window-screens, &c., are manufactured. The harbour, which is defended by three forts, is large, deep, and well sheltered; there are wharves, elevators, and dry-docks, and an important trade is carried on; steamers ply direct to Liverpool in winter. The place was first settled by an English colony in 1632. In 1866 a fire destroyed \$10,000,000 worth of property. Portland is the seat of Episcopal and Roman Catholic bishops, and was the birthplace of Longfellow. Pop. 70,000.—(2) **PORTLAND**, the largest city of Oregon, and capital of Multnomah county, is on the Willamette River, 12 miles from where it joins the Columbia (about 100 from the ocean). It is one of the world's chief lumber ports, large ocean-going ships coming up to it. A handsome city, well built with fine, shaded streets, it has a court-house, a United States government building, numerous churches, colleges and schools, and an asylum for the insane. There are iron-foundries, machine-shops, sawmills, flourmills, canneries, and numerous manufactures, including woollen goods, furniture, soap, paper, &c. Founded in 1844, Portland became a city in 1851. Pop. (1870) 8293; (1900) 90,426; (1920) 258,288.

Portland, DUKES OF. See BENTINCK.

Portland, ISLE OF, a rocky peninsula of Dorsetshire, connected with the mainland by the Chesil Bank (q.v.), and 4 miles S. of Weymouth by a branch railway (1865). It is $4\frac{1}{2}$ miles long, $1\frac{1}{2}$ wide, 9 in circumference, and 2890 acres in area. From its highest point, the Verne (495 feet), it shelves with a gradual and almost unbroken slope to Portland Bill. Here a lighthouse (1903-4), 136 feet high, has superseded two old ones (1789-1814). Between the Bill, the southern extremity, and the Shambles, a dangerous reef 3 miles south-east, a surf called the Portland Race is raised by the rushing of the impetuous tides. The cliffs have in places been worn into fantastic caverns; and ancient raised beaches are well marked near the Bill. Portland is one solid mass of oolitic limestone, which has been largely quarried for building purposes since the 17th century, when Inigo Jones employed it for Whitehall and Sir Christopher Wren for St Paul's. Indeed it has been largely used everywhere in the London district.

There are three different qualities of Portland stone, the three strata lying close together. The top bed, called *Roach*, is unsuited for fine hewn work, since it is full of fossils, but it is hard and durable, and does well for the walls of docks, foundations, and the like. The *Whit Bed*, which comes next, yields the best stone for fine buildings. It varies in texture from a fine close grain to the roe-like structure characteristic of oolitic limestones, and is free from shells. Its colour is a pleasing grayish white. The *Base Bed*, not quite so much quarried as the others, is of finer grain and whiter than the Whit bed; but it is softer and better suited for internal than external architectural work. An analysis of this stone by Professor Daniell shows the following composition: Silica, 1.20; carbonate of lime, 95.16; carbonate of

magnesia, 1·20; iron and alumina, ·50; water and loss, 1·94; besides which ingredients there is often a trace of bitumen present. Portland stone is also quarried in the 'Isle' of Purbeck and the Vale of Wardour.

Two great breakwaters (1849-72 and 1893-1904), jointly more than 4 miles long, extend one from the 'Isle', the other from the Nothe, and encircle the harbour and roadstead (see BREAKWATER); and there are formidable fortifications. Other features of the 'Isle' are its great Borstal institution, till 1921 a convict prison, dating from 1848; Portland Castle (1520), built by Henry VIII., and held for Charles I. till 1646; Bow and Arrow Castle, ascribed to Rufus; and Pennsylvania Castle (1800), built by Governor Penn, the great Quaker's grandson. The inhabitants of the 'Isle' long remained a peculiar people, intermarrying, and preserving, generation after generation, the many curious customs of their forefathers. The 'Isle' itself is remarkable for its copious and excellent spring-water and for its small breed of black-faced sheep, whose flesh, well known as 'Portland mutton,' is much esteemed for its flavour. Pop. of Portland urban district (1911) 17,011; (1921) 12,434.

Portland Beds. See JURASSIC SYSTEM.

Portland Cement. See CEMENT.

Portland Sago. See ARUM.

Portland Vase, a celebrated ancient Roman glass vase or cinerary urn found during the pontificate of Urban VIII. (1623-44) in a marble sarcophagus (of Alexander Severus, it is thought, and his mother Mamæa) in the Monte del Grano, near Rome. It was at first deposited in the Barberini Palace at Rome, and hence it is sometimes called the Barberini Vase. It was bought in 1770 by Sir William Hamilton (q.v.), and in 1787 by the Portland family, who in 1810 deposited it in the British Museum. The ground is of dark-blue glass, and the figure-subjects which adorn it are cut in cameo style in an outer layer of opaque white glass. The vase was broken to pieces by a lunatic in 1845, but the fragments were very skilfully united again. It is 10 inches high, and is the finest specimen of an ancient cameo cut-glass vase known.



Portland Vase.

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Port Louis, the capital and principal port of Mauritius, on an excellent harbour on the north-west coast, is enclosed by a ring of lofty hills. It is defended by forts (1887-91), is a coaling station of the British navy, and has graving-docks, a Protestant and a Roman Catholic cathedral, a royal college, &c. Pop. 50,000.

Port Mahon. See MAHÓN.

Port Moody. See VANCOUVER.

Port Moresby, capital of Papua, on the south coast, 330 miles ENE. of Cape York, is named after Admiral John Moresby (1830-1922), who explored the New Guinea coasts. Copper occurs in the district. Pop. 2000.

Porto Alegre, capital of the Brazilian state of Rio Grande do Sul, stands at the north-west extremity of the Lagoa dos Patos, by means of which it communicates with the sea. It was

founded in 1742, is well built, and has about 180,000 inhabitants. It contains a presidential palace, an archiepiscopal cathedral, an arsenal, colleges, and a German club. Germans are numerous. The port has been made accessible to ships of moderate size.

Portobello, a Scottish watering-place on the southern shore of the Firth of Forth, 3 miles E. of Edinburgh. Its first house (1742) was built by one of Admiral Vernon's seamen in the expedition against Puerto Bello, and hence it derived its name; but it dates, like its eastern extension Joppa, almost wholly from a time later than 1804. An esplanade skirts the broad level sands. There are public baths, an electric power station, manufactures of bricks, bottles, stoneware, &c. Portobello, with Leith and Musselburgh, returned one member to parliament. Pop. (1841) 3587; (1911) 11,037. By the Edinburgh Extension Act (1896) it was incorporated municipally with Edinburgh, and in 1918 became with Musselburgh part of the east division of Edinburgh parliamentary burgh.

Portobelo, formerly PUERTO BELLO, a decayed seaport of Panamá, on the northern shore of the Isthmus of Panamá. It has an excellent harbour, discovered by Columbus in 1502, but has fallen into decay since 1739, when it was stormed by Admiral Vernon.

Porto Ferrajo. See ELBA.

Port of Spain, capital of Trinidad (q.v.).

Porto-Maurizio, capital of a North Italian province, stands embowered in olive-groves on the Gulf of Genoa, by rail 69 miles SW. of Genoa, and 41 E. by N. of Nice, and consists of an old town on the hills and a new town next the sea, with a small harbour; pop. (1921) 8337. It now forms one commune with Oneglia, under the name of Imperia (pop. 15,439).

Porto Novo, a small port on the Coromandel coast of India, 145 miles S. of Madras by rail. Both the Danes and the Dutch had formerly a factory here. The place is celebrated for the battle of 1st July 1781, when Sir Eyre Coote, with 8000 men, defeated Hyder Ali with 60,000.

Porto Rico, or PUERTO RICO, a West India island (Spanish till 1898), lies 75 miles E. of Hayti or St Domingo. An oblong in shape, it has an area of 3530 sq. m., about five-sixths the area of Jamaica, and measures 110 miles from east to west, and 40 from north to south. It is traversed from east to west by ranges of mountains, 1500 feet in average height, though El Yunque rises almost to 5000 feet. From the base of the mountains rich alluvial tracts extend to the sea on all sides, and are watered by innumerable short streams. The higher parts are covered with forests. Rain falls in much greater abundance on the north than on the south of the island. The principal crops are sugar, coffee, rice (the food of the people), and tobacco. Maize, yams, bananas, plantains, and tropical fruits are also grown. Large herds of cattle and horses are fed on the lowland pastures. The exports are sugar, coffee, lumber, tobacco, and cattle. The population increases rapidly: in 1800 it was 155,400; in 1834, 358,800; in 1880, 754,313; and in 1920, 1,299,809 (948,709 being white). Chief towns are San Juan (71,000), the capital, and Ponce (42,000). Porto Rico was discovered by Columbus in 1493; Ponce de Leon founded a settlement in 1510. A rising against Spain in 1820-23 failed. Porto Rico was ceded to the United States as a result of the war (1898), and in 1900 an act of congress conferred civil government on the island. See K. Mixer, *Porto Rico* (1926).

Portpatrick, a village in Wigtownshire, 7½ miles SW. of Stranraer by rail. It is sheltered by high cliffs, but the coast is rocky and the sea

boisterous. Portpatrick is but 21½ miles direct north-east of Donaghadee in County Down, was long the Gretna Green for Ireland, and the chief place for the importation into Scotland of Irish cattle and horses, while it was a mail-packet station from 1662 till 1849. A pier was built in 1774, and a great harbour begun from Rennie's designs in 1821, but public confidence received its death-blow from the wreck of the *Orion* steamship in the port in 1850, within a few yards of the crowded street, and the harbour-works fell quickly into hopeless ruin, after having cost the country £500,000. Pop. 500.

Port Phillip, the gate of Melbourne, discovered in 1802 by Lieutenant Murray, and named in honour of Captain Phillip, the first governor of New South Wales (q.v.). Victoria itself was originally called the district of Port Phillip.

Portraits, COMPOSITE, a method of indicating the facial characteristics of a family or group of persons, while at the same time suppressing the peculiarities of individual members. Sir Francis Galton thus prepared type faces of considerable value to the student of anthropology. One way of obtaining them is to take full-face photographs of each person composing the group, of such a uniform size that two fixed horizontal lines pass, one through the inner angle of the eyes, the other through the line dividing the lips, while a fixed perpendicular line equally divides the nose; the photographs are thus brought approximately to the same size, and like portions of the faces occupy like positions. In printing from, say, ten negatives, each negative is placed in position for one-tenth of the time required for an ordinary photograph.

Portree. See SKYE.

Portreeve, once the English name of the principal magistrate in a port town, especially in London (q.v.).

Port Royal. See JAMAICA.

Port-Royal des Champs, a convent of Cistercian nuns, nearly 8 miles SW. of Versailles, which obtained much celebrity during the 17th century. It was founded for nuns by a member of the family of Montmorency in the early part of the 13th century, and soon after its establishment obtained from the pope the privilege of receiving lay persons, who, without taking monastic vows, desired to live in religious retirement. The discipline of the convent having been much relaxed in the 15th and 16th centuries, one of its worst abuses—that of appointing the superior, not on account of fitness, but from considerations of family or other worldly or political motives—became in the end the occasion of its complete reformation under Marie Angélique Arnauld (q.v.). The community was removed to Paris in 1626, and in 1633 to a new convent, Port-Royal de Paris; and from this time the old establishment of Port-Royal des Champs was exclusively devoted to the use of a lay community. This community soon numbered among its permanent inmates some of the most distinguished scholars of that age. Their rule of life was most austere. They rose at 3 A.M., devoting many hours to prayer and spiritual reading and instruction, and a portion of the day to manual labour. One of their public services was the establishment of a school, for which they prepared well-known educational books. But Port-Royal is best known for its adhesion to the Jansenist movement (see JANSEN). The nuns of Port-Royal having refused to subscribe the formulary condemning the Five Propositions, a royal order was issued in 1660 for the suppression of the school and the removal of the boarders of Port-Royal des Champs; and the abbess and several other nuns were arrested, and confined as prisoners in other houses. After the

'Peace of Clement IX.' they were permitted to return; but the two communities were placed under separate government. In 1707 a bull was issued by Pope Clement XI. for the suppression of Port-Royal des Champs, and the transfer of its property to Port-Royal de Paris.

Portrush, a watering-place in Antrim, 7 miles W. by S. of the Giants' Causeway, with which it is connected by tramway (1883). The town is built on the isthmus of a short peninsula, looking to the Causeway cliffs on the one side, and to Inishowen and almost Malin Head on the other. Pop. (1926) 2952.

Port Said, on the west side of the Suez Canal, on a desolate strip of land between Lake Menzaleh and the Mediterranean, owes its origin to the Suez Canal (see CANAL), being named after Said Pasha, its promoter, and depends wholly on the canal trade, mainly as a coaling station. Pop. (1882) 16,560; (1907) 49,884; (1917 with Ismailia, q.v.) 91,090. Port Fuad on the opposite bank was founded in 1926.

Portsea Island, an island on the south coast of Hampshire, between Portsmouth Harbour and Langston Harbour, separated from the mainland by a narrow channel, crossed by bridges. Four miles long by three broad, it contains Portsmouth (q.v.).

Portslade-by-Sea, an urban district 2 miles W. of Brighton, has timber-wharves, brickmaking, extensive gas-works, and Saxon and Roman remains; pop. 7700.

Portsmouth, the chief naval arsenal of Great Britain, and an important seaport, market-town, municipal, parliamentary, and county borough and city (1926) in the south of Hampshire, stands on the south-west shore of Portsea Island (q.v.), at the entrance to Portsmouth Harbour, and opposite the town of Gosport (q.v.), with which it communicates by means of a steam-bridge. The county borough includes Landport, Portsea, Southsea, and Cosham, and returns three members to parliament. Pop. (1821) 69,479; (1871) 113,569; (1921) 247,284. Portsmouth has probably the most complete fortifications in Britain. These comprise on the landward side the outer line of the Portsmouth forts and the Hilsea lines, to seaward the Spithead (q.v.) forts. The greater portion of the once imposing bastioned ramparts was removed after 1872; the Camber Bastion and a small section of ramparts and moats near the Governor's Green have been left. Southsea, which is situated on land skirting Southsea Common to the north, is rapidly increasing, and is now a fashionable watering-place. In the town proper there are few objects of note. The Victoria Park was opened in 1878, and the town-hall in 1890. Among the few notable buildings may be mentioned the church of St Thomas, from 1927 cathedral for the new diocese of Portsmouth and Wight; the chancel and transept date from the close of the 12th century, and the nave and tower from 1698; in the chancel there is a ghastly cenotaph in memory of the murdered Duke of Buckingham. The Garrison Chapel, Early English in style, and finely restored by Street in 1867, is a fragment of the hospital of St Nicholas, founded in 1212 by Bishop Peter de Rupibus. It is Charles II. married Catharine of Braganza; and in front of it is buried the brave Sir Charles James Napier (q.v.), who died in this neighbourhood in 1853. The dockyard of Portsmouth, in the district of Portsea, was till 1872 only 116 acres in extent; but vast works have since then been carried out; and the total dock area, including the two dry-docks added in 1896, is now over 300 acres. Of this immense naval establishment noteworthy features are the mast and rope houses, hemp-stores, rigging-stores, sail-loft, gun and torpedo mounting stores, a torpedo-range, electrical shops, a coaling-wharf with hydraulic appliances, and the dry-docks,

spacious enough to admit the largest vessels, and offering every facility for their speedy repair. The fifteen docks, 22 to 36 feet deep, are lined with

resort. It has a custom-house, and some ship-building is still carried on; the manufactures include cotton, hosiery, shoes, and iron castings.

At Kittery, on an island opposite, is a large United States navy-yard. Portsmouth was settled in 1623, and was capital of the state till 1807. Here, in 1905, peace was concluded between Japan and Russia. Pop 13,600.

(2) Capital of Scioto county, Ohio, stands among hills in an iron region, on the Ohio River, at the mouth of the Scioto, and at the south terminus of the Ohio Canal, 106 miles by rail ESE. of Cincinnati. It has several iron-foundries, rolling-mills, sawmills, railroad shops, and manufactures stoves, steel springs, furniture, machinery, shoes, &c. Pop. 33,000.—(3) An important city and port of Virginia, on the Elizabeth River, opposite Norfolk (q.v.), with an excellent harbour and navy-yard, large railway workshops. It exports iron, lumber, cotton, and early vegetables, &c. Pop. (1900) 17,427; (1920) 54,387.

Portsmouth, DUCHESS OF. See CHARLES II.

Port Talbot, a municipal

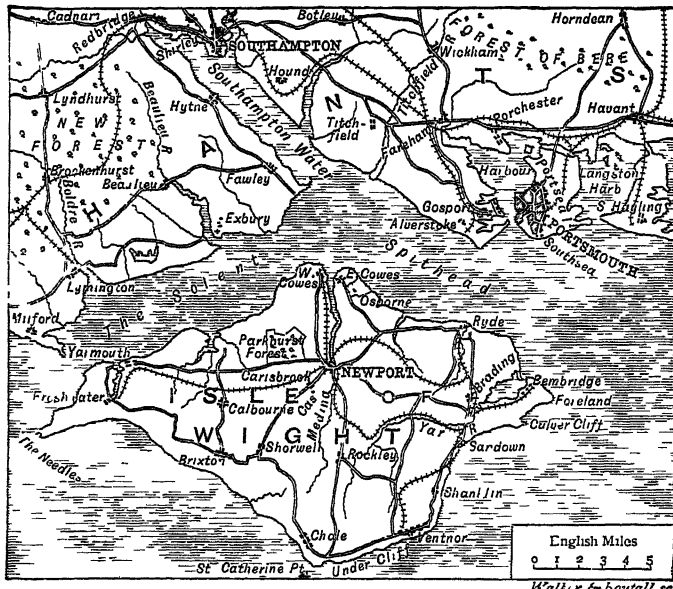
borough of Glamorganshire formed in 1921 out of the parishes of Aberavon, Michaelston Lower, Cwmavon, Margam, and part of Baglan Lower. It has a good harbour, and coal, iron, and copper works. Pop. 40,000.

Portugal, a republic of Europe, on the west side of the Iberian Peninsula, stretches 350 miles between 36° 59' and 42° 8' N. lat., and varies in width from 70 to 140 miles between 6° 10' and 9° 31' W. long. Its eastern and northern boundaries are Spain, its western and southern the Atlantic Ocean. Details of provincial areas and populations are given in the subjoined table.

Provinces.	Area in sq m	Pop. (1920).
Entre Minho e Douro.	2,790	1,804,461
Traz os Montes.	4,163	405,801
Beira.	9,308	1,597,573
Estremadura.	6,987	1,544,704
Alentejo.	9,219	501,252
Algarve.	1,987	268,294
Azores.	922	232,012
Madeira.	314	179,002
Total.	35,490	6,082,991

The population increases steadily but slowly: in 1851 it numbered 3,487,000; in 1874, 4,160,315; and in 1900, 5,428,659. But fully 70,000 persons emigrate every year, very many going to Brazil.

Physical Aspects.—Portugal is a part of the Iberian Peninsula (see SPAIN). The coast is low and flat, and sandy, except for one or two short distances, as immediately north and south of the mouth of the Tagus, and at Cape St Vincent in the extreme south-west. The two northern provinces are diversified by spurs (5000 feet) of the mountains of Spanish Galicia. The most important mountain-range of Portugal is the Serra da Estrella (6540 feet), a westward continuation of the Spanish Sierra Guadarrama system. The Sierra Morena is continued westwards in southern Portugal. In like manner, the principal rivers of the country—the Guadiana in the south, the Tagus in the centre, and the Douro and Minho in the north—are simply the lower courses of Spanish rivers. The Mondego, which reaches the sea about half-way between the Tagus mouth and that of the Douro, is the longest river that has its



solid masonry, roofed over, and closed by lock-gates. The dockyard contains officers' residences and a school of naval architecture.

Portsmouth Harbour, about 400 yards wide at its entrance, expands into a spacious basin, extending inland for about 4 miles, and having a breadth of 3 miles along its northern shore. Large war-vessels can enter and lie at anchor at all times of the tide, there being 4 fathoms of water in the channel at low water. The outward entrance is defended by Forts Monckton and Gilkicker, and Southsea Castle. The harbour is very favourably situated in the middle of the channel, close to the magnificent anchorage of Spithead, where 1000 ships of the line may ride without inconvenience, and is under shelter of the Isle of Wight, and opposite the French arsenal of Cherbourg. The local trade of Portsmouth is chiefly supported by the dockyard and other public establishments. Brewing is largely carried on.

The importance of this port dates only from the reign of Henry VIII. Its defences were commenced by Edward IV. and strengthened by Elizabeth, and afterwards in a more thorough manner by William III. Here, in a house that still remains in the High Street, and was then an inn called the 'Spotted Dog,' the Duke of Buckingham (the 'Steenie' of King James) was assassinated by John Felton. On the 29th of August 1782, when its commander, Admiral Kempenfeldt, was writing in his cabin, the *Royal George* went down at Spithead, and nearly 1000 lives were lost. Dickens was born at 387 Mile End Terrace, Commercial Road, Landport, Portsea; other worthies of Portsmouth have been George Bentham, Sir Walter Besant, the younger Brunel, Jonas Hanway, Sir Frederick Madden, George Meredith, and John Pounds.

Portsmouth, (1) the metropolis and only seaport of New Hampshire, is on the south bank of the Piscataqua River, 3 miles from the Atlantic, and 57 miles by rail NNE. of Boston. Built on a beautiful peninsula, overlooking a capacious and deep harbour, with smooth rock bottom, it is a handsome old town, many of its streets lined with shade-trees, and is a favourite summer-

sources in the country. Portugal has numerous mineral springs, a large proportion impregnated with sulphur. Minerals, fairly abundant, are not worked as much as they could be, chiefly for want of fuel and cheap transit, and also for lack of capital, and heavy taxation. There is a vast amount of water-power undeveloped. Salt is prepared in large quantities in the salt marshes; copper, iron, lead, manganese, antimony, gypsum, lime, and marble are extracted and in part exported.

Climate.—The ocean tempers the climate, and exempts it from the dry heat by which Spain is visited. The inequalities of the surface, however, produce diversities; for, while snow falls abundantly on the mountains in the northern provinces, it is never seen in the lowlands of the south, where spring begins with the new year and harvest is over by midsummer. Rain falls abundantly all the year round, especially on the coast, and from October to March. As a general rule, the climate is healthy in the elevated districts, even of the southern provinces. The mean annual temperature ranges from 60° F. at Oporto to 63°·5 at Lagos on the south coast.

The animal life and plant life do not differ from those of Spain (q.v.).

Occupations.—The soil is generally rich, except in the mountainous parts, but agriculture, though 60 per cent. of the population take part in it, is everywhere in a backward state, little more than half the area of the country being put to profitable use. The neglect of irrigation and the absence of good roads are severely felt. Cereals and pasture occupy 26·2 per cent. of the area of continental Portugal; vineyards, 3·5 per cent.; fruit-trees, 3·9; forest, 17·3; and waste land, 49·1. The cereals chiefly grown are maize, wheat, rye, barley, and rice, but not enough for the wants of the people. Potatoes, onions and other vegetables, flax, fruits (oranges, lemons, chestnuts, almonds, figs), are much grown. But the cultivation of the vine and of the olive are the most prosperous branches of industry; from the former is derived the rich red wine familiarly known as Port, from its being shipped at *O Porto*, 'the port.' About 100,000 hands are engaged in the vineyards. Cattle are reared in the north, sheep and goats in the centre, and swine in the oak forests of the south. In the vine districts of the north and centre the soil is mostly owned by peasant proprietors; in other parts of the country great estates are owned by land-owners and let to tenants to cultivate. Fish is abundant in all the rivers and off the coasts. The tunny and sardine trades are very considerable; oysters are also exported, but to a lesser extent.

Commerce.—Portugal is not a manufacturing country, and the industries are principally concentrated in the two chief towns, Lisbon and Oporto. The wine and cork trades, the fisheries, and weaving form the staple industries. Porcelain tiles, used extensively for interior and exterior decoration, and glassware are manufactured near Lisbon. The merchant marine, which suffered considerably during the Great War, amounted to 100,000 tons in 1918. There are more than 2000 miles of railway. The exports average 7½ million pounds a year, of which one-third is accounted for by wine, and one-fourth by sardines and cork; other exports are fruit, vegetables, and wool. Great Britain is the principal purchaser of Portuguese goods, to the extent of one-fourth of her exports, chiefly wine. The imports average 20 million pounds, of which one-third is accounted for by coal, iron and steel, machinery and textile manufactures; other imports are raw cotton, cod-fish, and hides. One-third of the imports comes from Great Britain, chiefly coal, cotton goods, and iron. The other

principal countries doing business with Portugal are the United States, France, and Brazil.

Finance.—The financial arrangements of Portugal have never been good, and there is almost invariably a deficit, which is mostly met by loans, so that the national debt rapidly increases. The chief sources of revenue are customs duties and the taxes on land and industries, but one-fourth of the expenditure is devoted to paying the interest on the national debt.

Defence.—Every Portuguese male between the ages of seventeen and forty-five is liable for military service: ten years in the active army, ten in the reserve, and eight with the territorials, though exemption could be obtained by payment. The annual contingent is fixed at different intervals by the legislative power. The peace footing of the army embraces about 26,000 of all ranks, and the war strength anything up to 200,000. The small navy is manned by some 6000 men.

Religion, Education.—Since the revolution and the deposition of King Manoel, anti-clerical influence has been all powerful, and in 1910 church and state were separated. There are three ecclesiastical provinces presided over by the Patriarch of Lisbon, the Archbishop of Braga, who is primate of Portugal, and the Archbishop of Evora. The monasteries were dissolved in 1834, their properties appropriated by the state; and monks and nuns were expelled in 1910. In 1917 the law of separation was somewhat modified, and diplomatic relations were resumed with the Vatican. There is freedom of worship for all, but 90 per cent. of the population are Roman Catholic. Compulsory education was enacted in 1844, but is far from being fully enforced; in 1920 there were 4 million illiterates (including children) out of a population of 6 million. The university at Coimbra (1291) is one of the oldest in Europe; Lisbon is the centre of different academies, many learned societies, and has a university and an important library (1796); and Oporto a university.

Constitution.—The revolution of 1910 changed the constitution of Portugal from a constitutional monarchy to a republic. There are 2 chambers, the Lower (164 members) being elected by direct suffrage for three years, and the Upper (71 members) being elected by all the municipal councils, renewable half at a time every three years. The president is elected by both chambers for a term of four years, cannot be re-elected, and receives an annual income, including allowances, of £5300. In 1920 the president obtained the right to dissolve parliament, which retains control over taxation. The president appoints the prime minister and the secretaries of state, forming the cabinet, who in their turn are responsible to parliament. Candidates for election to the Lower Chamber must be over twenty-five years of age, and for the Upper Chamber over thirty-five years, while the suffrage is open to all male Portuguese over twenty-one years who can read and write. The republic is strongly anti-clerical, most of its leaders, like its first president, Senhor Braga, being positivists, but the complete separation between church and state roused much opposition. At the end of the Great War the situation became less strained. The republic has abolished all hereditary titles and privileges.

People.—The Portuguese are a mixed race, mainly Mediterranean. Upon the Iberian or Basque came a later Celtic admixture. Galician blood (derived from the ancient Gallaici, presumably Gallic invaders) predominates in the north; Jewish and Arabic are strongly present in the centre, and African in the south. The Portuguese differ essentially from their Spanish brethren, whom they regard with inveterate hatred and jealousy, mainly

on account of their past attempts to subvert the independence of Portugal. The opinions of observers differ as to the national traits of the people. They seem, however, to be generally sober, good-natured, obliging, and patriotic, but shiftless and dirty. Lisbon, the capital, situated at the mouth of the river Tagus, with a magnificent bay, has a population of 486,372 (1920), and Oporto has 203,091 inhabitants. No other town reaches 38,000.

The colonial possessions of Portugal are enumerated in the subjoined list, though accurate figures are not easily obtainable :

AFRICA—	Area, in sq. m.	Pop.
Cape Verde Islands.....	1,480	149,798
Senegambia (Guinea).....	18,940	289,000
St Thomas and Principe.....	860	58,907
Angola, Ambriz, Benguela, Mossamedes, and Congo.....	484,800	4,119,000
East Africa.....	426,712	3,120,000
ASIA—		
Goa (in India).....	1,469	515,772
Diu, Damao, &c.....	169	82,700
Timor.....	7,830	377,815
Macao (in China).....	4	74,866
Total.....	986,264	8,787,858

See Crawford, *Portugal, Old and New* (1880); and *Round the Calendar in Portugal* (1890); Vasconcellos, *As Colónias Portuguezas* (2d ed. 1903); Crum Watson, *Portuguese Architecture* (1908); W. H. Koebel, *Portugal, its Land and People* (1909); A. F. G. Bell, *In Portugal* (1912); and *Portugal of the Portuguese* (1915).

HISTORY.—Romans followed Carthaginians as conquerors (138 B.C.) of the western Iberians and Celts. Under Augustus the peninsula was divided into three provinces, one of which, Lusitania, has, until quite recent times, been regarded as nearly identical with the present kingdom of Portugal; but the Augustan province of Lusitania lay wholly on the south side of the Tagus. The history of Portugal was in early times coincident with that of the Iberian Peninsula as a whole; and, along with the rest of the peninsula, Portugal was thoroughly Romanised in the days of the empire. After the Romans withdrew, the peninsula was overrun by Visigoths from the north, and at a later period by Saracens from the south. Under Roman, Visigothic, and Saracenic rule the people were prosperous and well governed, but became enervated by luxury and unwarlike ease. About the middle of the 11th century northern Portugal fell under the sway of Ferdinand I. of Castile. In 1094 Henry of Burgundy, who had married a natural daughter of Alfonso VI., son and successor of Ferdinand, received from that monarch the county of Portugal (from the Minho to the Tagus) as a dependent fief. Under his widow, Theresa (1114-28) the country acquired a sense of national unity and a certain measure of independence. Their son, Alfonso I., made Portugal an independent kingdom (1143)—through the victory of a picked body of Portuguese knights over a picked body of Castilian knights in a tournament—and gained signal advantages over the Arabs, whom he fought for twenty-five years, his greatest exploits being the victory in the plain of Ourique, in Alemtejo, in 1139, the capture (with the help of English crusaders) of Lisbon in 1147, and of Alcaicer do Sal in 1158. The Burgundian House, which continued in possession of the throne for 440 years, gave to Portugal some of its best kings. The immediate successors of Alfonso I. were engaged in incessant wars against the Moslems and in severe struggles with the clergy and nobles, who were always ready to combine against the sovereign; but, although often baffled in their attempts to uphold the independence of the crown, the dignity of the kingdom was, on the whole, well maintained by the representatives of this family, who were, moreover, distinguished as

the promoters and champions of the maritime glory of Portugal. Sancho (died 1211), the 'builder of cities,' especially distinguished himself by his care for the material welfare of his kingdom, and by his bold fight against the claims of Pope Innocent III. and that pope's supporters, the Portuguese bishops. His son, Alfonso II., summoned the first Portuguese Cortes. Alfonso III. (1248-79) conquered the southern province of the kingdom in 1250, and made Portugal what it practically is in area at the present time. His son Diniz (Denis) must be regarded as the founder of Portuguese commerce and mercantile enterprise. He likewise encouraged agriculture and the industrial arts, and protected learning, in furtherance of which he founded in 1300 a university at Lisbon, subsequently transferred to Coimbra. Diniz was succeeded in 1325 by his son, Alfonso IV., surnamed the Brave, whose reign was almost wholly occupied in wars with the Castilians and the Moslems (see CASTRO, INEZ DE). It was during his reign that the friendly commercial relations with England began. With Alfonso's grandson, Ferdinand I., the legitimate branch of the Burgundian House became extinct in 1383. After some disturbances Ferdinand's illegitimate brother, John, was recognised by the Cortes as king in 1385; four months later the allied Portuguese and English army won at Aljubarrota a glorious victory over the Castilians, who had invaded the country. John's reign (he died in 1433) was eventful, not merely on account of the internal reforms which he introduced, and of his steady maintenance of the prerogatives of the crown, but chiefly as being associated with the first of those important geographical discoveries and commercial enterprises which made Portugal for a while the greatest maritime power of Europe. During this reign, on May 9, 1386, the treaty of Windsor cemented the firm alliance and national friendship between Portugal and England, that was further confirmed by the marriage of King John to the daughter of John of Gaunt (1387). To John's son, Henry the Navigator (died 1460), is due the merit of having organised several voyages of discovery, which culminated in the acquisition of the Azores, Madeira, Cape de Verde, and other islands. At this time, too, the slave-trade began, the Portuguese bringing captive negroes to cultivate the large estates of their southern provinces. During the reign of John II. (1481-95), who broke the power of the feudal nobles, Bartholomeo Diaz doubled (1486) the Cape of Good Hope; and Vasco da Gama, in the reign of John's successor, Manoel, successfully achieved the passage by sea to India in 1497. The discovery of Brazil (1500), and the settlements made there and on the western coast of India by Albuquerque (q.v.), increased the maritime power and fame of Portugal, which were further extended under Manoel's son, John III., who ascended the throne in 1521.

At this period Portugal ranked as one of the most powerful monarchies in Europe, and Lisbon, the great distributing centre of the products of the East, as one of its most important commercial cities. Sudden as this prosperity had been, its decline was almost more abrupt, and may in a great measure be accounted for by the destruction of the old nobility, the extensive emigration that went on to the new colonies, the expulsion of the numerous wealthy and industrious Jews, on whose able financial management the commercial interests of the Portuguese were largely dependent, and the introduction of the Inquisition (1536), and of the Jesuits (1540), whose baneful supremacy gave rise to much tyranny and oppression, both in the colonies and at home, and in various ways stamped out the old spirit of the people, and crippled the resources of the nation. The influence of the Jesuits

over John's grandson, Sebastian (1557), was responsible for the defeat of the Portuguese, and the capture and death of their young king, at the battle of Alcazar al-Kebir in Africa in 1578. And the extinction of the old Burgundian line in 1580, after the brief reign of Sebastian's uncle, Cardinal Henry, plunged the country into difficulties and misfortunes. After a struggle for the throne between half-a-dozen candidates, none of whom found favour with the nation at large—they clung to the delusive hope that Sebastian was still alive, and would return from the hands of his Moorish captors—Philip II. of Spain succeeded in securing to himself the crown of Portugal and annexing the kingdom to the Spanish monarchy. This involved it in the ruinous wars of Spain against England, in the Low Countries, and in Germany, while the Dutch and English, in retaliation for Spanish aggressions at home, attacked and seized the Portuguese possessions in the Indian Archipelago and in South America. At length the insolence of Philip IV.'s minister, Olivarez, brought matters to a crisis; and in December 1640, after a forced union of sixty years, Portugal was freed, by a bold and successful rising of the nobles, from all connection with Spain, and the Duke of Braganza, a descendant of the old royal family, was placed on the throne (1641), under the title of John IV. The war with Spain, which was the natural result of this act, turned out, under the guidance of the famous Count Schomberg (who fell at Boyne battle, 1690), and with the assistance of 3000 English troops, favourable to Portugal, and was terminated in 1668 by the treaty of Lisbon, by which the independence of Portugal was formally recognised by the Spanish government. But her ancient glory had departed; she had lost many of her colonies, and of those she still retained Brazil alone was prosperous; the nation was steeped in ignorance and bigotry; and the Portuguese, from having been one of the greatest maritime powers of Europe became virtually a commercial dependent, rather than ally, of Great Britain, especially after the Methuen (q.v.) Treaty of 1703. Under the reign of Joseph I. (1750–77) the genius and resolution of the minister Pombal (q.v.) infused temporary vigour into the administration, and checked for a time the downward tendency of the national credit. But Pombal's efforts to rouse the people from their sloth, and infuse vigour into the government, were checked by the accession of Joseph's daughter, Maria, who, with her uncle-husband, Pedro III., allowed things to turn back into their old channels. The mental alienation of Maria led, in 1799, to the nomination of a regency under her eldest son, John. This prince, who showed considerable capacity in early life, on the outbreak of the war between Spain and France threw himself wholly on the protection of England; and finally, when he learned that Napoleon had determined on the destruction of his dynasty, left Portugal in 1807 and transferred the seat of government to Rio de Janeiro, the capital of Brazil (q.v.).

This act was immediately followed by the occupation and annexation of Portugal by the French—a measure which gave rise to the Peninsular War (q.v.). The victory of Vimeira, gained by the combined English and Portuguese army in 1808, freed the land from its French assailants; and in 1816, on the death of Queen Maria, the regent succeeded to the joint crowns of Portugal and Brazil. But even after the French were driven out of the Peninsula and Napoleon's power was broken for ever, the new king, John VI., still continued to reside at Rio de Janeiro, leaving Portugal to be governed by English officers, Marshal Beresford and others. This gave occasion to abuses and discontent, which resulted, in 1820, in a revolution at Lisbon, and in the proclamation of a constitutional form of

government, very democratic in spirit, in the place of the pre-existing feudal absolutism. John hurried to Portugal, and there signed the constitution and ratified the independence of Brazil, which proclaimed his son Pedro emperor. On the death of John in 1826, Pedro IV., after organising the government of Portugal on the model of the English parliamentary system, renounced the Portuguese crown in favour of his daughter, Maria da Gloria, a child of seven, on condition that she married her uncle, Miguel. The latter, who had availed himself of every opportunity to thwart the liberal policy of his father and brother, waited only for the embarkation of the English troops to break the oath which he had taken to maintain the constitution, and, gathering round him the clergy, the army officers, the old nobility, and all who were in favour of the former order of things, was through their aid declared king by the Cortes in June 1828.

Then ensued a period of indescribable confusion and misrule. At length, in 1832, Pedro was enabled, chiefly by means of a loan from Englishmen, to raise an army, and make a landing at Oporto. Charles Napier virtually destroyed Miguel's fleet off Cape St Vincent in 1833. Shortly afterwards Queen Maria made her entry into Lisbon; and in the following year Miguel signed the Convention of Evora, by which he renounced all pretensions to the throne, and agreed to quit Portugal. The death of Pedro in the same year, after he had effected several important reforms, including the reintroduction of the constitution of 1826, proved a heavy misfortune to Portugal, which suffered severely from the mercenary rule of those who occupied places of trust about the person of the young queen. Her marriage, in 1835, with Augustus, Duke of Leuchtenberg, and, after his death at the end of a few months, her marriage with Ferdinand of Saxe-Coburg, were followed by grave political disturbances. A branch of the democrats, known as the Septembrists, from the month in which they made their first decisive stand against the government, loudly demanded (1836) the abrogation of the charter promulgated by Pedro (known as the Charter of 1826), and the restoration of the democratic constitution of 1824. This contest of the charters continued through the entire reign of Maria, and party feeling ran so high that it resulted more than once in hostilities. The government was alternately in the hands of Septembrists and Chartists; one Cortes was dissolved after another; finally, in 1852, a revised charter was drawn up that proved acceptable to all parties. Shortly afterwards the queen died, and her eldest son ascended the throne in 1853 as Pedro V., under the regency of his father. The latter used his power discreetly; and by his judicious management the financial confusions and embarrassments were partially removed. Upon the sudden death of Pedro in 1861 his brother was proclaimed king as Luis I., but the financial condition went from bad to worse, and the royal power grew weaker and weaker. Charles I. succeeded his father in 1889, and in the same year the establishment of a republic in Brazil gave an impulse to republicanism in Portugal. In 1889 also Britain compelled Portugal to abandon her claim to Nyassaland; further delimitations in 1891 provoked bitter feelings against Britain, and anti-foreign demonstrations became anti-dynastic. Financial embarrassment increased, corruption was rampant, court expenditure extravagant, monopolies were monstrous, taxation ruinous. Two political parties, Progressistas and Regeneradores, arranged to divide the spoils between them, though reforms were proposed, the king made some sacrifices, and

the army was slightly reduced. When Senhor Franco had by degrees secured power and, supported by the king, aimed at reform by a practical dictatorship (1905), popular discontent culminated in the assassination of the king and his eldest son in the streets of Lisbon in February 1908. His second son, Manoel, succeeded. Franco withdrew from Portugal, and some concessions were announced. But a parliamentary committee revealed a wholesale system of plundering the treasury, by which large sums had been made over to King Carlos and the royal family and to the bureaucracy. In 1910 the murder of Dr Bombarda, a republican, hastened on a revolution already arranged for. The army and navy assisted in deposing Manoel and setting up a Provisional Government, with Dr Braga as President of the Republic. Subsequent history has been stormy. Financial embarrassments have continued with an ever-increasing national debt, the government never being strong enough adequately to tax war-profits, or to reduce the bureaucracy. Royalist risings, though on a small scale, have been frequent, and there have been several alarming industrial crises. In 1915, 1917, and 1918 disorders in Lisbon between the Radicals and Liberals ended in bloodshed. In 1914 the government was authorised to intervene in the Great War as Britain's ally; and in 1916 Germany declared war on Portugal. The attempt of Dr Paes to form a ministry on national lines was cut short by his assassination in 1917. The republic had its first stable government under Dr de Silva in 1922-23. The absence of a firm and guiding hand has been much felt in Portugal. General Gomes da Costa in June 1926 unsuccessfully sought to emulate the dictators of Spain and Greece. General Carmona's military dictatorship followed.

See works by the native historians Herculano (1848-57), Da Silva (1860-71), Da Luz Soriano (1866-90), and De Almeida; J. P. Oliveira Martins, *História de Portugal* (1901) and other works; Martin Hume, *Through Portugal* (1907); Morse Stephens, *Portugal* (2d ed. 1908); G. Young, *Portugal Old and Young* (1917).

LANGUAGE AND LITERATURE. — Portuguese, like every other branch of the Romance family of languages, has grown out of a local form of the *Lingua Romana Rustica*, and in course of time has had ingrafted upon it many elements of Arabic from the Saracen invaders, and numerous verbal and idiomatic characteristics of the Frankish and Celtic dialects which were introduced with the Burgundian founders of the monarchy. The earlier forms of Portuguese bore close affinity to Galician; and, although Portuguese presented strong resemblance to its sister-language, the Castilian, in so far as both possessed numerous words of identical origin, it differed so widely from the latter in regard to grammatical structure as almost to merit the designation of an original tongue. The antipathy existing between the Portuguese and Spaniards, and the consequent strenuous efforts of the best writers among the former to keep their language distinct, and to resist the introduction of further Castilian elements, had the effect of making Portuguese still more dissimilar from the sister-tongues of the peninsula, and the result has been a language that differs from pure Spanish in having an excess of nasal sounds and fewer gutturals, with a softening or lisping of the consonants, and a deepening of the vowels, which renders it the softest, but feeblest, of all the Romance tongues. The earliest specimens of genuine Portuguese belong to the beginning of the 13th century, and consist for the most part of collections or books of song, (see *CANCIONERO*), which, both in regard to form and rhythm, resemble the troubadour or *minne* songs of the same period. Amongst the writers of these the most outstanding figure is King Diniz,

who, besides being the forerunner of the Portuguese school of pastoral poets, also drew inspiration from the popular songs of his people. In the 14th and 15th centuries, whilst the romances of chivalry were popular and numerous chronicles were written, the best being that of Fernan Lopes (1380-1459), the court continued to be the centre of poetry and art; but Castilian was in greater vogue than Portuguese, which was despised by the numerous royal poets who emulated the example of Diniz, and composed love-songs and moral or didactic poems. Under the culture of these noble bards the poetry of Portugal was weak and effeminate, without the tenderness and pathos which characterised the Spanish verse 'romances' of that age. But the literature of Portugal acquired new vigour with the growth of her maritime and commercial prosperity. The *Cancioneiro Geral* (1516) of Garcia de Resende (1470-1554), which gives a general summary and extracts of the Portuguese poets of the later half of the 15th and beginning of the 16th century, is the first evidence of the change, which is most strongly exemplified in the dramas of Gil Vicente (1470-1536), and in the pastorals and eclogues of Ribeiro (c. 1500) and Sá de Miranda (1495-1558; q.v.), whose dramatic imitations of Horace and Terence mark the transition period between the mediæval lyrical and the later classical style. These first attempts at the drama were followed by Antonio de Ferreira's (1528-69) *Ignês de Castro*, the oldest, and still the finest, Portuguese tragedy. But the classical school, whose chief cultivators were the courtiers of Lisbon and the professors of Coimbra, found little favour among the people at large, whose enthusiasm and patriotism were deeply stirred by the discoveries and conquests of the nation in Asia, Africa, and America. The national pride and glory found full expression in the works of Portugal's greatest writer, Camoens (1524-80; q.v.), who, in *The Lusitads* (1572), struck out a new path in the domain of epic poetry; while his numerous sonnets, his songs, his dramas, and other poetic productions exhibit a versatility of genius and graceful tenderness which place him in the foremost rank of European poets. Next after Camoens come the epic poets Corte-Real (1540-93), Mousinho de Quebedo, F. de Andrade (1540-1614), Pereira de Castro (1571-1632), and Sá de Menezes (died 1664). To the same period belongs the dramatist Ferreira de Vasconcellos (died 1585).

With Camoens the language and poetry of Portugal reached the culminating point of their development. During the dominion of Spain the Portuguese so far lost all feeling of national independence that they at length renounced their native tongue, and adopted the language of their rulers. With the restoration of political independence, under the sway of the House of Braganza, a reaction took place; but the 17th and 18th centuries produced few Portuguese writers who attained more than an ephemeral and purely local reputation—bombast, and slavish imitation of Spanish and Italian writers, being the predominant characteristics of the Portuguese school of light literature. Some good historical writers belong, however, to this period, as Jacinto Freire de Andrade (1597-1657), whose life of João de Castro, Viceroy of India, still holds its place as a monument of classical Portuguese prose; the great Indian missionary, the Jesuit Father Antonio Vieira (1608-97), whose sermons and letters are regarded as models of style and diction; De Barros (1496-1570), the historian of *The Conquest of the Indies*; Da Faria e Sousa (1590-1649), De Brito (1569-1617), and Brandão (1584-1637), who wrote *Monarchia Lusitana*; A. de Resende (1498-1573); and F. X. de Menezes (1673-1743). During the 18th century

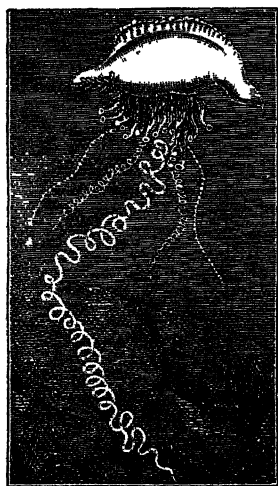
French literary canons and models were slavishly followed by most Portuguese writers of verse, of whom the best known is Da Cruz e Silva (1731-1800). Nascimento (1734-1819) and De Bocage (1765-1805), though both rather pedantic, had an enormous influence in reviving a more national thought and style. During the first half of the 19th century Portuguese literature is dominated by two writers; the versatile De Almeida Garrett (1799-1854), who sought to make poetry less artificial and more spontaneous, and at the same time to found a national drama; and the eminent scholar and historian, Herculano (1810-77), whose work is characterised by thoroughness and attention to detail. João de Deus (1830-96), who was inspired by the native soil and popular speech to compose lyrics, simple and natural, and Anthero de Quental (1842-91), who wrote some splendid sombre sonnets, are perhaps the best poets of the century, but Teixeira de Pascoaes (b. 1877), continuing the traditions of *saudade*, has almost a Wordsworthian occupation with nature. Castello Branco (1825-90) poured out novels profusely, all more or less fantastic and sensational, rather in the style of the 18th-century Spanish romances, though the purity of his language is unquestioned. Eça de Queiroz (1843-1900) presents a marked contrast; devoted to realism, almost to the extent of caricature, he fell rather unfortunately under French influences, and his style suffered accordingly. Other names of importance are those of the poets de Castilho (1800-75), Ribeiro (1831-1901), and de Castro (b. 1869), the novelist Gomes Coelho (1839-71), the historian Oliveira Martins (1845-94), and the critic Dr T. Braga (1843-1924), the first president of the republic. Gomes Leal (1849-1921) and Guerra Junqueiro (1850-1923) were the greatest poets of their generation. In 1917 a Chair of Portuguese Language and Literature was founded at King's College, London.

See F. da Silva and Aranha, *Dicionário Bibliográfico* (12 vols. 1858-65); T. Braga, *História da Literatura Portuguesa* (32 vols., summarised in 4 vols., 1909-18); G. Young, *Portugal: An Anthology* (1916); Mendes dos Remedios, *História da Literatura Portuguesa* (5th ed. 1921); A. F. G. Bell, *Portuguese Literature* (1922); *Oxford Book of Portuguese Verse*, ed. by Bell (1925).

Portugalete, a Spanish seaport 8 miles NW. of Bilbao, with a lofty swing-ferry; pop. 7600.

Portuguese Man-of-War (*Physalia*), a

remarkable genus in the class Cœlenterata, in the sub-class Siphonophora. It is common in tropical seas, floating on the surface with an inflated brightly coloured bladder, sometimes 6 inches in length, and with a pendent colony of individuals, among which there is no little division of labour. Most important are the nutritive and reproductive members, and long stinging tentacles which stream for several feet into the water. The stinging power, normally used in benumbing the small animals on which the floating colony feeds, is sufficient to cause intense irrita-



Physalia utriculus.

colony feeds, is sufficient to

tion in those who incautiously test it. The *Physalia* floats for the most part passively, and is occasionally driven to British coasts. An allied genus, *Rhizophysa*, is even more remarkable, with a large float and long stem.

Portulacaceæ, a family of dicotyledons, nearly allied to Caryophyllaceæ. The species are not very numerous: they are much diffused over the world, and are shrubby or herbaceous, generally succulent, mostly growing in dry places. The flowers are often large and beautiful, but ephemeral. The foliage is bland and insipid. Some species are used as salads and pot-herbs, of which the best known is Purslane (q.v.). The tuberous roots of *Claytonia tuberosa*, a Siberian plant, are used for food. The genera *Calandrinia* and *Portulaca* furnish some beautiful annuals.

Port Wine (i.e. *Porto* or *Oporto Wine*), a species of Portuguese red wine, defined, by formal agreement incorporated in a treaty of 1916, as 'a fortified wine, produced in the Douro region, and exported through the bar of Oporto.' The vine from which it is produced is generally planted on craggy slopes with a southern exposure. The wine, when pure and unadulterated, does not acquire its full strength and flavour till it has stood for some years; but care must likewise be taken that it is not allowed to become too old. The colour of new port wine varies from pale rose to deep red, and changes with age, becoming a deep tawny brown, which is permanent. By far the greater portion of the wine made is mixed with spirit even during the time of fermentation, in order to give the new wine the ripeness and strength which exporters require, and which the wine does not naturally attain till it has stood for some time; the proper colour is also given by a mixture known as *jeropiga*, which is a preparation of elder-berries, molasses, raisin-juice, and spirit. It is an excess of this *jeropiga* that gives a medicated odour to the inferior sorts of port. The extreme 'headiness' of port is chiefly due to liberal admixture with spirit. The natural port wine, with less than 26 per cent. of proof spirit, is wholesome and invigorating. Port wine came into demand about 1700, though it was known in England for a considerable time before. See W. J. Todd, *Port* (1926).

Porus. See ALEXANDER THE GREAT.

Poscharevatz. See PASSAROWITZ.

Poseidon, Greek god of the sea and of water, son of Kronos, brother of Zeus and Pluto. A god, especially of the Ionians, he lost the sovereignty of Athens in contest with Athena, notwithstanding his gift of the horse. The dolphin and the trident are his attributes in works of art. Black bulls were sacrificed to him. The Isthmian Games at Corinth were held in his honour; and the Panionian festival was kept at his temple at Mycale. See Farnell, *Cults of the Greek States*; and NEPTUNE.

Posen (Polish *Poznań*), the westernmost county or voivodeship of Poland, composed of the greater part of the former Prussian province of Posen, together with a small area about Bralin taken from Lower Silesia. Area, 10,232 sq. m.; pop. (1921) 1,974,057, of whom about one-sixth were Germans. The Warthe traverses it from east to west, and is navigable throughout the greater part of its course, as is also the smaller Netze. The Vistula touches Posen on the north-east. The region is a continuation of the great plain of north Germany; there are several lakes in the east. Like Pomerania, it is essentially agricultural. Grain, potatoes, and hops are the principal products. The industry is not much developed, being limited chiefly to machinery, cloth, bricks, sugar, and beer, with saw-milling. The Roman Catholic archbishop

of Gnesen and Posen is primate of Poland. The chief towns are Posen (the capital), Gnesen (Gniezno), Bromberg (Bydgoszcz), Lissa (Leszno), and Rawitsch (Rawicz). Posen formed an integral part of Poland till 1772, when, at the first partition, the districts north of the Netze were given to Prussia; to these was added in 1793 Great Poland, except Masovia, the whole being incorporated under the name of South Prussia. In 1807 Posen was included in the duchy of Warsaw; but by the Congress of Vienna it was reassigned to Prussia under the title of the Grand-duchy of Posen. In 1848 the Poles gave the Prussian government considerable trouble. In 1919 Posen was given to Poland, except small strips in the north-west and west, which, with the remnant of West Prussia, went to form the Prussian province of Grenzmark.

POSEN, or Poznań, the chief town of the province, and a fortress, is situated on the Warthe, 158 miles by rail E. of Berlin. One of the most ancient cities of Poland, it became the seat of a Christian bishop in 968, and it was the capital of the early Polish dukes. In the 16th century it was an important trading mart, but by the end of the same century had begun to decline. The Prussians made it a prosperous and very pleasant town; it has stately public buildings, regularly built streets and squares, and handsome suburbs. The cathedral, a Gothic pile dating from 1775, has attached to it the 'Golden Chapel' of Count Raczyński, which is adorned with valuable treasures and works of art. Other buildings are the town-house (1508, restored 1913), containing valuable archives; the Raczyński Palace, with a library; the Działynski Palace, with archives; and the archiepiscopal palace. There is a provincial museum of antiquities. A university was founded in 1919. The chief manufactures are artificial manures, agricultural implements, furniture, tobacco, &c.; and there are likewise several breweries, distilleries, and flour-mills. Pop. (1875) 60,998; (1890) 69,627; (1900) 117,033; (1910) 156,696; (1921) 169,793, including a great proportion of Germans.

Posidonia. See PÆSTUM.

Posidonia, a marine genus of Potamogetonaceæ (or Naiadaceæ) consisting of two species. *P. oceanica* is abundant in the Mediterranean, and rolled masses of its long, ribbon-like leaves are often thrown up by the waves. *P. australis* is found off the Australian coasts. Its fibre has been mixed with wool, but without much success.

Posidonius, a Stoic philosopher, born at Apamea, in Syria, about 135 B.C., who studied at Athens, and settled at Rhodes, whence in 86 he was sent as envoy to Rome. Here he became intimate with Cicero, Pompey, and other conspicuous Romans. He died at the age of eighty-four, leaving works on philosophy, astronomy, and history, of which only fragments have been preserved.

Posilipo (from a villa here called *Pausilypon*, 'Sans-souci,' which at one time belonged to the Emperor Augustus), a mountain on the north-west of Naples, close by the city, from of old a noble site for the villas of wealthy citizens. It is remarkable for the tunnel known as the Grotto of Posilipo, through which the road from Naples to Pozzuoli (anc. *Puteoli*) passes. The grotto varies in height from 20 feet to 80 or more, is 20 to 30 feet wide, and 755 yards long. It is traditionally said to have been made in the reign of Augustus, but is probably earlier. Above the eastern archway of the grotto is the so-called 'Tomb of Virgil.' At the base of the hill anciently stood the poet's villa. During the middle ages the common people believed the grotto to be the work of the poet, whom they regarded as a great magician. Two other tunnels penetrate through

the hill, one to the north of the grotto, 800 yards long, 39 feet high, and 33 feet broad, made for the tramway, and another constructed at the command of Agrippa in 37 B.C., but only discovered in 1812.

Positive Rays, or CANAL RAYS, streams of positively charged particles (atoms and molecules) which escape through a perforation in the kathode of a discharge tube, were turned to use by Sir J. J. Thomson in 1911 for purposes of chemical analysis. The ray directed upon a photographic plate may be deflected by a magnetic field by an amount $y = A \frac{e}{mv}$; and by an electric field by an

amount $x = B \frac{e}{mv^2}$; where A and B are constants depending on the strength of the fields and the geometrical data of the apparatus, e the charge, m the mass of a particle, v its velocity. These deflections may be arranged at right angles to each other, and we easily deduce $y^2 = \frac{A^2}{B^2} \cdot \frac{e}{m} \cdot x$; which, if $\frac{e}{m}$ be constant, is the equation of a parabola.

It is found, in fact (from examination of the photographic plate), that owing to their different velocities atoms or molecules of like mass and charge are spread out in a parabola. Thus, by enclosing a very small quantity of a gas in a tube it is possible not merely to determine what elements and compounds are present, but by measurement of the parabolas to find their molecular weights. The method is one of extreme delicacy. See Sir J. J. Thomson, *Rays of Positive Electricity* (new ed. 1921).

Positivism, the System of Thought and Life founded by Auguste Comte (1798-1857; q. v.), is defined by him as consisting essentially of a 'philosophy and a polity which can never be dissevered; the former being the basis, and the latter the end, of one comprehensive system, in which our intellectual faculties and our social sympathies are brought into close correlation with each other.' He chose the word *Positive* on the ground of its indicating the *reality* and *constructive tendency* which he claimed for the doctrine in its theoretical aspect, while he anticipated that in the future the term would acquire a wider meaning by suggesting also similar ideas in the sphere of feeling and action. The two primary characters of Positivism, the philosophy and the polity, were finally welded into a whole under the conception of a religion, which has for its creed the new synthesis established by the one, and for its practice the scheme of moral and social reorganisation proposed by the other. We may best consider Positivism under these three aspects.

Positive Philosophy.—Comte's primary aim was to put an end to the intellectual and social anarchy which had resulted from the destructive criticism and the revolutionary upheaval of the 18th century, by supplying an interpretation of phenomena which should organise our knowledge of the world, of man, of society, into a consistent whole. Such a universal synthesis must the new philosophy provide to form a sure basis for a new art of life.

Historical analysis revealed to Comte, as a law of mental growth, the progress of all human conceptions through three distinct phases. The primitive stage he called the *theological*; the transition stage, the *metaphysical*; and the final stage, the *positive*. The meanings which he attaches to these words are most concisely explained by Stuart Mill's translation of them into volitional, abstractional, experiential. The transition was effected by the gradual acceptance of the scientific method of induction from observation of phenomena as the only

sound basis of explanation, all inquiry into causes other than phenomenal being finally given up as fruitless. Science, therefore, is the instrument capable of effecting the desired unity; and the problem of the positive philosophy is a threefold one: (1) to bring all knowledge within the sphere of scientific investigation; (2) to extend scientific methods through the whole territory of each division; (3) to co-ordinate the results obtained from the separate sciences, so as to approach an expression of all our knowledge in terms of a single doctrine. All three parts of this problem Comte considered to be in a large degree solved by his *Classification of the Sciences*.

He observed that the several classes of conceptions advanced from the theological to the positive stage with different degrees of facility, and on inquiring into the law of progression he found that the order of emancipation of the various sciences was determined by the degree of complexity and the consequent relations of dependence. A preliminary distinction was made between the abstract and the concrete sciences, the former treating separately of the general laws manifested by all the phenomena of any class, and the latter depending on these and treating of definite objects under the several aspects in which they may be viewed. The concrete sciences, Comte considered, did not yet admit of co-ordination, and he confined his classification to the abstract sciences, which he placed in the following series: (1) Mathematics; (2) Astronomy; (3) Physics; (4) Chemistry; (5) Biology; each of these drawing its data from the preceding science, and adding a new order of conceptions peculiar to itself. This series he found coincident with the sphere of knowledge then supposed to admit of scientific treatment. But there remained the phenomena of human character and society, forming a wide field of inquiry to which positive methods had never yet been applied. Certain tentative efforts had indeed been made to construct a so-called science of history—notably by Montesquieu and Condorcet—but no one before Comte had formulated the principles on which such a task might be accomplished. By his discovery of the methods proper to a rational study of social phenomena, and by his dicta—that owing to the complexity of the conditions involved, the laws of such phenomena cannot be determined *a priori*, but must be inductively observed, and afterwards verified and co-ordinated by deductive application of the general laws of life; that the statical condition of each historical period must be viewed in its totality, as determined by the interaction of the various classes of social factors; that intellectual evolution affords the true measure of social progress—by his enunciation of these and other doctrines Sociology was created and established in the hierarchy as the last and crowning science of the series.

The whole realm of fact was now included in the domain of positive inquiry, and Comte next addressed himself to the task of rationalising the separate departments of knowledge. In the earlier portion of this task his mathematical aptitude ensured him a large measure of success; while in biology he paved the way for further developments by his organisation of the materials then available. His main services, however, in scientific co-ordination were in the department of sociology. Besides the formal constitution which he gave to the new science, his chief substantive contribution was his enunciation of the fundamental law of intellectual development, already referred to as the cardinal doctrine of the positive philosophy. The progress of thought, moreover, from theological to positive conceptions was shown to be coincident with a progression in social action from an aggressive militarism, through a period of defensive attitude,

to the final régime of industrialism. The two series of transitions are mutually dependent, our increasing knowledge of the conditions of our existence and our systematic efforts to modify them naturally reacting on each other.

The main problem of the positive philosophy, the unification of knowledge, was not yet ripe for its final solution in the days of Comte, but his classification of the sciences is regarded by his followers as affording an admirable framework for the theory of evolution advanced at a later date with the claim of supplying this want. Comte was fain to be content with the demonstration of a subjective unity in the subservience of all the sciences to the needs of man.

Positive Polity.—On the basis of the philosophy he had thus established Comte founded a scheme of individual and social conduct. The ethical portion he did not live to complete, but in his elaborate exposition of the art of social politics we have ample insight into his views on what he considered an integral part of his system. We have space here only for a bare outline.

The most complete life must be that which rests on the fullest knowledge. We naturally strive to improve those conditions of our existence which we can affect in the direction indicated by the clearer light of a new synthesis. What, then, are the evils or imperfections of our lot which may be remedied by applying positive philosophy to life? Cosmical laws are wholly beyond our direct influence, and we can only to a limited extent affect the conditions of their action. But in the science of man we ourselves are the factors, and our efforts to modify our environment form the subjective aspect of what is, objectively considered, a law of social development.

Comte believed the first requisite of systematic action to be the recognition of a central intellectual and moral authority dissociated from practical politics, which he proposed to secure by organising a *Spiritual Power*, consisting of philosophers, supported by the state. This class, exerting a purely moral control, yet supreme in all affairs of private and social life in virtue of its natural prestige, would have only an indirect influence on political action. The temporal power should be in the hands of capitalists, the captains of industry—chosen by their own order and naming their successors—who would feel a moral responsibility to the spiritual power, especially when the authority of the thinkers should be strengthened by the support of women and of the working-classes, whose ready adherence to positive principles Comte firmly anticipated. Besides the corrective influence of each of these powers on the other, an efficient check on despotic control on the part of either is provided in the perfect freedom of opinion and expression allowed—a freedom the more valuable that it would rest on a system of scientific and moral education, which it would be one of the chief functions of the spiritual power to direct and enforce.

With the decline of militarism and the growth of industrialism Comte foresaw that political action would in the future be mainly directed on the organisation of labour for the benefit of society at large. No idleness would be permitted; all would be workers. The distinction between the capitalists and the workmen, the rich and the relatively poor, would remain; but the former would be taught to hold their wealth and power as in trust from society to be used for the benefit of all, while the latter would also come to regard themselves as performing public functions, serving society each in his place. These views are substantially similar to such later economic teaching as that of Carlyle and Ruskin in Great Britain.

In the sphere of morals the main office of the spiritual power would be to strengthen the social tendencies of man at the expense of the personal, a process made possible by the development of the affections originally called forth in family life. In the sphere of intellect it should regulate and concentrate the labours of its members, putting an end to the present 'dispersive speciality' of scientific aims, and determining the direction of all intellectual efforts by reference to social needs. In pursuance of the constructive principle of Positivism Comte applies these general doctrines to the immediate future, by propounding a scheme of concerted action for a great Western Republic, embracing the French, English, German, Italian, and Spanish nations—an organisation imperfectly effected by the influence of Feudalism and Christianity.

Positivist Religion.—Such are the creed and the practice of Positivism. But a religion is more than creed and practice; there must be a sentiment, an appeal to the heart, a satisfaction of the feelings. The conception of an object of love and reverence proposed by Comte to succeed the idea of a Deity (whose existence he considered it impossible either to affirm or deny) is that of *Humanity*, regarded as a collective unity, a *great being*, consisting of all the men and women past, present, and to come, whose lives have been or shall be devoted to the well-being and progress of the race. This being, partly ideal yet wholly real, capable of being definitely conceived, and not beyond the reach of our services, would gather round it all our affections for our fellow-men; gratitude and reverence for those whose struggles and achievements in the past have made us what we are; love and sympathy for all around us who are striving after better things; hope and effort for the more perfect life of those yet unborn. Comte looked on the religion of Humanity as fulfilling all the highest aims sought by the religions of the past, and especially as succeeding naturally to Christianity, the historical value of which he thoroughly appreciated as a transitional phase of religious development. The worship of Humanity was to consist in prayer, taking the form of high resolve strengthened by effort after ideal communion with the noble spirits among the dead; and in public commemorations, for the observance of which a calendar was suggested, associating each day of the year with some great name in the roll of mankind, and arranged so as to illustrate the course of human progress. The spiritual power would carry on the traditions of the priesthoods of former religions, preaching self-abnegation as the rule of life that brings the highest happiness, and offering no reward, save a place in the 'choir invisible' of the great and good, whose names are cherished in the hearts of those who follow them, and whose influence will live to the end of time.

Positivism is of too recent origin to be adequately treated except in an account of its genesis, and the above outline of the system has therefore been entirely confined to the works of its founder. In his lifetime Comte attached to himself a body of disciples more remarkable for intellectual eminence than for numbers. The most prominent of these was Littré (q.v.), who afterwards edited his master's works, and established a review with the title of *La Philosophie Positive*. His discipleship, however, did not extend to the later developments of the system. Near the end of his life Comte founded the Positivist Society. Among the best-known English Positivists, Dr Congreve, Frederic Harrison, Dr Bridges, and Professor Beesly translated Comte's chief works and published many expository and illustrative papers and addresses.

Among sympathetic critics of Positivism are many thinkers of eminence imbued with the positive spirit,

and more or less indebted to the genius of Comte. Stuart Mill, in his work on *Auguste Comte and Positivism* (1865), though taking an independent standpoint, speaks in terms of high appreciation not only of the leading doctrines of the positive philosophy, but also of the conception of humanity as a *Grand Être*, which is the keystone of the new religion. Many of the details of ritual and worship, however, were repugnant to him, as they have proved to many; and, while exaggerating the importance of these, he makes an arbitrary separation between the earlier and the later portions of Comte's career. Dr Bridges replied in *The Unity of Comte's Life and Doctrines* (1866). Levy-Bruhl's *La Philosophie d'Auguste Comte* (1900) was translated with preface by Harrison (1903). Herbert Spencer took more pains to vindicate his independence of Comte than to acknowledge his obligation to him. In two essays, one on *The Genesis of Science* and the other on *The Classification of the Sciences*, he opposed Comte's views on these subjects; and he even thought it necessary to publish an article entitled *Reasons for dissenting from the Philosophy of M. Comte*. Spencer's exposition of the theory of evolution is regarded by Positivists as a valuable contribution to that scientific philosophy the inauguration of which they claim for their master. G. H. Lewes, in the chapter on Comte in his *History of Philosophy*, calls him the greatest thinker of modern times, and declares himself an ardent adherent of the positive philosophy. For the religious aspects of Positivism, however, Lewes's feeling is one of partial sympathy only. In George Eliot's works the influence of Comte's doctrines is evident, and she devoted one of her poems to the interpretation of the Positivist conception of immortality. In addition to the works of these writers, the following are the most important criticisms of Positivism, representing various degrees of sympathy and antagonism: Lord Morley, article 'Comte' in *Ency. Brit.*; Professor Edward Caird, *Social Philosophy and Religion of Comte*; Dr J. M'Cosh, *Christianity and Positivism*; Dr Martineau, in *Types of Ethical Theory*; Professor Huxley, 'Scientific Aspects of Positivism,' in *Lay Sermons*; and Lord Balfour, *Religion of Humanity*.

Among critics wholly antagonistic to Positivism are naturally to be found the theologians and so-called metaphysicians—i.e. all whose explanations of phenomena either assume the action of supernatural beings or are expressed in terms of abstractions such as *vital principle*, *inherent tendency*, *nature*. Such thinkers, Positivists contend, generally profess little knowledge of scientific fact; but with these may be included many scientific specialists whose contracted view of the phenomenal world unfits them for general conceptions, and leaves them open to theological and metaphysical influences beyond the immediate sphere of their own speciality. The opposition of these classes follows from the refusal of Positivism to recognise the claims of such modes of thought to other than an historical importance.

Posse Comitatus ('the *posse* of the county'—the infinitive 'to be able' being used in late Latin as a noun, and meaning power or force), the whole force of the county, consisting of knights and men above the age of fifteen, with constables, who attend the orders of the sheriff to assist in enforcing process or quelling riots. Justices of the peace can also, if apprehensive of an organised resistance, command the services of the posse comitatus, and it is the sheriff's duty to raise the necessary number of men. But practically, in modern times, constables and special constables are all the assistance given or required. See **SHERIFF**.

Possession is the relation which subsists between a person and a thing, when the person has control over the thing, and maintains his control with the intention of exercising rights over the thing. A man may be in possession of what is not his own; a thief enters into unlawful possession of another's goods; a farmer has lawful possession of his landlord's property. Again, a man may own a thing without possessing it, and the law prescribes the forms of action, &c. whereby an owner may recover possession of his property.

In a reasonably well-governed community possession is evidence of right to possess; the person in possession is therefore protected against all the world, unless there is some other person who can show that he has a better title: this is what is meant by saying 'possession is nine points of the law.' We speak sometimes of an interest in possession, as distinguished from an interest in reversion or remainder: thus, the person who is entitled to receive the rent of land has an interest or estate in possession, though he does not possess the land. In common speech possession is frequently used as synonymous with property; but for legal purposes the two ideas must be carefully distinguished. See Hunter's *Roman Law*; and Pollock and Wright's *Essay on Possession in the Common Law* (1888). There may be joint-ownership in either personal or real property, one of the characteristics of this kind of ownership being 'benefit of survivorship'—i.e. if one of the joint-owners dies his interest accrues to the other, and does not go to the deceased co-owner's heirs and representatives. In partnership, when one partner dies his share belongs to his own personal representatives.

Possession, DEMONIAC. See DEMONOLOGY, EXORCISM.

Posset, a dietetic preparation, made by curdling milk with some acidulous liquor, such as wine, ale, or vinegar. White wine or sherry is usually preferred, but sometimes old ale is used. The milk is boiled, and whilst it is still on the fire the acidulous matter is added; if sherry, about a wine-glassful and a half to the pint of new milk is the proportion, or twice the quantity if ale. A teaspoonful of vinegar or of lemon-juice is sometimes used instead; one or two tablespoonfuls of treacle may be added, to sweeten. Taken at bedtime, it is used for colds and coughs.

Post-captain. See CAPTAIN (NAVAL).

Postglacial and Recent System. The deposits belonging to this system contain the remains of plants and animals, few of which are not still existing species. The beds consist of more or less incoherent and unconsolidated materials, which have been formed under very diverse conditions. They are represented by the low-lying alluvial flats that occupy the sites of silted-up lakes, and the bottoms of valleys at moderate elevations above the streams and rivers. Most of the bogs of northern and central Europe belong to the same system, but some had commenced to form towards the close of the glacial period. Many bogs overlie the remains of old forests, and not infrequently trees, occupying the place of growth, occur in the peat at various levels. Two such 'buried forests' have been met with in the bogs over a wide region in north-western Europe. At many places on the coasts of the British Islands and the opposite shores of the Continent peat with buried trees passes out to sea, and has been dredged up from the sea-bottom at considerable distances from the land. The only other formations that need be mentioned are the raised Beaches (q.v.) which are met with at various heights above the present sea-level, and the local moraines and fluvio-glacial gravels of the higher valleys of the Scottish Highlands. Some of these moraines come down to the level of the 45 to 50 feet beach.

The flora and fauna of the period are essentially the same as at present. In the earlier stages of the period, however, the flora of north Germany, Denmark, southern Sweden, &c. was arctic-alpine, and that flora was accompanied by the northern mammals, including the reindeer, &c. Later in the period, as the climate became more genial, the northern flora and fauna disappeared from the low

grounds of temperate Europe, and the present plants and animals took their place. Of the more notable mammals of the period in Britain were *Megaceros* (Irish deer), *Bos primigenius*, and *Bos longifrons*. The oldest traces of man met with at this stage belong to the Neolithic phase.

Several geographical and climatic changes appear to have supervened in postglacial and recent times. After the Scandinavian flora and fauna had been succeeded in our area by the present assemblage of plants and animals, the climate appears to have become even more genial than it is in our day. Great forests spread far north into regions where trees do not now grow, and reached elevations on the mountains which they cannot now attain. At the same time many southern types of molluscs migrated into northern seas, some of which have since died out, or still survive in diminished numbers and dwarfed in size. To this genial stage belong the great oaks and other leafy trees in the lower buried forests of the bogs. Eventually the climate changed and became wet and cold. The British area, formerly continental, was insulated and of less extent than now—the sea overflowing the low ground of Scotland up to a height of 45 to 50 feet above its present level. Local glaciers then made their appearance in many mountain-glens, and even descended in some places to the sea. The 'carse-clays' (45–50 feet terrace) belong to this stage. The climate was not so favourable for the growth of great trees, which were now more restricted in their vertical and horizontal range. Over wide areas the forests decayed and became buried by mosses and their allies. The general occurrence throughout north-western Europe of a second well-marked 'buried forest' seems to indicate a return to more genial climatic conditions, giving rise to a second period of great forests, which gradually over-spread much of the moory and waste lands. Coincident with this second forest-epoch there appears to have been a gain of land, at least in Scotland, but there is no evidence to show that Britain again became continental. The second forest-epoch was succeeded as the first had been by somewhat cold and wet conditions, under the influence of which the forests decayed, while swamps and morasses increased. At the same time the Scottish area became depressed for some 25 feet or thereabout below its present level. The last physical change of which there is clear evidence is the final retreat of the sea, while the general aspect of the bogs (in which the rate of decay exceeds that of growth) would seem to indicate that we are living under drier conditions than obtained when the second forest-epoch came to a close. See EUROPE, STONE AGE.

Post-horn. See HORN.

Post-mortem Examination. Examination of the body after death is a duty which has frequently to be discharged by medical men in various circumstances, of which the most important are (1) cases of sudden or accidental death; (2) cases of lingering illness, in which the nature of the disease had not been determined during life; and (3) cases of suspected suicide or homicide. In ordinary cases where the examination is necessary or advisable for the purpose of throwing light upon the nature of the fatal illness, and where no judicial question is involved, the consent of the parents, relatives, or guardians must be procured. In medico-legal cases the order of the coroner (in England) is essential. In Scotland, when there is reason to suspect the possibility of other than natural causes for death, the sheriff, on the petition of the procurator-fiscal, authorises a medical man, or men, to perform a post-mortem examination. In such cases the examination should

always be performed by two medical men, one of whom, it is desirable, should be an expert. In all cases the position of the body and of the surrounding objects should be carefully noted, as they often throw light upon the cause of death. The external appearances of the body, such as the presence of rigidity and of putrefactive changes, should be observed, as affording a certain clue to the period at which death occurred. In medico-legal autopsies every organ in the body should be carefully examined, and its condition briefly but accurately noted. A careful microscopic examination should follow if there be the least doubt as to the nature of the diseased condition present. Finally, in cases of suspected poisoning portions of the organs must be subjected to chemical analysis. The study of the changes wrought in the various organs by disease has been one of the most potent factors in advancing scientific medicine.

Post-nuptial Contract. See HUSBAND AND WIFE, SETTLEMENT.

Post-obit (Lat. *post obitum*, 'after death') is a bond or security given by heirs and others entitled to reversionary interests, whereby, in consideration of a sum of money presently advanced, the debtor binds himself to pay a much larger sum after the death of some person, or of himself. Whenever, as is not unusual, the payment is uncertain, and depends on the obligor outliving somebody else, very high interest is required, or rather a very much larger sum is agreed to be repaid than what is advanced. These are generally usurious bargains; but the obligee or creditor can enforce payment of the full amount; though, if there is a gross case of inadequacy in the proportions amounting to fraud, a court of equity will interfere.

Post-office, (1) a government department whose primary concern is the collection and distribution of correspondence between individuals; in most countries the functions extend beyond the primary limits, and may cover communications by telegraph and telephone, parcel conveyance, passenger transport, money remittances, banking, insurance, and a multiplicity of minor social services; (2) the premises where such work is transacted. The word *post* is derived from *posta*, a contraction for *posita*, from the Latin *ponere*, 'to place,' signifying relays of mounts placed for the use of couriers along routes of travel.

The oldest and longest established postal system of which we have knowledge is that of China. Under the Chou dynasty (B.C. 1122-255) a system of foot and mounted couriers was established for the carrying of state edicts. Records are fragmentary, but there are numerous references to the system. Confucius (B.C. 551-479) says, 'Justice outstrips the speedy royal posts,' and there are curious details, such as that urgency was indicated by attaching a feather. An ancient atlas gives a list of places served by the posts under the Han dynasty (B.C. 206-A.D. 23). These posts were known as *I Chan*, and were purely government services. Under the T'ang dynasty (A.D. 618-905) the stages were 93 miles apart, and numbered 1297 stations by road, 360 by river, and 86 partly by road partly by water. During the same period a money-order system was devised. Marco Polo, in the 14th century, estimates the number of stations at 10,000, at intervals of 25 miles and equipped with 200,000 horses. He describes the riders as changing horses without dismounting; they carried their despatches in a sealed coffer, and were distinguished by a small yellow flag worn at the collar. Military notices in the 11th century were inscribed on wooden plaques varnished to resist weather. The *I Chan* system of courier posts lasted till modern times. It is but a few years since the expresses, sealed into their

uniforms with wax seals, made their unhalting journeys of 800 miles to Lhasa, their faces chapped through exposure, their eyes bloodshot and sunken in their heads. About the beginning of the 16th century the need for a service available to the general public led to the formation of private companies whose operations spread from Ningpo along the main routes of the empire. This unofficial system was known as *Min-chiu*. Cheques, silver ingots, letters, and parcels were carried; the sender inscribed the value on the cover, and if loss occurred through carelessness the last agency made good the loss. If an express service were required the sender marked a higher portage on the cover for payment by the recipient; or one corner of the envelope was burnt, or a protruding feather was enclosed. Generally, however, the public were content with the less speedy ordinary service; the charges were moderate, and varied according to distance. The *I Chan* and the *Min-chiu* systems existed side by side for many centuries, till they were absorbed in the modern system established on European models in 1896 (see *Rapport de l'administration des Postes Chinoises pour 1921*, Shanghai, 1922).

The posts of antiquity were purely courier services for state business—'So the posts went with the letters from the king [Hezekiah] and his princes' (2 Chron. xxx. 6). In Egypt letter-writing had an important place in the curriculum. A papyrus of about 3000 B.C. bears a complaint from a commanding officer that certain of his men who had been sent across the Nile had been kept five days awaiting new regimentals. The existence in later ages of an organised messenger system is evidenced by the register of an intermediate post-office in the Nile valley about 270 B.C. Note was taken of the day and hour of the messenger's arrival, the packages brought, the addresses of each, and the names of the messengers to whom they were entrusted for delivery. At Tell el-Amarna, in Upper Egypt, a repository of state letters, dating about B.C. 1400, has been discovered in the shape of a large number of clay tablets addressed in cuneiform from kings and governors in Assyria, Palestine, and Phœnicia. Darius (B.C. 500) had an elaborate system of swift messenger-posts throughout Persia, and the Romans in turn had similar systems. The restriction of the posts to state purposes is illustrated by the fact that Pliny, though a minister and a favourite, apologised for granting post-horses for the use of his wife on the most urgent business. The incident also illustrates the liability of any such system to become a convenience for unofficial travellers, a tendency which further obscures early postal history. To this day the English term postmaster is ambiguous: it may mean a government official charged with the oversight of local post-office affairs, or a trader who supplies horses on hire. In mediæval times a kind of post for correspondence emerged in France when the University of Paris set up a system of messengers. In 1296 these messengers were freed from tolls, and during the next two centuries the system developed, and was used, though without authority, by the general public. A royal system was established in 1464. Conveyance of unofficial letters was not at first contemplated, but it gradually became general though unauthorised. In 1576 definite provision was made for private letters for the first time. In 1637 the royal posts were given the monopoly of letter-carriage. In Germany messenger systems were maintained by political administrations and by monastic, scholastic, or commercial corporations. The Emperor Maximilian about 1489 established an imperial post for state use, but before long it was found necessary to extend the scope for the conveyance of travellers and for the transmission

of private correspondence. Maximilian's first postmaster-general was Johann von Taxis, and the family of Thurn and Taxis retained a connection with the postal affairs of central Europe until 1867.

In Britain developments were similar. Richard II., apprehensive of the landing of Henry of Richmond in 1484, 'followed the practice in the last war with Scotland [1482] of appointing single horsemen every 20 miles: . . . news was able to be carried 200 miles within 2 days' (*Chron. of Croyland*). The king's messengers, *nuncii* or *cursores*, developed into a set system, fixed when the traffic was constant, with temporary expansions to meet emergencies. In 1512 a master of posts appears. An instruction of Queen Elizabeth lays down that the rider is to start within 15 minutes, and to proceed at the rate of 7 miles an hour in summer and 5 in winter, all times to be entered in a book. But only the queen's letters were thus provided for. All others are to pass as by-letters—i.e. as letters of no urgency. Apparently private letters were finding their way to the post-houses, and while not recognised or catered for were allowed on sufferance. Regulations made in 1603 gave postmasters the exclusive right of letting horses to travellers; king's messengers riding under authority paid 2½d. per mile for a horse, other travellers made their own terms. If the post-house could not provide horses the local authorities had to find them. This monopoly was largely a police measure for the surveillance of unknown travellers. A like reason led to repeated attempts by the crown to secure a monopoly of the carriage of private correspondence now rapidly growing in volume. A proclamation of 1591 had repeated earlier prohibitions against the conveyance of letters from abroad by any other means than through the regular posts. The prohibition was repeated in 1609, and again in 1637, when the restriction was applied also to inland letters. An additional reason for this was now operative, as two years earlier Thomas Witherings had introduced a scheme for the conveyance of the people's letters on payment of a fee 'the cleere profit whereof to goe towards the payment of the Postmrs. of ye Roades . . . for wch his Matie is now chargd with 3400^l p anm.' On six main routes—to Edinburgh, Holyhead, Plymouth, Bristol, Norwich, and Dover—there were to be express messengers bound to fixed times carrying 'portmantles' containing correspondence for places on their routes. 'Newes,' exclaims Witherings, 'will come sooner than thought.' The rates, which formed the foundation of British postal administration for two centuries, were:

Distance.	Single Letter.	Double Letter.	Ounces.
Up to 30 miles	2d.	4d.	6d.
30 to 140 miles	4d.	8d.	9d.
Over 140 miles	6d.	12d.	12d.
To Scotland	8d.	(?)	(?)

According to a contemporary definition, 'a single letter is one written on a single sheet of paper sealed; a double is one sheet of paper which covers another sheet sealed up.' Witherings barely had time to bring his scheme to fruition when he fell from favour, and a long-drawn-out dispute ensued between rival claimants for office. In 1653 the Inland and Foreign Office was farmed for a rental of £10,000 a year; fourteen years later this figure had risen to £43,000. In 1657 the post-office was for the first time placed on a statutory basis, and was confirmed by the Restoration parliament of 1660. The monopolies for letters and for post-horses for travellers were retained; a postmaster-general was appointed; the office was to be farmed; the rates from London for single letters were: not exceeding 30 miles, 2d.; over 30 miles, 3d.; to Berwick, 3d.; beyond Berwick 40 miles, 2d.; over 40 miles, 4d. There were no cross-country posts;

except between towns on the same route all correspondence had to pass through London and became subject to a fresh charge. Thomas Dockwra in 1680 organised a private local post for London, which with its suburbs was divided into seven sorting districts. Between 400 and 500 offices received letters; collections were made hourly, and deliveries four to twelve times a day according to the locality. The postage was 1d., which covered either a letter or a parcel not exceeding 16 ounces, and, further, carried insurance up to £10. Another innovation was the impression of post-marks showing the office of posting, time, and payment. This local post was held to be a breach of the postmaster-general's monopoly, and in less than five years was incorporated into the state service. In 1695 the Scots parliament set up a separate post-office, with a postmaster-general for Scotland, but the two offices were reunited in 1710. By the act of that year a proportion of the postal profits went to the exchequer, the remainder to the crown. Another act of this time made the theft of letters a capital offence, a penalty which existed till 1835: so late as 1832 a man was hanged under this law. Up to 1720 the cross-posts remained undeveloped. There were posts from Exeter to Chester and from Bath to Oxford, but all other posts radiated from London, and, except between places on the same route, all correspondence still had to pass through the capital. Ralph Allan undertook the development of the cross-posts, and for forty-five years held them in farm to the benefit of the public, the revenue, and himself. The post-horse monopoly was restricted in 1749 and abolished in 1779, by which time stage-coaches were running, although the mails still went on horseback. John Palmer of Bath saw the advantage of the new means of transport, and was appointed controller to the post-office to carry out his scheme. In 1784 the first mail-coach ran from Bristol to London, taking seventeen hours, and inaugurating the most picturesque period of postal history. For sixty years the mail-coaches set the standard of swift communication. In 1797 the number of mail routes was forty-two, connecting sixty of the most important towns of the kingdom. Two years later the journey from London to Edinburgh took three nights and two days; the fare for travellers was £10. Forty years later the journey took 45½ hours. In 1836 there were in England 104 four-horsed mail-coaches; they carried four passengers inside and three or four out; their average speed was 8½ miles an hour; the Liverpool and Preston coach ran at 10½ miles an hour. Payment to the contractors was made on a mileage rate; the vehicles also went free from tolls. Side by side with the mail-coaches ran stage-coaches, which, carrying no mails, were free of any restrictions as to hours or number of passengers or weight of goods carried. Some of these travelled even faster than the mail-coaches. A coach between Edinburgh and Aberdeen, with fifteen passengers, travelled at an average speed of over 11 miles per hour. But another means of transport had now appeared in the railways, whose spreading tentacles slowly strangled the life of the highways. The first mail by railway was sent from Liverpool to Manchester in November 1830. The last of the old mail-coaches from London ceased running in January 1846. In the provinces, of course, they continued to a much later date. Even to-day their successors are found in remote places, though horses have yielded place to petrol, and the old-time bugle has been replaced by a mechanical horn. Particularly in the Scottish Highlands there are wide areas where the railway has never penetrated, and where the only regular means for the conveyance of mails, passengers, and merchandise is the motor mail-car.

In 1837 Rowland Hill published his scheme for

national penny postage. His main contentions were that charges by distance were unsound, as an analysis of costs of conveyance showed that the cost per letter varied, not according to distance, but inversely according to the numbers carried. Further, that as a reduction of tax on a wanted article tends to encourage consumption of that article and so to maintain the revenue from the tax, a reduction in postage would not permanently decrease the revenue gained. His arguments were stoutly contested by the post-office, and the matter became a burning social and political question. An interesting forerunner of the modern pictorial diagram gives an analysis of the London to Edinburgh mail of 2d March 1833. The coach is shown with coachman, guard, and two outside passengers, while the roof is piled with sacks appropriately labelled: '2296 newspapers, weight 273 lb., go free'; '484 franks, 47 lb., go free'; '1555 letters, 34 lb., pay £93'; 'parcels of stamps go free.' Eventually parliamentary sanction was given, but, with that irony which often accompanies great reforms, the measure by which penny postage was achieved was little less than a bribe given by a tottering government to gain party support. The rates which were superseded were: within 8 miles, 2d.; to 15 miles, 4d.; to 20 miles, 5d.; to 30 miles, 6d.; to 50 miles, 7d.; to 80 miles, 8d.; to 120 miles, 9d.; to 170 miles, 10d.; to 230 miles, 11d.; to 300 miles, 12d.; and thereafter 1d. for each 100 miles. These were rates for a single letter; double letters were charged double, and triple letters triple (in 1812 it is recorded that the sorting-office at Edinburgh was purposely kept dark to obtain full advantage of artificial light in the examination for enclosures); letters weighing an ounce or more were charged one rate for each quarter-ounce. There were additional charges on letters in Scotland conveyed by mail-carriages with more than two wheels, and for sea-carriage to Ireland; also for local delivery. In place of this complicated system, the rates from 10th January 1840 became, irrespective of distance carried:

Not exceeding $\frac{1}{2}$ oz.	1d.	} If paid by sender; if paid on delivery, double rates.
$\frac{1}{2}$ oz.	2d.	
Every additional oz.	2d.	

At the same time disappeared the franking system, under which any packet, however bulky, went free of postage if its cover bore the signature of a member of either house of parliament. The queen also announced that she would, like her subjects, pay postage on her correspondence. The king's post had become the people's post. A feature of the new scheme was the inducement to prepay the charges. The original proposal was to have stamped sheets of paper or specially-printed covers to show that postage had been paid, but these fell into early disuse through the popularity of the new adhesive label, first suggested as an expedient to meet the case of a person bringing a letter to post and not being able to write the address on the purchased cover.

The immediate result of penny postage was an increase in the number of letters in the first year from 82½ millions (6½ million franks) to 169 millions, with a reduction in net revenue from £1,500,000 to £500,000. But correspondence continued to increase rapidly, and the gross revenue of 1839 was equalled in 1850 and the net revenue in 1863. Recent figures excluding post-cards, printed matter, and newspapers are: 1900, 2326 millions; 1910, 2947 millions; 1914, 3478 millions; 1920, 3832 millions; 1925 (excl. Irish Free State), 3500 millions. In the last-named year the figures for post-cards were 465 millions; printed papers, 1710 millions; newspapers, 165 millions. The increase in correspondence was accompanied by improvements in service, especially as

regards extensions of free delivery, and also by further reductions in rates. In 1897 the rates became: 4 oz., 1d.; for each succeeding 2 oz., ½d. The financial exigencies of the Great War forced a rise in rates, and penny postage was lost in 1918, when the minimum rate became 1½d., raised in 1920 to 2d. The current rates are: 2 oz., 1½d.; for each succeeding 2 oz., ½d. The surplus in 1924 on postal undertakings was £4,965,030; telegraph deficit, £1,270,925; telephone surplus, £1,596,917; net grand surplus, £5,291,022.

Rural Posts.—Up to 1764 it may be said that the post-office carried letters to post-towns only, and made no attempt at delivery; in London only was there a local post. In that year the postmaster-general received authority to set up in any town a penny post similar to that existing in London; letters to be delivered free. The measure, however, was only applied to a few of the largest towns, and at the opening of the 19th century there were neither village nor rural posts. Residents either sent for their own letters, or combined and hired a common messenger. In 1801 authority was obtained to arrange with inhabitants of non-post-towns for the collection and delivery of their letters, and also for the acceptance of guarantees for the working of posts otherwise unremunerative. Usually the charge was 1d. per letter over and above the normal charge for conveyance by general post. In 1838 the practice was to take the post-town as centre, and to establish radiating penny posts to the surrounding country districts. At that date, however, there were parts of England exceeding the area of Middlesex where a postman never entered. The establishment of uniform penny postage rendered the problem acute. In 1843 it was decided that all places receiving 100 letters per week should have a receiving-office and a free delivery, but in 1850 this rule was found to be unsatisfactory, and the principle was adopted that a post should be established if it paid its way—i.e. if the cost was covered by the revenue, calculated at ½d. on each letter delivered. The delivery service might be daily or less frequently as circumstances warranted. This principle remains operative to the present day. In 1859, 93 per cent. of the whole correspondence was delivered free. Successive efforts were made to provide for the balance of undelivered letters, and in 1897, as part of the celebration of the diamond jubilee of Queen Victoria, it was announced that a regular delivery would be given to every house in the kingdom. The extension of deliveries in rural areas during recent years has been facilitated by the employment of mechanical aids to locomotion—bicycles, motor-cycles, and motor-vans—which enable a postman to travel greater distances and to carry heavier loads than would otherwise be possible.

Travelling Post-office.—An important factor in speeding inland communication is the travelling post-office system widely developed on our railways, particularly as regards night mails. One or more coaches on a train are fitted with suitable apparatus and fittings, and throughout the journey sorters are continually receiving, sorting, and despatching mails. Even when the train is travelling at full speed a net attached to the carriage sweeps in bags hung from wayside standards, and bags suspended outside the carriage are similarly caught by nets on the ground by the rails. The system arose out of experiments made in 1838. Its most complete development is seen in the down-special night mail train leaving Euston at 8.30 P.M. The train is composed entirely of vehicles reserved for post-office purposes, its ultimate destination being Aberdeen. Another example of post-office enterprise in transport is the construction of an underground electric railway between the London

office and the chief railway termini for the avoidance of street conveyance of the mails.

Subsidiary Postal Concerns.—Besides the conveyance of letters, the post-office provides for the conveyance of other classes of matter—*Newspapers*. In the 17th century postmasters received gazettes free. Later the stamp-duty imposed on newspapers was held to cover postage. In 1855 this duty was repealed. When stamped, newspapers continued to go free; if unstamped, they went at book rates. In 1870 a news rate at $\frac{1}{2}$ d. a copy was introduced. Current rate, 2 oz., $\frac{1}{2}$ d.; 6 oz., 1d.; each 6 oz. thereafter, $\frac{1}{2}$ d.; numbers (1925), 165 millions. *Book post* (1848). Original rate, 6d. per lb.; altered 1904 to $\frac{1}{2}$ d. packet post; now includes books, printed papers, and commercial documents falling within certain restrictions; numbers (1925), 1710 millions. *Sample post* (1863). For *bona fide* traders' samples; rates now as for letters and parcels. *Post-cards* (1870). Originally only officially printed cards impressed $\frac{1}{2}$ d.; private post-cards were allowed in 1894; numbers (1925), 465 millions. *Blind post* (1906). For encouragement of literature for blind. *Railway letters* (1891). Letters can be handed in at most railway stations for conveyance by next train for delivery at destination by ordinary post. *Express delivery* (1891). (a) By special messenger all the way; besides applying to letters and parcels, this service includes the conducting of persons and animals; (b) in advance of usual delivery on request of sender; (c) in advance of usual delivery on request of addressee; (d) on Sundays; (e) after transmission by telephone. *Registration* (1841). Limited compensation was added in 1878; in 1886 insurance of letters and parcels was allowed up to £10; current limit, £400. *Air post*. Conveyance by air is useful mainly on long routes and where there is no standardised railway communication. The method suffers from irregularities and interruptions at present inseparable from air transport, and is not yet suited to the needs of commercial correspondence, which requires regularity and punctuality not less than speedy transit. *Parcel post* (1883). Initial rates were 1 lb., 3d.; 3 lb., 6d.; 5 lb., 9d.; 7 lb., 12d. First year's traffic was 23 millions; in 1910, 120 millions; 1914, 137 millions; 1920, 143 millions; 1924 (excluding Irish Free State), 126 millions. *Cash on delivery* (1926). Payment for the goods sent by parcel post is collected on delivery, and is remitted to the sender.

Besides conveyance services the post-office undertakes certain financial business, including transmission of money, banking, and insurance. *Money-orders* (1838). In 1792 an unofficial cheque-bank scheme was undertaken by certain officers of the post-office. The business thus developed was taken over in 1838. In 1889–90 telegraph money-orders were introduced. Any sum can be so sent up to £40. In 1924 10½ million inland money-orders were issued, value £73,000,000, and 3¼ million foreign orders, value £11,500,000. *Postal orders* (1881) are issued in fixed denominations from 6d. to 21s.; they form a cheap and convenient method for transmitting small sums; in 1924 109½ million postal orders were issued, value £38,000,000. *Savings-bank* (1861). While the accounting work is centralised in London, deposits and withdrawals may be effected at all offices of any importance. Interest is paid at the rate of 2½ per cent.; there is now no limit to the total sum which may be deposited: purchase and sale of government securities is also undertaken: number of active depositors, 11½ million. *Annuities and insurance* (1864). The amount of business is not large. *Licences* of many kinds—dogs, guns, motors, wireless, &c.—are issued at post-offices. *Pension payments* are made in connection with state schemes.

Telegraphs, Telephones, and Wireless Telegraphy. The post-office also controls communication by electrical means. *Telegraphs* (1870). An act of 1868 authorised the postmaster-general to acquire the inland telegraph systems of the United Kingdom, and invested him with a monopoly of telegraphic communication. The transfer took place in 1870; rates were 20 words 1s., addresses free; in 1885 rates were reduced to 12 words 6d., additional words $\frac{1}{2}$ d., addresses charged. The inclusion of the telegraph system created a large department for engineering work in connection with erection and maintenance of wires and cables. The initial expenditure was charged to a capital account of £10,948,000; at no time has the revenue been sufficient to meet the interest on this amount. Mileage of telegraph-wires (1924), 265,000. *Telephones*. A legal decision in 1880 decided that the postmaster-general's monopoly in telegraphs covered telephonic conversations, and the various telephone companies thereafter worked under licence. They amalgamated in 1889 as the National Telephone Company. In 1896 the post-office purchased the trunk or long-distance lines; at the end of 1911 the whole system passed to the post-office. Exchanges (1924), 3500; subscribers, 720,000; calls, 1000 millions. *Wireless telegraphy and telephony*. An act of 1904 (amplified 1925) makes it illegal to install or work wireless apparatus except by permission of the postmaster-general. The post-office maintains coastal radio stations at Wick, Cullercoats, Grimsby, North Foreland, Niton (Isle of Wight), Land's End, Seaford (Liverpool), Portpatrick, and Malinhead. There is also a station at Valentia. These stations have an effective range of about 250 miles. Devices station has a range of 1500 miles, Oxford 3000 miles, and Rugby, the most powerful station in operation, is practically world-wide in range. A recent and popular development is broadcasting, the transmission by wireless telephony of daily programmes of music, plays, news, educational talks, speeches, &c. This is undertaken by the British Broadcasting Company working under licence from the postmaster-general; in 1926 twenty stations were in operation.

Regulations and Charges.—For current information see the *Post-office Guide*, published half-yearly, which may be consulted or purchased at any post-office.

Organisation and Staff.—The highest authority in the post-office is the postmaster-general, with whom is generally associated an assistant postmaster-general. These are political heads responsible to parliament and demitting office on a change of government. The chief of the permanent staff is the secretary, assisted by various assistant-secretaries and technical officers, and by a secretary for Scotland at Edinburgh. The secretary's office deals with matters of administration and questions of policy. Controllers are responsible for separate departments dealing with London postal service, central telegraph-office, London telephone service, money-orders, savings-banks, and stores. The accountant-general is responsible for the vast accounting work, and acts as financial adviser. The engineer-in-chief supervises the erection and maintenance of telegraph and telephone wires, cables, telephone exchanges, radio stations, and apparatus. In the provinces the district surveyors (12) and postmaster-surveyors (9) possess wide powers in their respective districts. Postmasters (498) in towns deal with local details. The total permanent staff in 1926 numbered 227,891 (full-time, 142,566 men, 37,967 women; part-time, 32,548 men, 14,810 women). Of these, 36,381 were sorting-clerks and telegraphists, 18,588 telephonists, 72,168 postmen and deliverers, and 20,071 sub-postmasters. The health of the staff

is looked after by 2300 medical officers paid on a capitation basis. The staff, through local Whitley committees, has a voice in local arrangements, and through the national Whitley council in certain aspects of administration.

Legal.—So far as postal matters are concerned, the various post-office acts prior to 1908 are consolidated in the act of that year (8 Edw. VII. chap. 48), and this act now forms the basis of post-office administration. It deals with the right to fix rates and charges, various classification of correspondence, money-orders and postal orders, ship letters, appointment of postmaster-general and subordinate officers, post-office accounts and expenses, holding and purchase of lands, extension of accommodation and facilities, offences against the post-office, legal procedure, exemption from tolls and ferriage, &c.

International Postal Union.—A conference on international postal affairs was held at Paris in 1863, and led the way to the treaty of Berne in 1874, when delegates from twenty-two countries first consolidated the Postal Union for the regulation of international postal questions. The union now embraces practically all civilised nations, and its periodic conferences fix maximum rates and legislate on all the complex questions of inter-state traffic. Its offices in Berne form a headquarters for statistical and other information.

BIBLIOGRAPHY.—Postmaster-General's Annual Reports for 1854-1916; *The Post Office: an Historical Survey* (H.M. Stationery Office, 1911); *Life of Sir R. Hill*; and *History of Penny Postage*, G. B. Hill (1880); *Reports of Select Committee on Postage* (1838); *Her Majesty's Mails*, Lewins (1864); *History of the Post Office to 1836*, Joyce (1893); *Forty Years at the Post Office*, Baines (1895); *The Early History of the Post in Grant and Farm*, Hyde (1894); *Post Office Packet Service 1798-1815*, Norway (1895); *Romance of the Post Office*, Bennett (1919); *Development of Rates of Postage*, A. D. Smith (1917); *St Martin-le-Grand*, a post-office quarterly magazine, 1890 to date. For current information, see *Post Office Guide*, half-yearly. For current statistics, see *Statistical Abstract for the United Kingdom* (H.M. Stationery Office); and *Statesman's Year Book*. For foreign administration systems, see *Recueil de renseignements sur l'organisation des administrations de l'union* (Berne, 1923).

Post-Tertiary. See QUATERNARY.

Posy. See RING.

Potamogeton, a considerable genus of aquatic plants (pond-weeds), very difficult of discrimination, spread over the greater part of the globe, and living chiefly in fresh water. Some botanists make it the type of the family of Potamogetonaceæ, others include it in Najadaceæ. See AQUATIC PLANTS; and Fryer and Bennett, *The Potamogetons of the British Isles* (1898-1915).

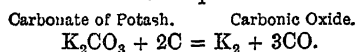
Potash. See POTASSIUM; also AERATED WATERS.

Potassium (sym. K; atom. no. 19; atom. weight 39.15) is one of the alkaline metals. The letter K is selected as its symbol, as the first letter of *Kali*, the Arabic word for potash, P being already taken as the symbol for phosphorus. The following are the chief characters of this metal. It is of a bluish-white colour, and presents a strong metallic lustre. It melts at 146.5° (62.5° C.), and at a red heat is converted into vapour. Its affinity for oxygen is so great that on exposure to moist air it immediately becomes covered with a film of oxide, and hence it must be kept below the surface of naphtha. When heated it burns with a violet flame. Its intense affinity for oxygen is well shown by throwing it into water, on which, from its low specific gravity, .865, it floats. The metal abstracts oxygen from the water, and forms oxide of potassium (potash); while the liberated hydrogen carries off a small portion of the volatilised potas-

sium, and, taking fire from the heat evolved by the energetic chemical action, burns with a brilliant violet flame. The experiment is a very beautiful one, the burning metal swimming about rapidly on the water, and finally disappearing with an explosion of steam, when the globule of melted potash becomes sufficiently cool to come in contact with the water.

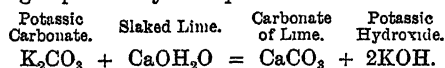
Potassium does not occur in the native state, and can only be obtained by the reduction of its oxide, potash. In 1807 Davy prepared it by decomposing its hydrated oxide (potash) by means of a voltaic current, and this process is now the one usually employed on the large scale. It may be manufactured by distilling a mixture of carbonate of potash and charcoal in an iron retort.

If proper proportions are taken, the mixture is wholly converted into carbonic oxide and potassium, as is shown in the equation:



Potassium forms two compounds with oxygen, viz. a protoxide, K₂O, which constitutes potash, and is strongly basic, and a peroxide, K₂O₂. Of these the former is the only important one.

Potash can be procured in the anhydrous form by heating thin slices of the metal in air perfectly free from moisture or carbonic acid. It is white, very deliquescent, and caustic. When moistened with water it becomes incandescent, and the water cannot be expelled by any degree of heat. A far more important substance is the *Potassic Hydroxide* or *Caustic Potash* (KOH). This is commonly prepared by dissolving carbonate of potash in ten times its weight of water, and gradually adding to the boiling solution a quantity of slaked lime equal in weight to half the carbonate of potash used. The resulting compounds are carbonate of lime, which falls as a precipitate, and hydrate of potash, which remains in solution; the changes being expressed by the equation:



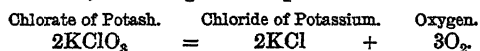
The clear supernatant fluid is removed by decantation, or by means of a siphon, into a clean silver or iron basin, and is rapidly evaporated till it flows tranquilly like oil: it is then either cast into cylinders in metallic moulds, or poured upon a cold slab, and solidifies on cooling. As so obtained it is very impure, but by solution in alcohol and evaporation a very pure article is produced.

The hydroxide, on solidifying after fusion, occurs as a hard, grayish-white, opaque body, with a crystalline fracture, which may be readily again fused into a colourless oily fluid, but which only volatilises at a very high temperature. It is soluble in about half its weight either of water or of alcohol, and rapidly absorbs both carbonic acid and moisture from the atmosphere. It acts as a powerful caustic, and quickly destroys both animal and vegetable tissues, and hence its solutions can only be filtered through asbestos or pounded glass or sand. Its affinities are so powerful that few vessels are capable of resisting its influence. Its solution must be preserved in glass bottles into the composition of which no oxide of lead enters, as it has the property of dissolving this oxide out of the glass. Vessels containing silica (porcelain, earthenware, &c.) are decomposed, and platinum itself is oxidised when heated in contact with it.

The salts which potassium forms with acids are for the most part readily soluble in water, and colourless, unless (as, for example, in potassium permanganate) the acid is coloured. Most of them

are crystallisable, and they all communicate a violet tint, characteristic of potassium, to the blow-pipe flame. Many of them occur in animals and vegetables, and the ashes of plants contain them in large quantity.

Potassium Carbonate, K_2CO_3 , can be got by burning plants in dry pits, dissolving the ashes in water, evaporating till the sulphates, chlorides, &c. separate in crystals, and then boiling the mother liquor to dryness in iron pots. The quantity of pure carbonate of potash contained in it is liable to great variation, and for pharmaceutical purposes it must be dissolved in water and crystallised, the crystals containing about 20 per cent. of water. It is made now by a modification of the Le Blanc process (see SODIUM). It is extremely deliquescent, and is soluble in less than its own weight of water, but is insoluble in alcohol. It has an acrid, alkaline taste, and its reaction upon test-paper is strongly alkaline. It is a compound of great importance, both as a chemical reagent and as entering largely into the preparation of most of the other compounds of potassium, and into the manufacture of soap and glass. The commercial carbonate is often called *Pearl Ashes*. *Bicarbonate of Potash*, $KHCO_3$, is obtained in white rhombic prisms, by passing a current of carbonic acid gas through a strong solution of carbonate of potash. These crystals are permanent in the air, but are decomposed by heat; water and carbonic acid being evolved, and the simple carbonate left. This salt is much less soluble than the carbonate, requiring four parts of cold water for its solution, which is nearly neutral to test-paper, and has a much milder taste than the preceding salt. It is employed as an antacid in medicine. The *Sulphate*, K_2SO_4 , and *Bisulphate*, $KHSO_4$, may be prepared by treating potash with sulphuric acid. *Nitrate of Potash* has been already described under the head NITRE. *Chlorate of Potash*, $KClO_3$, occurs in white rhomboidal tablets of a pearly lustre. It has a cooling taste like that of nitre. It fuses at a gentle heat without decomposition, but on increasing the heat it gradually gives off all its oxygen, and is converted into chloride of potassium, according to the equation :



It is not very soluble, as it requires for solution 16 parts of cold and 1.7 parts of boiling water. It even surpasses nitrate of potash as an oxidising agent; and if combustible substances, such as carbon, sulphur, or phosphorus, be heated or forcibly rubbed with it, a detonation or explosion occurs. This salt is employed in the manufacture of *Matches* (q.v.), in certain operations in calico-printing, and for filling the friction-tubes employed for firing cannon: the best mixture for these tubes consisting of 2 parts of this salt, 2 of sulphide of antimony, and 1 of powdered glass. A mixture known as *White Gunpowder*, consisting of chlorate of potash, dried ferrocyanide of potassium, and sugar, has been employed for blasting purposes, but its preparation is accompanied by so much danger that it is seldom used. This salt does not occur as a natural product, but may be obtained along with chloride of potassium by passing a current of chlorine gas through a hot solution of caustic potash. The two salts are easily separated by crystallisation, as the chlorate is comparatively insoluble, and the chloride extremely soluble. *Hypochlorite of Potash* can only be obtained in solution. Under the title of *Eau de Javelle*, it is sold as a bleaching agent. It is obtained by passing chlorine gas through a cold dilute solution of carbonate of potash, when chloride of potassium and hypochlorite of potash are formed, from which

the chloride may be removed by crystallisation. The *Phosphates of Potash*, formed by the different varieties of phosphoric acid, are sufficiently noticed in the articles PHOSPHORUS and MANURE. The *Silicates of Potash* are important compounds in connection with the manufacture of glass; they also enter into the composition of Fuchs's *Soluble Glass* (see GLASS), or *Water-glass*, and have been employed as a coating by which the decay of magnesian and other limestones may be prevented. The *Chromate* and *Bichromate of Potash* are noticed in the articles CHROMIUM and CALICO-PRINTING. The haloid salts of potassium may be passed over very briefly. The *Chloride of Potassium*, KCl , is obtained in large quantity in the preparation of chlorate of potash, or may be procured by burning potassium in chlorine gas, when the result of the brilliant combustion which takes place is this salt. In its general characters it closely resembles common salt, $NaCl$, except that the former communicates a violet and the latter a yellow tint to the flame of alcohol. It is a constituent of sea-water, of salt marshes, and of many animal and vegetable fluids and tissues. The *Bromide* and *Iodide of Potassium* are noticed in the articles BROMINE and IODINE. *Fluoride of Potassium*, KF , possesses the property of corroding glass. There are several sulphides, the most important being the *Liver of Sulphur*, prepared by fusing together carbonate of potash and sulphur. Besides its use in skin diseases, it is much employed by florists to prevent mildew on roses. The *Yellow* and the *Red Prussiate* (or the *Ferrocyanide* and *Ferricyanide*) of Potash are noticed at FERRICYANOGEN and FERROCICYANOGEN. The *Cyanide of Potassium*, KCN , may be procured by heating potassium in cyanogen gas, when brilliant combustion occurs, and the resulting product is this salt. It may, however, be more cheaply and easily prepared by fusing together 8 parts of ferrocyanide and 3 of carbonate of potassium. This salt forms colourless deliquescent crystals very soluble in water. It exhales an odour of hydrocyanic acid, and is nearly as poisonous as that acid. Its great deoxidising power at a high temperature renders it a valuable agent in many of the finer operations of metallurgy.

The following are the ordinary tests for the potassium compounds: (1) Solution of tartaric acid added in excess to a moderately strong solution of a potassium salt gives after some time a white crystalline precipitate of cream of tartar (see TARTARIC ACID). The result is hastened by stirring or shaking. (2) Solution of bichloride of platinum gives a crystalline yellow precipitate, which is a double salt of bichloride of platinum and chloride of potassium. If not previously acid, the mixture to be tested should be acidulated with hydrochloric acid. (3) The violet tint occurring in the presence of potassium in the outer flame of the blowpipe, or in the flame of spirit, has been already noticed. (4) The spectrum of a flame containing potassium exhibits a characteristic bright line at the extreme limit of the red, and another one at the opposite violet limit of the Spectrum (q.v.).

In medicine the following compounds are used. *Caustic Potash*, or *Hydroxide of Potash*, KOH , is supplied in hard white pencils. From its power of dissolving the animal tissues, it is sometimes used as a caustic, although its great deliquescence renders it somewhat difficult to localise its action to the desired spot. In bites of venomous serpents, mad dogs, &c. it may be applied with advantage, and it is useful in destroying warts and fungoid growths of various kinds. *Solution of Potash*, commonly known as *Liquor potassæ*, is obtained by the process already given for the preparation of hydrate of potash. *Liquor potassæ*, in combination with a

tonic infusion, is of service in cases of dyspepsia which are accompanied with excessive acidity of the stomach, such, for example, as often occur in habitual spirit-drinkers. It is also frequently given with the view of rendering the urine alkaline, or of diminishing its acidity in cases in which that secretion is too acid. The usual dose is ten drops, gradually increased to as much as a fluid drachm. *Acetate of Potash*, $\text{KC}_2\text{H}_3\text{O}_2$, is obtained by the action of acetic acid on carbonate of potash, and occurs in white foliaceous satiny masses. In its passage through the system it is converted into carbonate, and thus renders the urine alkaline. In small doses, as from a scruple to a drachm, it acts as a diuretic, and is of service in some forms of dropsy. Combined with other potass-salts, it is much given in acute rheumatism. The two carbonates and the sulphurated potash have been already referred to. The iodide is also largely used as an alterative.

The *Chlorate of Potash* has come much into use as a popular remedy for sore throats. For this purpose it is usually employed in the form of compressed pellets, which are allowed to dissolve slowly in the mouth.

Potato (*Solanum tuberosum*; see SOLANUM), one of the most important of cultivated plants, and in universal cultivation in the temperate parts of the globe. It is a perennial, having herbaceous stems, 1 to 3 feet high, without thorns or prickles; pinnate leaves with two or more pair of leaflets and an odd one, the leaflets entire at the margin; flowers about an inch or an inch and a half in breadth, the wheel-shaped corolla being white or purple, and more or less veined, followed by globular, purplish fruit, of the size of large gooseberries; the roots producing tubers. The herbage has a slightly narcotic smell, although cattle do not refuse to eat a little of it, and the tender tops are used in some countries like spinach. The tubers are, however, the only valuable part of the plant.

It was long customary to speak of the potato as a native of mountainous districts of tropical and subtropical America; but it has never been clearly determined where it is really indigenous, and where it has spread after being introduced by man. Humboldt doubted if it had ever been found truly wild; but subsequent travellers, of high scientific reputation, express themselves thoroughly satisfied on this point. It has been rendered certain that long before the Spaniards reached the New World the potato was cultivated by the Incas and other Andean nations. It seems to have been first brought to Europe by the Spaniards, from the neighbourhood of Quito, in the beginning of the 16th century, and to have spread from Spain into the Netherlands, Burgundy, and Italy, but only to be cultivated in a few gardens as a curiosity, and not for general use as an article of food. It is said to have been brought to England from Virginia by Sir John Hawkins in 1563; and, again, in 1586 by Sir Francis Drake, to whom indeed a statue, as the introducer of the potato, was erected at Offenburg, in Baden, in 1853. Anyhow, it cannot have attracted much notice; and though Raleigh is believed to have planted potatoes both at his Devonshire birthplace Hayes, and on his Munster estates, it was a long time before they began to be extensively cultivated. It long received throughout almost all European countries the same name with the Batatas or Sweet Potato (q.v.), which is the plant or tuber meant by English writers down to the middle of the 17th century in their use of the name potato. Gerard, in his *Herball*, published in 1597, gives a figure of our potato under the name of *Batata Virginiana*; but so little were its merits appreciated that it is not even mentioned in the *Complete Gardener* of

Loudon and Wise, published more than a century later, in 1719; whilst another writer of the same time says it is inferior to skirret and radish! It began, however, to be imagined that it might be used with advantage for feeding 'swine or other cattle,' and by-and-by that it might be useful for poor people, and for the prevention of famine on failures of the grain-crops. The Royal Society took up this idea, and in 1663 adopted measures for extending the cultivation of the potato, in order to the prevention of famines. To this the example of Ireland in some measure led, the potato having already come into cultivation there to an extent far greater than in any other European country, and with evident advantage to the people. From Ireland the cultivation of the potato was introduced into Lancashire about the end of the 17th century, soon became general there, and thence spread over England; so that before the middle of the 18th century it had become important as a field-crop, which it became in the south of Scotland some twenty or thirty years later, about the same time in Saxony and some other parts of Germany, but not until the later part of the century in some other parts of Germany and in France. In France the potato was long supposed to cause leprosy and fevers, and the extension of its culture was mainly due to the exertions of Parmentier (1778). In Prussia Frederick the Great took an interest in it, and promoted it by compulsory regulations.

The potato is of great importance as affording food both for human beings and for cattle; and next to the principal cereals is the most valuable of all plants for human food. It is also used for various purposes in the arts. No food-plant is more widely diffused; it is cultivated in subtropical countries, and struggles for existence in gardens even within the Arctic Circle, yielding small and watery tubers, although the effects of late spring frosts, or early autumnal frosts, upon its foliage often prove that it is a plant properly belonging to a climate milder than that of most parts of Britain. No more important event of its kind has ever taken place than the general introduction of potato culture into the husbandry of Britain and other European countries. It has exercised a beneficial influence on the general welfare of the people, and has increased the national wealth, notwithstanding the occasional occurrence of famine and distress (notably in the years 1846 and 1847) in Ireland and elsewhere from the failure of the crop. The results—due mainly to excessive and imprudent cultivation of the potato—confirmed two great laws, that plants long very extensively or almost exclusively cultivated in any district, however successfully they may be cultivated for a time, are sure to fail at last; and that the exclusive, or almost exclusive, dependence of a people on one source or means of support is unfavourable to their welfare in respect to all their interests.

The potato has the specially valuable capability of producing an exceptionally large quantity of food from a given area. Thus the average yield (by weight) is probably eight or ten times as great as that of wheat, and, since wheat is less than four times as nutritious as potatoes, the latter crop produces more than twice as much nutriment per acre as the former. The tubers have, however, the disadvantage that they are a less complete food than wheat, being notably deficient in protein. Consequently they require to be used in conjunction with foods rich in protein, such as meat, fish, or cheese. Where potatoes bulk too largely in the diet, both physical and mental energies deteriorate, a fact which has been noted from time to time in Ireland and in the Scottish Highlands. The potato tuber in its natural state contains about

75 per cent of water, 20 per cent of carbohydrates, principally starch, about 2 per cent of albuminoids, and small quantities of fibre, other organic substances, and ash. There are considerable differences, however, in different varieties, different stages of ripeness, and in samples grown under different soil and climatic conditions.

Potatoes are used, both raw and boiled, for the feeding of cattle. For human food they are variously prepared by roasting or boiling, but now chiefly by boiling, a process by which they are freed from all that is narcotic and noxious in their juice. The water in which potatoes have been boiled is not wholesome.

Experimental attempts have been made to use the herbage or haulm of the potato for paper-making, but the results were unsatisfactory. A kind of vegetable ivory has been made from the pulp, and it is said that passable cigarettes can be made from the leaves. The plant, of course, belongs to the same family as tobacco.

The varieties of the potato in cultivation are extremely numerous—300 were exhibited at the Westminster Tercentenary Exhibition (1886). Any enumeration or classification of them is impossible. New ones are continually appearing, and old ones passing away. Those most advantageously cultivated in particular soils and climates are often found to degenerate when removed to a small distance. Potatoes differ considerably in the character of their herbage—which is sometimes erect, sometimes straggling—and in the size and colour of their flowers, but are more generally distinguished by the size, form, and colour of their tubers, which are round, long, or kidney-shaped, white, red, dark purple, variegated, &c.

New varieties of potato are produced from seed; but potatoes are ordinarily propagated by planting the tubers, or cuttings of the tubers, each containing an eye or bud. Much has been written by gardeners and agriculturists on the comparative advantages of planting whole tubers or cuttings; but the former method generally prevails.

Potatoes are planted in drills, made either by the spade or plough, or in *lazy beds*, which are always made by the spade, and are beds in which the sets of potatoes are covered over with earth dug out of the alleys. The alleys serve, although imperfectly, for drains in undrained land. The cultivation of potatoes as a field-crop seems to have been first attempted in lazy beds. They are still common in many parts of Ireland, but are now scarcely ever seen in England or Scotland. They are very suitable for strong, heavy, and somewhat moist land, and are profitably used in reducing some kinds of soil to cultivation, but are generally unsuitable for field-culture, owing to the expense of labour required. In strong, heavy land potatoes are cultivated in raised drills; in lighter and drier soils the raising of the drills is unnecessary. Manure is invariably given, consisting generally of farmyard dung and artificial manures. Common dressings consist of from fifteen to twenty-five tons of dung per acre, with from five to ten cwt. of artificial manure, such as a mixture of two parts superphosphate, one part sulphate (or chloride) of potash and one part sulphate of ammonia. The cultivation of potatoes, after they are planted, whether in the field or garden, consists chiefly in keeping the ground clear of weeds, and in earthing up the plants, to promote the formation of tubers. Potatoes are taken up by the fork, by turning over the drills with the plough, or by an implement specially designed for the purpose, known as a potato-raiser. Where the crop is grown extensively this implement is now almost universally used, and performs its work expeditiously and thoroughly. Garden potatoes are generally used

long before they are really ripe, forming a favourite dish in a very unripe state, when they are far from being a safe article of food, and contribute not a little to the prevalence of cholera and kindred diseases in summer. In recent years the growing of early potatoes for use in the large towns has been prosecuted to a large extent and with much success on the coast of Ayrshire and other similar parts favoured with a genial climate. To facilitate this the seed is forced in small boxes in which it is placed over winter, and from which it is taken in spring when the shoots are 2 to 4 inches long and planted in well-manured drills. Potatoes from seed thus prepared may be dug about three weeks earlier than if the seed had not been sprouted. The main field-crop is allowed to ripen thoroughly, and is capable of being stored for winter and spring use. The planting of potatoes in the open air cannot be successfully practised in most parts of Britain before February or March. April and the early part of May are more normal times. The storing of potatoes is variously accomplished in dry lofts or sheds, in airy cellars or barns, and in *pits*, which are sometimes holes excavated to a small depth in the earth, with the potatoes piled up above the surface of the ground, in a conical, or in a roof-like form, sometimes mere heaps of one or other of these forms upon the surface of the ground, and covered with straw and earth to keep out light and frost. Potato-pits should always be well ventilated by means of pipes or otherwise, as without ventilation the potatoes are apt to heat and sprout. Potatoes taken from the ground before they are quite ripe are extremely apt to heat and sprout.

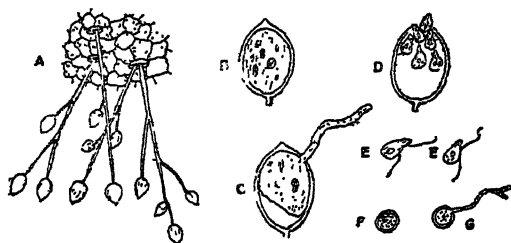
The potato crop is now an important one in most parts of Britain, the largest proportion of land being occupied by it in the Lincolnshire and Cambridgeshire Fens, in Lancashire, in the Vale of York, and in the eastern counties of Scotland. It very commonly succeeds a grain-crop, but sometimes is advantageously planted on land newly broken up from grass.

Besides its value as a culinary vegetable, the potato is important in other respects. Its starch is very easily separated, and is in large proportions; hence it is cheaper than any other kind. It is manufactured on a very large scale. It is chiefly used in textile manufactories under the name of *farina*, which is converted into dextrine or British gum (see STARCH). In Holland and in Russia, where there is much difficulty in keeping potatoes through the winter, and there is consequently a necessity for using the crop quickly, large quantities of starch are made, and this is converted into sugar or syrup (see SUGAR). The refuse of the starch-manufactories is all utilised; it is pressed out from the water, and used either for pig-feeding or for manure. In the north of Europe much spirit for drinking is made from potatoes; it is called *Potato-brandy*.

The potato is subject to several diseases, the chief of which is that serious fungous affection now commonly known as the *potato disease*. This disease was first observed in Germany; the earliest known outbreak of a grave character occurred at Liège in 1842. It broke out in Canada in 1844, and at once proved very destructive. In the following year it made its appearance in the British Isles, having been first observed in the Isle of Wight. Its ravages in Ireland in 1846 and 1847 brought a terrible famine upon the small farmers of that country, and at frequent intervals since it has caused great loss in the potato crop.

It has been proved beyond doubt that a particular fungus causes this peculiar and destructive disease. This mysterious fungus, *Phytophthora infestans*, runs through a strange life-cycle every year, and is by no means easily kept at bay. It is believed that, except in temperatures below 40° and above

77° F., it is always present, ready to pounce upon a weak potato-plant, and liable to develop into an epidemic should the climatic conditions be favourable to fungus-life. These conditions are damp, dull, calm weather, and a moist or wet soil, enveloped in mists morning and evening. The fact that the fungus is unable to bear a temperature above 77° or below 40° is of practical importance. The tomato is also subject to the attacks of the *Phytophthora*, but the ravages of the fungus may be stopped by raising the temperature of the tomato-house to over 77° F. On the potato crop the fungus generally makes its appearance about the third week in July, almost invariably beginning its attack in the leaves of the potato-plant. There it is first seen in a delicate white bloom, accompanied by dark blotches, caused by the spawn of the fungus having pierced the leaf and set up putrefaction. With favourable climatic conditions it will now develop with great rapidity—a single germ multiplying ten thousand times in a few days in a temperature from 60° to 68° F.



Potato Disease (*Phytophthora infestans*).

A. Hyphae of fungus on under surface of potato leaf, bearing conidia. B. Conidium or spore. C. Conidium germinating, producing hypha directly. D. Conidium breaking up into zoospores. E. Zoospores bearing cilia, by which they are able to swim in drops of moisture. F. Zoospore in resting condition. G. Zoospore germinating.

The fungus ramifies throughout the leaves, blasting them as it proceeds, and causing an offensive odour which is now unfortunately familiar to the farmer. The spores of the fungus are of two kinds, *conidia*, which are scattered by the wind, and *zoospores* which are motile, and swim in rain drops or dew. They are carried about and spread from one patch of potatoes to another by insects and birds. From the leaves the germs spread to the leaf-stalks, the stems, and the tubers. The spawn readily pierces the skin of the tuber, consuming or rotting the cells, and corroding the starch, and ultimately reducing the potato to a black mass of rottenness. In this last stage of its yearly course of destruction the fungus provides means of continuing its curious life. It produces some kind of 'resting-spores,' which, possessed of amazing vitality, lie dormant during winter and spring, and carry on the disease to the crop of the succeeding year, which in its turn passes the fungus through another round of its mysterious life, to be handed on again from crop to crop as before. There is still uncertainty as to the precise character of these spores; but, be what they may, their tenacity of life is great.

Of the many remedial measures that have been tried, the following have been found most useful in preventing or mitigating the onslaught of the fungus: (1) Earthing up the drills with a deep covering of earth, with the view of preventing the spores of the fungus from passing down through the soil to the tubers; (2) cutting off the diseased potato-tops before the fungus reaches the tubers; (3) removing and burning all dead and decaying potato stems, leaves, and tubers, especially after a crop which has been attacked by the disease;

(4) planting varieties which have been known to be exceptionally successful in resisting the disease; (5) growing the potato crop under such general cultural, sanitary, and manurial conditions as will ensure to the fullest extent possible the healthy and vigorous development of the crop; (6) careful selecting and storing of potatoes to be used as seed; and (7) dressing the potato-tops, both before and after the appearance of the disease, with Bordeaux Mixture. No certain prevention or absolute remedy has as yet been discovered, but the last-mentioned measure has been carried out with very great advantage. This is the mixture—12 lb. copper sulphate, 8 lb. fresh quicklime to 100 galls. water—which proved so effectual in combating the allied parasite fungus, *Peronospora infestans*, that attacks the vines, and it has been demonstrated that it can be used almost equally successfully in averting the potato disease. It is well known that a vigorous variety of potatoes grown under conditions favourable to its healthy development is most successful in resisting the fungus. It is with the potato as with a human being—deprive it of wholesome food and healthy sanitary surroundings, and disease will speedily ensue. The prevalence of this particular disease in recent years is a sure indication of a deterioration in the constitutional vigour of the cultivated potato. The other diseases from which the potato crop is liable to suffer are *Curl*, *Scab*, *Dry Rot*, *Wet Rot*, and *Black Scab*. *Curl* is a disease affecting the foliage and general health of the potato-plant, and is caused by an ultra-microscopic organism or virus which is small enough to pass through a porous porcelain filter.—*Scab* is a disease of the tubers, which become covered with brown, oblong, and finally confluent and cup-shaped spots, whilst under the surface is a powdering of minute olive-yellow grains, a fungus called *Spongospora subterranea*—*Dry Rot* is also ascribed to the growth of a fungus, *Fusarium solani*, and attacks the tubers either when stored for winter or after being planted. It was first observed in Germany in 1830, and caused great loss in that country throughout many years. The tissues of the potato-tuber become hardened and completely filled with the mycelium of the fungus, which at last bursts forth in little cushion-shaped tufts loaded with fructification.—*Wet Rot* differs from dry rot in the tubers becoming soft and rotten instead of hard and dry, and is due to two species of bacteria, apparently assisted in most cases by various kinds of fungi. Wart disease or *Black Scab*, due to the fungus *Chrysophyctis endobiotica* was first noted in Britain in 1899, having in all probability been introduced from the continent of Europe. It is now very prevalent in certain areas. The main preventive measure is to grow immune varieties, of which there are many. The Potato-frog fly (*Euteryx solani*, Curtis) and the caterpillar of the Death's-head Moth (*Acherontia atropos*, Linn.) feed on the leaves and stems of potatoes, but rarely do serious damage. See books on potato-culture by Sanders (1905), Findlay (1906), and Grubb and Guilford (1912).

Potato, SWEET. See SWEET POTATO.

Potato-beetle. See COLORADO BEETLE.

Potchefstroom, a town in the south of the Transvaal, 105 miles SW. of Pretoria, has a university college. Pop. 14,000 (10,000 whites).

Potemkin, GREGORY ALEXANDROVITCH, the most celebrated of the Empress Catharine II.'s favourites, was born near Smolensk on 16th September 1739, the descendant of a noble but impoverished Polish family. Having entered the Russian army, he managed (1762) to attract the notice of the empress by his handsome face and athletic figure; he was attached to her house-

hold, and in 1774 was preferred as her recognised favourite. From 1776, when the Emperor Joseph of Austria made him a prince of the Holy Roman Empire, till the year of his death he was the director of the Russian policy in Europe. It was at his instigation that the khan of the Crimea put himself (1783) under Russian protection. Four years later Catharine paid a visit to his government in the south, and the 'hoax' which he then played off on his sovereign is described by De Ségur (*Mémoires*). He caused an immense number of wooden painted houses to be constructed, and grouped into towns and villages along the route the empress was to take, and hired people to act the part of villagers, merchants, tradesmen, and agriculturists, engaged in their various pursuits. The empress's vanity was hugely gratified at the seeming improvements of the country under her rule, and she covered Potemkin with titles and honours. Almost immediately after this a war broke out with the Turks, and Potemkin was placed at the head of the army, with Suwaroff serving under him. Otchakoff was taken after a terrible siege, and Suwaroff won the great fights of Bender and Ismail—of all of which Potemkin reaped the credit when he entered St Petersburg in triumph in 1791. That same year he was seized with sudden illness whilst travelling between Jassy and Otchakoff, and died October 15, and was buried at Kherson. He was a man of considerable ability in court intrigue and statesmanship; his skill as a general has been both affirmed and denied. Personally he was licentious, coarse in his habits, and utterly tyrannical and unscrupulous; in spite of his lavish extravagance he heaped up an immense fortune.

See *Mémoires* (Lond. 1812), and the Life in German by his secretary Saint-Jean (new ed. Karlsruhe, 1888).

Potential, in dynamical science, is a quantity of peculiar importance. Its value, as a mathematical function in the theory of attraction, was recognised by Laplace in the *Mécanique Céleste*. The name was, however, given by George Green (1793-1841) in 1828, when its broad dynamical significance was for the first time explicitly stated and powerfully developed. The theory of the potential, in fact, is co-extensive with the dynamics of what are known as *Conservative* systems. When such a system is made to pass from one configuration to another, the work done against the forces of the system depends only upon the initial and final configurations, and in no way upon the particular series of changes by which the passage is made. For instance, the work done against gravity in lifting a given mass to a height of 500 feet is exactly the same whether the mass is lifted vertically up, by a balloon, say, or more laboriously taken up the gentle slope of a hill. The earth and the mass form, so far as gravitation is concerned, a conservative system. Practically, however, in dragging a mass up a slope a certain amount of work, greater or smaller according to circumstances, must be done against friction, and this will depend upon the character of the course taken. We know that the work so done is lost and cannot be recovered in dynamic form (see **ENERGY**). These forces are in short dissipative, and so far as their action is concerned the system is not conservative, and the theory of the potential does not apply. A little consideration will show that when the forces are functions of distances only the system will be conservative. Such forces then have a potential; and, although this does not exhaust all types of force-systems which have a potential, it includes all that are certainly known to occur in nature around us. The force of gravitation and the force between electrified or magnetised bodies evidently

belong to the category just described. In all such cases the potential at any point in the field of force is a definite function of the position, a mathematical expression having for any particular case a definite value, such that the difference of the potentials of two points measures the work done in carrying unit quantity (of matter, electricity, magnetism, &c.) from the one point to the other (see **ELECTRICITY** for some further properties of the potential). If we take the two points very close to each other, we see at once that the small difference of the potentials must equal the product of the average force into the corresponding small distance. Thus, in the notation used in the article **Calculus** (q.v.), we have $\Delta V = S \Delta s$, where V is the potential, S the force, and Δs the small distance. Hence $S = dV/ds$ or the force in any direction is numerically equal to the rate of change of the potential per unit-length in that direction. When the potential is known a simple differentiation in any chosen direction gives the force in that direction. It is obvious that other directed quantities besides forces may be expressible as the differential coefficients of a single non-directed or scalar quantity. Thus, in the mathematical theory of Hydrodynamics (q.v.) a very important distinction is made between motions which have a velocity-potential and motions which have not. In the former the velocity can be represented as a space differentiation of a scalar quantity; in the latter it cannot. See **VORTEX** for an account of fluid motion, which has no velocity-potential.

Potentilla, a genus of plants of the family Rosaceæ, differing from *Fragaria* (Strawberry) in the fruit having a dry instead of a succulent receptacle. The species are very numerous, natives chiefly of northern temperate regions, and some of them of the coldest north—even northern Greenland; most of them perennial herbaceous plants, with yellow, white, red, or purple flowers, and pinnate, digitate, or ternate leaves. They are often called Cinquefoil (Fr., 'five-leaved'); and some of the species are favourite garden flowers.



Tormentil.

Some are natives of Britain; one of the rarest of which is a shrubby species (*P. fruticosa*), forming a large bush, with pinnate leaves, and a profusion of yellow flowers, often planted in shrubberies. *P. reptans*, a common British species, has creeping stems, digitate leaves, and yellow flowers. *P. anserina*, a very common British species, popularly known as Silverweed, has creeping stems, yellow flowers, pinnate leaves, which are beautifully silky and silvery beneath, and an edible root, with a taste somewhat like that of the parsnip. Swine grub it up with avidity, and it was once much esteemed as an article of food in some parts of

Scotland, particularly in the Hebrides, where it abounds and has been a resource in times of famine. The Tormentil (*P. erecta* or *P. Tormentilla*) differs from most species in having four sepals and four petals, though the first flowers to appear have often five. It is a very common plant on moors and heaths. So near does the genus come to *Fragaria* that *P. sterilis* (also known as *P. Fragariastrum*), the Barren Strawberry, is very difficult to distinguish from the wild strawberry (*F. vesca*). Sometimes included in *Potentilla* are the Marsh Cinquefoil (*Comarum palustre*, otherwise *P. Comarum*) with spongy receptacle, dusky brownish purple flowers, common in marshes, and *Sibbaldia procumbens* (*P. Sibbaldii*), a little yellow-flowered plant growing close pressed to the ground on Highland mountain-tops.—The name *Potentilla* seems to allude to medicinal virtues now known to merit little regard. See a monograph (Latin and German) by Wolf in *Bibl. Bot.* xvi.

Potenza (anc. *Potentia*), a town of South Italy, ensconced in a valley of the Apennines, 103 miles E. by S. of Naples. It lies on an isolated hill 2700 feet above sea-level, and is much exposed to winds; the mean temperature for the whole year is 53° F. The ancient Roman town lay lower down near the river and the railway station. The modern town contains only scanty traces of older buildings; for Potenza was shaken by earthquakes in 1273, 1694, 1812, and 1857. Pop. 18,600.

Poterium. See BURNET.

Pot-holes. See GIANTS' KETTLES.

Poti, a seaport of Georgia, stands at the mouth of the river Rion, on the eastern shore of the Black Sea, 200 miles by rail W. of Tiflis. Poti was seized by Russia in 1828. Pop. 20,000.

Potidaea, a Corinthian colony founded on the westernmost isthmus of the Chalcidic peninsula in ancient Macedonia. By its revolt from the Athenian League (432 B.C.) it brought on the Peloponnesian war; it was besieged and taken by the Athenians (429 B.C.) The Athenian colony which was then settled there was destroyed by Philip of Macedon (356 B.C.). Cassander built up a new town, and called it Cassandria; this flourished greatly until it was captured and sacked by the Huns.

Pot-metal. Tap and pot metals are alloys of copper and lead. The proportions of the two metals vary from equal parts of each to 1 of copper and 10 of lead.

Potomac, a river of the United States, formed by two branches which rise in the Alleghany Mountains in West Virginia, and unite 15 miles SE. of Cumberland, Maryland, from which point the river flows in a generally south-easterly course 400 miles, and falls into Chesapeake Bay, after forming an estuary nearly 100 miles long, and from 2½ to 7 miles wide. The largest ships can ascend to Washington, and the tide reaches Georgetown. A few miles above Washington the river forms a cataract 35 feet high; and between there and Westport it falls more than 1000 feet. The scenery in this portion of its course is wild and beautiful, especially where it breaks through the Blue Ridge at Harper's Ferry. Its principal affluents are the Shenandoah, Cacapon, and Monacacy. The Potomac forms the greater part of the boundary between Virginia and Maryland.

Potoroo. See KANGAROO RAT.

Potosí, capital of a department of the same name, and one of the most famous mining-towns of South America, stands in a dreary and barren district, nearly 50 miles SW. of Chuquisaca. It is built on the side of the Cerro de Potosí (15,381 feet), at an elevation of 13,000 feet above the sea,

and is thus one of the loftiest inhabited places on the globe. The town has a circumference of some 4 miles; but fully one-half is composed of tottering and ruined buildings, uninhabited and desolate, and the whole place, with its squalor, dilapidation, and dirt, presents a sinister aspect. The public buildings include a handsome cathedral, a mint, the Government Palace, and the Municipal Palace; and the reservoirs are also worthy of mention. The streets are steep and narrow, suitable only for llamas and mules. The climate is very trying: all the four seasons may be experienced in one day, but usually it is bitterly cold, owing to the elevation and to the mountains all round, from which the snow scarcely ever melts. Yet is Potosí one of the principal commercial towns of Bolivia. As the country in the vicinity produces little or nothing, all supplies have to be brought from a distance. The industry of the place is limited to silver-mining. The Cerro is still rich in this ore, although the production, owing to the exhaustion of the mines near the summit, and the frequent inrush of water in those worked at a lower level, has greatly fallen off. Potosí, founded in 1545, had, in 1611, 160,000 inhabitants, now about 30,000.—The *department*, a plateau rich in minerals and cattle, has an area of 50,000 sq. m. and a pop. of half a million.

Pot-pourri (Fr.), a mixture of sweet-scented materials, usually placed in a vase with a perforated lid, that the perfume may be diffused. The principal ingredients are rose-petals, lavender flowers and stalks, violets, jessamine-flowers, woodruff-leaves, cloves, orris-root, pimento, musk, sandalwood-raspings, cedar-shavings, &c. But it also, and originally, signifies a dish of different sorts of viands, and corresponds in this sense to the *Hotch-potch* (q.v.) of Scotland and the *Olla Podrida* (q.v.) of Spain. In Music the name is used for a selection of popular pieces strung together without much arrangement—a kind of medley.

Potsdam, chief town of the Prussian province of Brandenburg, was the second residence town of the royal family of Prussia. It is on an island beside the lake-like river Havel, 18 miles by rail SW. of Berlin. It is a handsome city, with broad streets, public gardens, adorned with statues of Prussian soldiers, and fine squares. The royal palace (1667–1701), in the park of which are statues of Frederick-William I., Alexander I. of Russia, and Generals Blücher, Gneisenau, Kleist, and Tauenzien; the town-house, a copy of that at Amsterdam; and the military orphanage are the finest of the public buildings. The garrison church, with a steeple 290 feet high, contains the tombs of Frederick-William I. and Frederick II.; and the Friedenskirche the tombs of Frederick-William IV. and the Emperor Frederick III. The Brandenburg Gate is a copy of Trajan's Arch at Rome. In the immediate neighbourhood of the town are more than half-a-dozen royal palaces, as Sans-Souci (1745–47), the favourite residence of Frederick the Great, surrounded by a splendid park and gardens, containing Rauch's monument to Queen Louisa and other structures; the palace of Friedrichskron, formerly the New Palace (1763–70), with nearly 200 rooms, many of which contain costly works of art; Charlottenhof, built by Frederick-William IV. in 1826; the Marble Palace, the summer residence of the Emperor William II.; and Babelsberg, the private property of the same prince. Potsdam has an observatory. Its manufactures produce sugar, chemicals, harness, silk, waxcloth, beer, &c. Flower-gardening, especially of violets, is a busy industry. Alexander von Humboldt was a native. It owes its creation as a town to the Great Elector, Frederick-William, and to Frederick II. Prior to

that period it was a fishing-village, built on the site of an ancient Slav settlement. Pop. (1925) 64,993.

Potsdam Beds, a name given in North America to the uppermost division of the Cambrian or Primordial strata.

Potstone, *Lapis ollaris* of the ancient Romans, a massive variety of talc-schist, composed of a finely-felted aggregate of talc, mica, and chlorite. It is generally of a grayish-green colour, sometimes dark green. It occurs massive, or in granular concretions. It is soft and easily cut when newly dug up, greasy to the touch, and infusible even before the blowpipe. It becomes hard after exposure to the air. It is made into pots and other household utensils, which communicate no bad taste to anything contained in them, and when greasy are cleaned by the fire. It was well known to the ancients; and Pliny describes the manner of making vessels of it. It was anciently procured in abundance in the isle of Siphnos (Siphanto), one of the Cyclades, and in Upper Egypt. Large quarries of it were wrought on the Lake of Como, from about the beginning of the Christian era to 25th August 1618, when they fell in, causing the destruction of the neighbouring town of Pleurs, in which it was wrought into culinary vessels, slabs for ovens, &c. It is quarried in the Valais, Moravia, Norway, Sweden, Greenland, near Hudson Bay, &c.

Pott, AUGUST FRIEDRICH, a great philologist, was born at Nettelrede in Hanover, 14th November 1802. He studied philology at Göttingen, habilitated at Berlin in 1830, in 1833 became extraordinary, in 1839 ordinary professor of the Science of Language in the university of Halle. Next to W. Humboldt, Bopp, and Grimm, the name of Pott stands prominent in the new science of comparative philology. The foundation of Pott's reputation was securely laid by his *Etymologische Forschungen auf dem Gebiet der Indogermanischen Sprachen* (2 vols. 1833-36; 2d ed. 6 vols. 1859-70), a work second in importance only to Bopp's *Comparative Grammar*. His well-known article 'Indogermanischer Sprachstamm,' in Ersch and Gruber's *Encyclopadie*, is a masterpiece of condensation, and for once of order. For his besetting fault was a lack of order and perspicuity, which made Ascoli compare his books to the plain of Shinar after the confusion of Babel had taken place. But no student ever brought to his studies a loftier spirit of devotion, or collected more massive materials for the foundation of a new science. So thorough was his treatment that all the progress of learning since has not stripped the value from his books on the Gypsies, on Personal Names, on Numerals, his essays on Mythology, African Languages, or General Grammar. He died at Halle, 5th July 1887, working to the last.

His most important books, besides those already named and countless articles and papers in the learned journals, are *De Borussia-Lithuaniæ tam in Slavicis quam in Letticis Linguis Principatu* (1837-41); *Die Zigeuner in Europa und Asien* (2 vols. 1844-45); *Die Quinäre und Vigesimal Zählmethode bei Völkern aller Welttheile* (1847); *Die Personennamen* (1853); *Die Ungleichheit der menschlichen Rassen, hauptsächlich vom Sprachwissenschaftlichen Standpunkt* (1856); *Doppelung als eins der wichtigsten Bildungsmittel der Sprache* (1862); *Antikaulen, oder mythische Vorstellungen vom Ursprung der Völker und Sprachen* (1863); *Die Ungleichheit der menschlichen Rassen, hauptsächlich vom Sprachwissenschaftlichen Standpunkt* (1856); *Doppelung als eins der wichtigsten Bildungsmittel der Sprache* (1862); *Antikaulen, oder mythische Vorstellungen vom Ursprung der Völker und Sprachen* (1863); and *Die Sprachverschiedenheit in Europa, an den Zahlwörtern nachgewiesen* (1868).

Pottawattamies, a tribe of American Indians, belonging to the Algonquin stock. The early French settlers established a mission amongst them at Green Bay, and to this day many of them are Roman Catholics. They sided with the English both during the Revolution and in the war of 1812, and afterwards settled in Kansas.

Potter, JOHN (1674-1747), an English scholar and divine, son of a linen-draper of Wakefield, studied at Oxford. He was appointed chaplain to Queen Anne in 1706, professor of Divinity at Oxford in 1708, Bishop of Oxford in 1715, and in 1737 archbishop of Canterbury. Potter's principal work is his *Archæologia Græca* (2 vols. 1698), not superseded until the appearance of Smith's *Dictionary*. He edited *Lycophron* (1697) and *Clemens Alexandrinus* (1715).

Potter, PAUL, the greatest animal-painter of the Dutch school, was born at Enkhuizen in 1625, and was the pupil of his father, Pieter Potter, a landscape-painter, with whom in 1631 he came to Amsterdam. He was also an excellent etcher, and so precocious that his best etched pieces, 'The Herdsman' and 'The Shepherd,' were finished in 1643 and 1644 respectively. He established himself at the Hague in 1649, where next year he married the daughter of an architect, but in 1653 he returned to Amsterdam. He died there in January 1654 at the untimely age of twenty-nine. His best pictures are pastoral scenes with animal figures, the life-size 'Young Bull' (1647, at the Hague) being especially celebrated. The Rijks Museum at Amsterdam possesses the 'Bear-hunt' and seven other pictures from his easel. Very many of his productions are preserved in England.

See *P. Potter sa Vie et ses Œuvres* by Van Westreene (The Hague, 1867), and Cundall, *Landscape Painters of Holland* ('Great Artists' series, 1891).

Potteries, THE, a district in North Staffordshire, 9 miles long by 3 broad, the centre of the earthenware manufacture in England, includes the county borough (1910) of Stoke-on-Trent, Newcastle-under-Lyme, and other towns.

Pottery. This term, derived through the French *poterie* from the Latin *potum*, 'a drinking vessel,' is applied to all objects of baked clay. Pottery may be said to be almost contemporaneous and co-extensive with mankind; it is found with the remains of our remotest ancestors, and it is fashioned amongst the rudest of present day tribes. The art in its rudimentary condition—merely moulding wet clay into the desired form, and submitting it to the hardening heat of the sun or of fire—is so simple as to be within the capacity of the least tutored savage. The universality of the primitive art, and the many different lines along which it progressed, preclude the possibility of tracing its history in chronological sequence, and only a few of its more important developments can be noticed in the historical section.

Pottery as known at the present day is distinguished into many classes according to the nature and purity of the clay employed, the heat to which it has been exposed in firing, the glazes or enamels with which it has been covered, and the coloured or other ornamental treatment of its surface. Briefly, as regards material and baking it may be divided into (1) earthenware, which, exposed to a comparatively low heat, remains earthy in texture and can be scratched with a steel point; (2) stoneware, fired at a high heat, hard, dense, compact, and not scratched by the knife; and (3) porcelain, fired at the highest temperature, semi-fused and vitreous in structure, and, when sufficiently thin, translucent. Whilst these are convenient and universally recognised distinctions, it must be pointed out that a continuous and unbroken sequence really exists from the coarsest sun-dried brick up to the most delicate translucent hard porcelain. In point of body, hardness, and colour, each class of pottery gradually merges into the other, so that it cannot be said where earthenware ends and stoneware begins.

Manufacture.—The dough-like condition into

which clay can be worked with water, and the hardness and indestructibility it acquires by burning, are the qualities upon which the potter's art essentially depends. Clay is one of the most abundant of substances, but it is of many qualities and degrees of purity. The commonest brick clays are so coarse in texture and so impregnated with iron and other foreign ingredients that they can be used only for bricks, tiles, and the very coarsest kinds of pottery. The purest potter's clay, known as china-clay or Kaolin (q.v.), is formed by the decomposition of granitic rocks. It consists essentially of the hydrated silicate of alumina with small proportions or traces of one or more of lime, potash, soda, and magnesia. The finest china-clay of Great Britain is found in Cornwall, where it was discovered at Carclaze, 2 miles N.E. of St Austell, between 1755 and 1758 by William Cookworthy. Cookworthy's discovery was of the utmost importance for the home manufacture of porcelain and fine pottery; and the development of the industry which took place under Josiah Wedgwood and others was due in no small measure to the fine material which thus became available to them. Commoner potters' clay or pipeclay is obtained principally from Poole in Dorsetshire. The materials which form the 'paste' or body of pottery vary according to the quality of the desired product. *Earthenware* (called also *Faience*) of the commoner quality may be made of a simple natural clay; but the finer and harder qualities are composed of pipeclay with varying proportions of calcined flint or other siliceous material. Calcined flint was first introduced about 1720 by John Astbury at Burslem. *Stoneware* is fired at a high temperature, which semi fuses the body, rendering it impermeable to liquids. It comprises a wide variety of products in quality and application, from drain-pipes, bottles, graybeards, and jars to fine salt glaze-ware and the 'gres' of Germany. According to quality, common or fine clays are employed, mixed with felspar, sand, and usually a small proportion of lime. *Porcelain* (derived from the Italian *porcellana*, the cowrie-shell, owing to the similarity of the white glazed surface of the ware

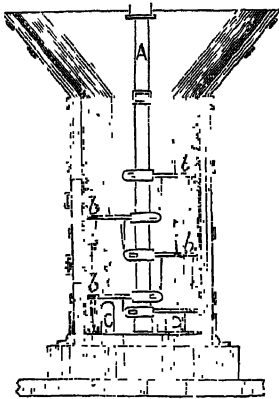


Fig. 1.

to the substance of that shell) is of two kinds—softpaste (*pâte tendre* of the French) and hard paste, or true Chinese porcelain. Of soft paste porcelain, again, two varieties fall to be distinguished, the French or Sevres soft paste, which was also the 'china' of England in the 18th century, and the bone porcelain, which has been the 'china' of the United Kingdom since the beginning of the 19th century. Sevres body is composed of equal parts of kaolin and white sand, with about 4 per cent of chalk. Bone porcelain, the characteristic English product of the present day, may be regarded as a fine earthenware to which a proportion of calcined bone or phosphate of lime has been added, thereby producing translucency in firing. In 1800 this variety of porcelain was introduced by Josiah Spode (1754-1827). Hard paste or Chinese porcelain may be composed of equal parts of china-clay and pure white sand, with a small proportion of chalk. Its hardness and power of resisting heat make it

invaluable for chemical and industrial uses. The ingredients, such as clay and calcined flints, are prepared by separate means, the former in the pug-mill, which is represented in fig. 1. This is an upright, iron-bound, wooden cylinder, with an axis, A, turned by machinery; projecting from A are seven arms, b, each of which has three knives fixed in it, with the points outward, and so arranged that they spread over the largest amount of space in the interior; and altogether they are placed in a spiral manner, so that when in motion the clay, which is thrown in lumps into the hopper-shaped upper part of the vat, is worked down, and is so cut and kneaded by the knives that it is forced out at an opening at C in the state of soft pap. This is aided by the knives on the lower part of the lowest arm being connected together by a plate D, which prevents all settlement at the bottom. This paplike clay passes into a large wooden tank, in which it is agitated with water until quite incorporated, so as to resemble milk in colour and consistency. In another mill (fig. 2), of a different construction, the Cornish granite and calcined flints are reduced to a somewhat similar state. This mill is very strongly constructed, and consists of a tub-like vat, A, in the centre of which turns an axle, B, moved by machinery; in the bottom of the vat is a thick stone-bed, C, consisting of either chert or horn stone. From the upper part of the axis three strong arms, D, D, D, project like the spokes of a wheel; and strongly attached to these are stout beams, a, pointing downward, and nearly touching the stone bed, C. As the axis, with its arms and beams, turns round, the beams push some large masses of the Cornish granite or of chert stone round with them, and these triturate the calcined flints and other hard materials, and

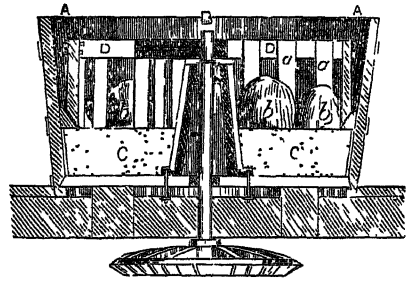


Fig. 2.

stir up the water with which the vat is kept constantly supplied, whilst it overflows in a milky state, charged with the finely-divided materials, into a cistern, where it is kept stirred until it is sufficiently supplied with the solid materials, and the thickened milky liquid is then drawn off, in proper proportions, into a vat to which the prepared clay is also passed. The mixture of the two is then allowed to subside until the water is nearly clear, when it is drawn off; and the sediment is deprived of its surplus moisture, either by evaporation, or, in the best works, by a pneumatic exhausting apparatus, which does it very quickly. The composition is then a fine plastic material of the consistency of tough dough, and is ready for the potter's use. In preparing the finer materials for porcelain many other operations are required, all, however, having the same object—viz. the extremely minute division of the substances used.

The prepared clay is taken to the *throwing-machine*, or *potter's wheel*, which is represented in fig. 3. This consists of a fixed table, A, through which passes the axle, B, rising a little above the surface, and having on its upper end a disc, C,

which revolves with it. The axle is put into rapid motion by turning the fly-wheel, D, either by hand or machinery; and this causes a rapid revolution of the disc, C, upon which is placed the soft mass of clay to be moulded. At E is seen an upright, with a small sliding bar regulated by a screw; this is

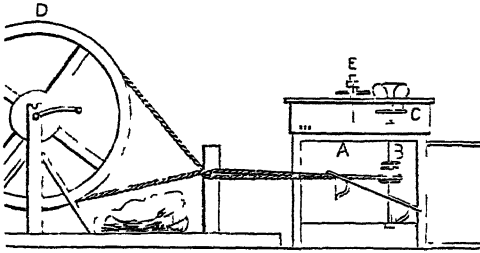


Fig. 3.

the guide for the potter to regulate the height of the vessel he is making. When the lump of clay is revolving, the potter, with his hands or with proper tools, fashions it into any rounded form he desires, gradually working from the base upwards till the vessel in his hands attains the external shape, height, and thickness of wall required. It is then put aside for some time to dry, and when in a state of greatest doughy tenacity it is fixed on a turning-lathe, and by means of sharp steel tools its surface is accurately turned and smoothed. But some articles are formed in moulds, the moulds being made of plaster

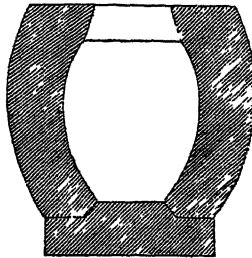


Fig. 4.

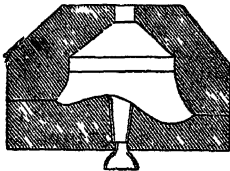


Fig. 5.

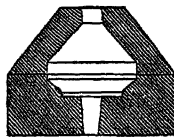


Fig. 6.

of Paris. This answers well for fine porcelain intended to be very thin, because the plaster-mould absorbs much of the moisture in the paste, and thus partially dries it, so that it admits of handling, which in a softer state would be very difficult. The paste is used so liquid that it can be poured into the moulds. It is usual, in casting, to have a mould for each part, as seen in figs. 4, 5, 6, which represent the body, neck and lip, and foot of the cream-ewer, fig. 7. The handle is also separately moulded, and attached with the aid of a fluid clay paste, called a slip. For nearly flat articles, such as dinner-plates, a plan is adopted which combines both processes: a mould, usually of plaster, fig. 8, *a*, is placed on the disc of the throwing-wheel, *b*, and a thin layer of the paste is pressed on to it, so as com-

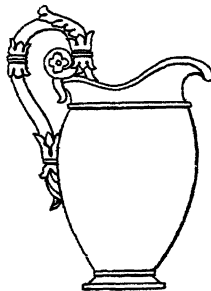


Fig. 7.

pletely to take its form; then to the guide-post, *c*, is attached an arm, *d*, with a small brass plate,

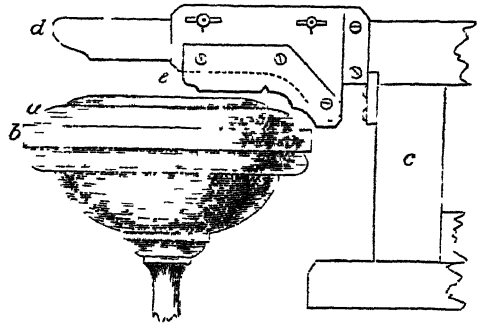


Fig. 8.

e, on its lower side. This plate is cut to the outline of half the plate, or dish; as it revolves, this passes down and shapes the clay to its own outline, and to the thickness to which it is set, there being an arrangement on the arm of the guide-post by which this can be effected. Sometimes, as in the case of deep vessels, moulds are used for the exterior, and the interior is formed by the hand. This process (fig. 9) ensures certainty of size and shape, which is important in making large numbers of similar articles, as tea-cups, &c. The mould is lined with a thin cake of clay, and when placed on the revolving disc it is fashioned inside by hand, and finished off with a wet sponge. Sometimes metal or horn tools are used for producing mouldings and other raised ornaments, or for grooves, when the turning or throwing wheel is used.

Being formed, the articles, of whatever kind, are now taken to the drying-stove, where they are placed on shelves, and remain there some time, exposed to a heat of about 85° F. When quite dry, they are next taken to a workshop near the kiln, and they are here carefully packed in coarse earthenware vessels, called *seggars* (fig. 10), which are so made that they can be piled upon one

another to a great height in the kiln, as seen in fig. 11, in which some of the seggars are shown in section, for the purpose of making the arrangement

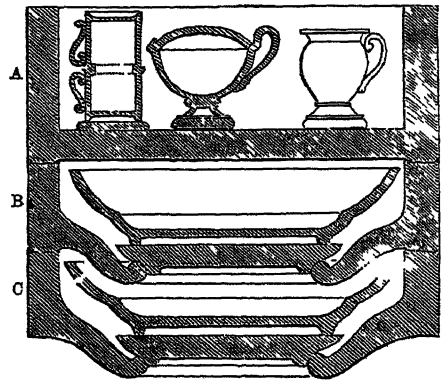


Fig. 10.

intelligible. As the seggars are generally made large enough to hold a number of articles, which would, when highly heated, adhere if they touched, a number of curiously shaped pieces of burned clay are used for placing between them, so as to make them rest on points; these are called *watches*, *cockspurs*, *triangles*, *stilts*, &c. (fig. 12). In the seggar filled with plates (fig. 13) the plates are seen each resting on *cockspurs*, which prevent them touching. Another object is gained by this in burning flat articles such as plates; these, if placed one upon another, would not be fired equally, but when they are held apart the heat affects all parts alike. The seggars are so piled in the kiln that the centre is hollow, and there are free spaces between them through which the fire can ascend; props, *a, a, a*, fig. 11, being so placed as to keep them from immediate contact with the sides all round. Thus each seggar forms a small oven, in which one or more pieces of pottery or porcelain are baked, and the seggars prevent any unequal heating of the pieces, and also protect them from smoke. A kiln has generally eight furnaces, and it is usual to raise six piles of seggars between every two furnaces, or rather between their flues, which rise to a considerable height in the kilns. Each pile of seggars is technically called a *bung*, so that there are generally forty-eight or fifty bungs to the charge of a kiln. When all this is arranged the furnaces are lighted, and great care is taken to

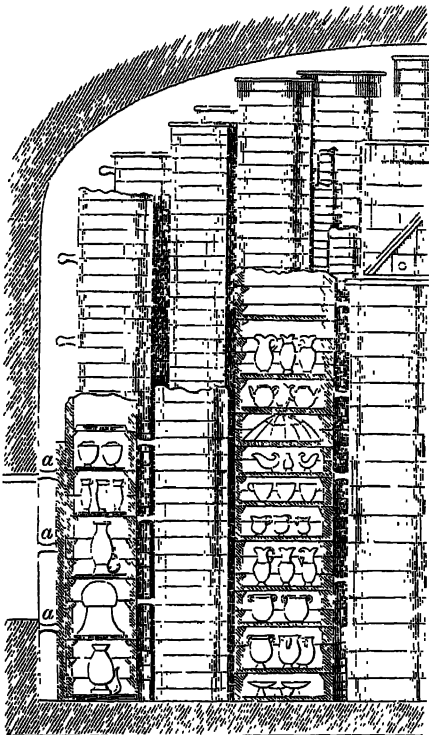


Fig. 11.

use the best coal, as it enables the manufacturer to make a more certain calculation as to its effects, and is less liable to smoke and sulphurous vapours, which might injuriously affect the contents of the kiln. The baking or firing usually lasts from forty to forty-two hours. The fire is then allowed to go out, and the kiln to cool very gradually, after which it is opened, and the seggars removed, to be unpacked in a separate workshop.

The articles are now in the state called biscuit-

ware, and are ready for any pattern they may be intended to bear, and the glaze. Here, however, it may be stated that it is possible to glaze refractory pottery, such as stoneware in the biscuit oven, and

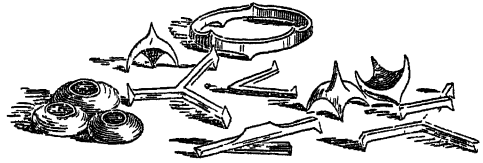


Fig. 12.

thus avoid the necessity for two firings to the ware. The glazing is in this case effected by throwing common salt into the oven when at its highest temperature. The salt is volatilised and the sodium separates from the chlorine, and, combining with the silica it finds in the heated ware, forms a true soda glass with it, which makes a uniform transparent glazed layer over all the pottery surfaces which it reaches. In this way all glazed sanitary wares and ordinary stoneware jugs and bottles are made at one firing. Common pottery is often figured by printing the design in enamel

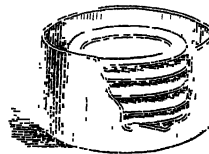


Fig. 13.

colours on transfer-paper, and, whilst the printing is still wet, applying it to the biscuit-ware; the ware absorbs the enamel ink, and the paper is removed by water, leaving the pattern on the ware. It is next fired in seggars, or a muffle, to fix the colour, and is then dipped into composition called *glaze*, of which three kinds are used in the Staffordshire potteries. The first, for common pipeclay ware, is composed of Cornish granite, 16 parts; flint, 36 parts; white-lead, 53 parts; and cullet, or broken flint-glass, 4 parts. These materials are triturated with water, with the same care and by similar means to those employed in forming paste, and are reduced with water to the same milk-like liquidity. Each workman has a tub of the glaze before him; and as the articles of biscuit-ware, either with or without

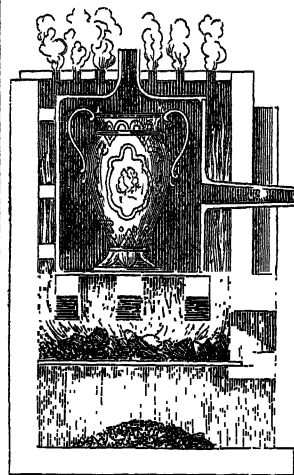


Fig. 14.

decorations, are brought to him, he dips them in the glaze, so as to ensure a uniform coating over them; and by nice management he prevents any large drops or accumulations on one part more than another. The porous biscuit-ware rapidly absorbs the moisture, and dries up the thin film on the surface of the articles, which are again placed in seggars, and carried to the glaze-kiln, where they undergo another firing, which melts the glaze, and converts it into a transparent glass all over the surface, and renders any pattern previously printed upon it very plain. The temperature in the glaze or enamel kiln is only

increased very gradually, and is kept up for about fourteen hours, after which it is allowed to cool slowly, and the articles are taken out completed. So far, this description has applied to the manufacture of pottery and porcelain on a large scale, for general purposes; but when it is applied to more costly and artistic works very special arrangements are required; and in the case of remarkably fine pieces, instead of the huge kilns, which hold frequently many thousand pieces, muffle furnaces (fig. 14) are used for each separate article for the biscuit, the glaze, and the coloured and gilded decorations, which, in porcelain, are applied on the glaze, and not on the biscuit.

In the decoration of painted pottery and porcelain the colours employed are coloured glasses ground to impalpable powders, and mixed with borax or some other fluxing material. For use they are generally made liquid with oil of spike, and they are laid on with hair-pencils, in the same way as oil-colours. The whole process is exactly the same as in painting or staining glass; the glaze on the biscuit-porcelain being true glass, and the enamel colours being exactly the same as those used by the glass decorator. The colours may be made by mixing the materials of which glass is made with the colouring material and the flux, or simply with the already coloured glass and the flux. When the former plan is employed the principal colouring materials made use of are oxide of chromium for green; oxide of iron for red, brown, violet, gray, and yellow; oxide of uranium for orange, yellow, black; oxide of manganese for violet, brown, black, and purple; oxide of cobalt for blue, gray, and black; oxide of antimony for yellow; oxide of titanium for yellow; oxide of copper for green; suboxide of copper for red; sesquioxide of iridium for fine black; protochloride of iron for brown; chromate of lead for yellow; chromate of barytes for yellow; chloride of silver for deepening reds and purples; purple of Cassius for ruby and purple. Several of these colours are much increased in brilliancy by the addition of oxide of zinc, which of itself gives no colour; and the transparent ones are rendered opaque by the addition of oxide of tin.

Other fluxes besides borax are used—as sand, felspar, boracic acid, minium or litharge, salt, salt-petre, potash, and soda. For the gilding of pottery gold-leaf is rubbed down with oil of turpentine; or metallic gold is produced by precipitating the metal from its solution. The finely-divided gold so obtained is washed and dried, and then worked up with one-sixteenth of its weight of oxide of bismuth and oil of turpentine, painted on, fired, and afterwards burnished.

HISTORY.—Primitive pottery, both present-day and prehistoric, shows forms and decorations derived from other utensils—baskets, vessels of leather and wood, gourds, and so on. The derivation may be direct, if, as may well be, the accidental burning of a clay-daubed basket suggested both the invention and the ornamentation. It is pretty well agreed that western Europe had no pottery till the coming of the Neolithic Alpine people. But by that time the Near East had several very highly developed cultures in which pottery had an eminent place.

Egyptian.—The Nile valley pottery is found buried at a depth which may indicate a date about 10,000 or 15,000 B.C. That the Egyptians attained considerable skill as potters is attested by the lustrous red ware they made for holding perfumes, wine, honey, and other delicacies; but their most remarkable pottery was their so-called porcelain made of a fine sand or frit covered with a thick siliceous glaze, known from pre-dynastic times, blue, green, white, purple, or yellow in colour.

The blue colour—which is that first and principally employed—was produced by an oxide of copper which yielded tints of unrivalled beauty and delicacy. This famous porcelain was at its best in the 18th dynasty (about 1600 B.C.), and continued to be produced till the period of the Greek and Roman rule. It was fashioned into vases, sepulchral figures of deities, scarabæi, beasts, &c.; and it must have attained a great reputation, for remains of it are found in most of the ancient countries which had commerce with Egypt. The glazed tiles of King Zoser's time (3d dynasty) are worthy of note.

Elamite, &c.—Competing with Egyptian for priority—though some would date it 4500 or even as late as 3000 B.C.—and excelling it in art, is the oldest ware of Susa. This ware is very thin, with geometrical or stylised designs in lustrous black. The wheel may have been used. A similar culture is seen at Anau (Turkestan) and elsewhere.

Red Ware.—About the time of the introduction of copper a red ware appears in Cyprus, Syria, and Asia Minor, where it supersedes earlier black wares with incised designs filled with white. A similar succession is found in the Danube basin.

Assyrian.—In the empires of Assyria and Babylon pottery was also in use at an early period. Sun-dried and kiln-dried bricks were made very early, and like Egyptian bricks these were stamped with the names and titles of the reigning monarchs, and the locality for which they were destined. Glazed bricks of various colours, occasionally enriched with figures of men and animals, were introduced into constructions, and Semiramis is said to have adorned with them the walls of Babylon. In these bricks we have the earliest example of the employment of materials for colouring like those now in use. The glaze, however, is largely siliceous, but tin-glazed polychromatic bricks were also used in the construction of the walls of the palace of King Darius at Susa. These bricks were moulded so as to build together into regular geometrical patterns, colossal figures of men, &c. in high relief. Remarkable for size are the large coffins found at Warka. The Assyrians and Babylonians used terra-cotta for historical and legal purposes, making cylinders, hexagonal prisms, tiles and tablets of it, on which were impressed extensive writings in cuneiform characters. See BABYLONIA, CUNEIFORM.

Minoan.—The succession of styles in Crete is so fully dealt with under that head that it need not be repeated here.

Greek.—The most remarkable pottery of antiquity was the Greek, which in its earliest development draws its inspiration from Minoan and Mycæan. The Greek vases which remain to this day, principally recovered from tombs in Greece and in the lands to which its commerce extended, show that within a few centuries the art rose from the rude condition like that shown in prehistoric pottery till it reached a perfection and variety of form and a grace and dignity of decoration not since attained by the efforts of any people. It was the triumph of pure art, for the material of which the body of Greek vases is fabricated is of the commonest type, and the colours the artists had at their disposal were few and simple. The archaic pottery of the Greeks down to about the 7th century B.C. was like the rude earthenware of prehistoric times. Their first improvement consisted in the application of a brown glaze to the surface of the ware, which enabled them to give force to



Fig. 15.—Unglazed Egyptian Bottle in the British Museum.

the incised ornament, scratched through the glaze into the differently coloured body. Next the potters discovered black pigment which they could apply over the brown glaze, and thus increase their decorative resources by painting geometrical patterns in black. By degrees the purely geometrical forms of ornament were abandoned, and figures of animals, rising ultimately to the human figure, were painted in black silhouette on the vases, some of the details being touched with white and purple. In the case of the human figure faces and limbs began to be expressed in white and colour on

superabundant, and the proportions of the vases became exaggerated and bad. Subjects themselves were no longer lofty and heroic, but connected with incidents of everyday life, with burlesque drama, and with jugglery.

Since 1873 a great number of terra-cotta figurines or statuette figures and groups have been excavated from tombs at Tanagra in Boeotia; subsequently a very important find was made at Myrina on the coast of Asia Minor, opposite the island of Mitylene, and at Tarentum, Corinth, the Crimea, Cyprus, the Cyrenaica on the African coast, and in other localities quantities of such figurines have been obtained. They consist principally of single figures and groups of diaped females and young girls; subjects drawn from the everyday life of the people, treated with true Attic grace and simplicity, and with marvellous sculptural feeling. In the Myrina series, which obviously have a different inspiration, deities and heroes of mythology form the most important element.

Etruscan.—From the fact that much Greek pottery has been found in Etruscan tombs, this ware came to be popularly known as Etruscan pottery. True Etruscan pottery, however, was rarely painted. The most characteristic ware of that people, with a body black throughout, had on its surface moulded ornaments, the shape and ornamentation showing that it was modelled on oriental metal-work. This black Etruscan ware, which was in use from 500 to 320 B.C., was the source from which subsequently arose the Aretine and so-called Samian ware of Rome.

Roman.—The only important development made in pottery under Roman rule beyond an enormous production of lamps was this Aretine or Samian ware. It is evidently imitated in its decoration from works in metal, in all probability from the chased cups of silver and gold which began to come into use in Italy, and was a continuation of the later moulded wares of Greece and Italy. The Samian ware of the Romans, so called from having originated in the island of Samos, was of a bright red colour throughout, but covered



Fig. 16.—Greek Krater, Amphora and Kylix of later style.

the black figures painted on a red ground. Concurrently, the rough clay body of the vases began to be wholly or partially covered with an engobe or slip of clay of much finer quality and colour, the engobe being applied by dipping the moulded article into a vessel containing the slip. With these developments in material and decorative variety the forms of the vases and the skill of the artist draughtsman show steady and continuous development. Just as the best period in Greek art approached the favourite method of vase decoration underwent a total change. The decorative figures, deities and men, were traced on their red and white clay surfaces; but, instead of the figures being filled up in black, the surrounding space—the body of the vase itself—was blackened, giving a black varnished background with figures the colour of the underlying body. The details of these figures are indicated with fine lines. Sometimes the faces and limbs are filled up in white, and the draperies may be parti-coloured. At this stage Greek pottery reached its greatest loveliness of form and perfection of ornamentation, the drawing being supremely refined, delicate, and spirited. Among the most interesting of the Greek vases which remain to us are certain of the Panathenaic amphorae—prizes won at the public games in Athens—on one side of which was painted an archaic figure of Athena, and on the other any appropriate design with the inscription: ΤΟΝ ΑΘΗΝΕΩΝ ΑΘΛΩΝ. In most cases also they contain the name of the archon or chief-magistrate of the city for the year, in this way enabling us to find the precise date of the manufacture. The most ancient of these date from the 6th century B.C. Of ten vases in the British Museum, six bear the name of the archon, and the Louvre possesses three, which, from the archonic names they bear, can be referred to 323, 321, 313 B.C. respectively. At this period the decadence of Greek art had already set in. The drawing degenerated speedily, figures were multiplied and crowded in confusion, ornament became florid and

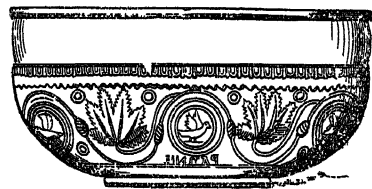


Fig. 17.—Samian Bowl.

with a lustrous siliceous glaze. The red colour nearly resembles in appearance and texture a coarse sealing-wax; the paste is often remarkably fine. The vases, generally of small dimension, were turned on the lathe; the ornaments were moulded separately, and attached to the vase; patterns were produced by the repetition of the same mould, or by placing the bas-reliefs from various moulds on the vases. This kind of pottery was first made by the Romans at Arezzo, but subsequently, or nearly simultaneously, was produced at Capua and Cumæ in the 1st century. It afterwards extended over all the Roman world, and was made in Gaul and Germany. While under the republic it was at first extremely fine, the manufacture deteriorated under the last of the twelve

Cæsar, and the ware is no longer found under the Antonines. The names of several hundred potters are found stamped upon existing specimens of this ware, some of them evidently of Gaulish origin. It was extensively imported into Britain and other remote provinces of the empire. In Britain the Roman conquerors established the manufacture of pottery in many localities, making use of the native clays. The ware was generally of inferior quality, but that of some places is sufficiently distinctive; and the discovery of kilns and fragments enables us to associate certain localities with distinct classes of pottery. Thus, a black ware was made at Castor in Northamptonshire, which was ornamented with reliefs laid on by depositing a fluid clay on the wet body, and moulding it with a tool. Characteristic ware was also made under Roman influence at Upchurch in Kent, and near Crockhill in the New Forest, Hampshire.

Rhodian and Hispano-Moresque.—The knowledge of glazes originally acquired by the Egyptians and Assyrians was continued and transmitted to the Persians, Turks, Arabs, and Moors; and through oriental influence it came to be a European possession in mediæval times. An interesting, but now generally rejected, theory used to be put forward

to account for the origin of the so-called Rhodian ware. Under the Knights of St John of Jerusalem, it was said, Persian potters were set to work in the island of Rhodes about the beginning of the 14th century. For about 100 years thereafter a large amount of a brilliant enamelled pottery was made, and sent out through the Mediterranean basin from that island. The pottery, somewhat Persian in form, colour, and ornamentation, is greatly treasured under the name of Rhodian ware. This ware is now held to have emanated mostly from Turkey, partly from Syria (Damascus ware), and is of the 16th and 17th centuries. Some centuries earlier there was

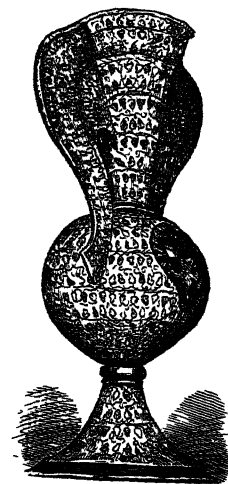


Fig. 18.
Hispano-Moresque Vase.

planted, under Moorish influence, on the Spanish peninsula and in the Balearic Islands, the manufacture of the famous Hispano-Moresque enamelled faience, which is specially remarkable for the brilliant metallic lustre of its glaze. The most famous specimen is the Alhambra Vase at Granada. The industry continued to flourish till the final expulsion of the Moors from Spain early in the 17th century, after which it rapidly fell away. From the island of Minorca especially a vast trade in this ware was carried on; and the name 'Majolica,' given by the Italians to their own more famous enamelled pottery, is an indication of the predominant importance of the ware, usually made at Valencia, sent out from Majorca in the middle ages.

Italy.—Probably the production of brilliant enamelled pottery simultaneously in the East and the West—in Persia, Damascus, and Turkey on the one side, and in the Spanish peninsula on the other, exercised a powerful influence on the origin and progress of the same art in Italy. But there, under the contemporaneous renaissance of art generally, the decoration of the pottery assumed a distinctively European character, and it attained a much greater freedom, wealth, and variety of decorative resource than was reached by any of its

predecessors. The fine white enamel glaze yielded by tin was used by Italian potters of the early 14th century, and from this time onwards the application of this tin enamel to earthenware became very common in Italy. Decorations were painted on the enamel, and later a lustre was sometimes added; it is to such pottery that the name Majolica properly belongs. One of the most famous of the many artists who produced this ware was Giorgio Andreoli, commonly known as Maestro Giorgio,



Fig. 19.—Deep Dish, by Giorgio.

who worked at Gubbio during the first half of the 16th century. His pieces, Gubbio ware, are distinguished by a remarkable iridescence, flashing ruby, golden, and opaline tints of marvellous brilliancy with every variation of light. Among the most famous centres of Majolica production in Italy besides Gubbio were Faenza, Siena, Urbino, Castel Durante, Deruta, Pesaro, Forlì, and Venice. The artistic value of the products declined with the waning of art in Italy in the 17th century.

France.—From Italy the art of making enamelled faience passed in the early 16th century into France, and tiles for the château of Écouen were manufactured at Rouen about 1542, probably by Masseot



Fig. 20.—Palissy Dish, La belle Jardinière.

Abaquesne. Faience factories were set up by Italians in the second half of the century at Lyons, Nantes, Nîmes, and at Nevers, where the Conrade brothers from Albissola became famous as master-potters. Bernard Palissy (q.v.) in 1555, after unheard-of exertions, independently discovered an

enamel glaze, which he applied to his characteristic rustic dishes, embellished with exquisitely moulded figures, in high relief, of fishes, reptiles, fruits, and other figures. Meanwhile there was being produced in France a ware which has become famous as the so-called *Henri Deux* or *St Porchaire* faience. First brought into public notice in 1839, it was till 1864 known as *Henri Deux* ware, from many of the pieces containing the cipher and emblems of Henry II. and of Diana of Poitiers. Then, owing to the acceptance of a false theory of its origin, it was designated *Oirin* ware: but the pieces were more probably made at *St Porchaire* (*Deux-Sèvres*) between 1525 and 1555. *Henri*



Fig. 21.—Vase of *Henry II. Ware*.

Deux ware, of which only sixty-five pieces are known, consists entirely of decorative pieces treated in an architectural manner, the body of the ware being a creamy pipeclay, with inlaid ornamentation in colour, and beautifully modelled masks, trusses, &c., and a transparent glaze. There were three important centres in France during the 17th century—*Nevers*, with its oriental *bleu persan* ware; *Rouen*, with its artificiality of design and conventionalities in bright brick-red; and *Moustiers*, with its elaborations in blue or polychrome, mostly after *Bérain*. *Strasbourg* and *Marseilles* had a considerable reputation. The French industry succumbed in the 18th century to the craze for porcelain and to the competition of the new English wares.

Northern Europe.—The celebrated enamelled faience of Holland owes its origin probably to Italian influence, though its main development came with the attempts of the Dutch to imitate the oriental porcelain with which they were made familiar by their eastern trade and connections. The manufacture dates from the 16th century, but it was not till about 1650, when the town of *Delft* turned from the manufacture of beer to that of pottery, that the production of *Delft* ware, generally known as *Delft*, became important. To imitate the fine lustrous white of the ordinary porcelain body tin-enamel glaze was employed by the Dutch potters, and their coloured decorations were chiefly in blue. Some of the motives depicted were scenes from Dutch life, but much more characteristic were the Chinese and Japanese devices first introduced by *Aelbrecht de Keizer*. The industry decayed during the 18th century. Ornamental glazed stone-tiles were made in Germany from an early date, while the later 16th century saw the production in *Nürnberg*, *Salzburg*, &c., of the famous *Hafner* ware of quaintly decorated

and coloured jugs. In the 17th century *Hamburg* produced a blue and white spiral ware, and in 1661 two Dutchmen established a flourishing factory at *Hanan*, turning out jugs showing Dutch and Chinese influence in decoration. Other important centres were *Nürnberg*, *Frankfurt-am-Main*, and *Bayreuth*. Stoneware *Bellarmines* or *Gieybeards* (q.v.), and the tall beer-jugs of the Germans usually decorated with moulded ornaments, medallions and inscriptions, &c., although generally spoken of as *Grès de Flandres*, are really almost exclusively of German origin, and may be traced, according to their colour and quality, to *Cologne*, *Siegburg*, *Frechen*, *Raeren* (associated with the name of *Jan Emens*), *Grenzhausen*, *Höhr*, and to *Kreussen* in *Bavaria*, &c. Scandinavian faience has of late come to occupy a position of some importance. *Johann Wolff*, a shiftless native of *Holstein*, founded two factories which have become famous—*Store Kongensgade* in *Copenhagen* (1722) and *Rörstrand* in *Stockholm* (1725). Their characteristic ware was blue-coloured and influenced by *Delft* and Chinese motives. Other centres of note were *Kastrup* (1749) near *Copenhagen*, and *Marieberg* (1759) near *Stockholm*. Norway's contribution is chiefly that of the factory of *Herrebee* (1760–1772), founded by *Hofnagel*. Its productions are in the rococo style.

England.—There is a tin-glazed dish of English make dated 1602 in the *London Museum*, and some undated pieces are doubtless earlier. During the 17th century *Lambeth* carried on a considerable industry in ‘*Delft*,’ copied from *Holland*, but otherwise the ware made in *England* was of a coarse, common description, and those who could afford the luxury obtained their pottery from the Dutch and other superior makers. The first step towards improvement was effected by *John Dwight*, who in 1671 obtained a patent for ‘making stoneware, vulgarly called *Cologne ware*,’ and by him the *Fulham* manufacture of stoneware was originated. A still more marked influence was produced on English pottery about the same time by the two brothers *Elers*, from *Holland*, who settled at *Burslem*, and there produced a ware which they called *red Japanese*. To these potters is imputed the origin of the process of salt-glazing of stone ware. Their secrets were discovered by *Astbury* and *Twyford*, and from this time onwards improvements were introduced in the *Staffordshire* potteries under such men as *Daniel*, *Billing*, and *Whieldon*; but the great strides which for a time put English pottery in the foremost rank of the productions of the world were due to the great potter *Josiah Wedgwood* (q.v.; 1730–95). In every department, in body or paste, in methods of decoration, and in the employment of artists of the highest ability, *Wedgwood*, with untiring application and with unstinted expenditure, aimed after perfection; his achievements in ‘*Queen*’ ware, *Egyptian black*, and *jasper* ware need only be mentioned. His efforts alone raised the manufacture of pottery in *England* to the position of an industry of national importance. Cheaper processes such as *transfer-printing* and more economical



Fig. 22.—Early *Staffordshire Tyg* or four-handed drinking-cup.

methods enabled England to flood the Continent, especially with the cream-coloured wares, with the result that the continental faience industry was well-nigh exterminated. Away from Staffordshire potteries of some importance existed at Lambeth, Bristol, Liverpool, Leeds, Lowestoft, and Swansea; but by degrees the manufacture drew more and more towards Staffordshire, where, in the towns collectively known as 'The Potteries' (q.v.), it now principally centres. English stoneware and pottery owe much to Sir Henry Doulton (q.v.) and his works at Lambeth, in the Potteries, and near Glasgow.

Peru.—In the New World the art of the potter showed an interesting development among the ancient Mexicans and Peruvians before the American continent became known to Europeans. No knowledge of glazes existed among these peoples, but, in the case of the Peruvians especially, a high degree of skill in working clay was developed; and they modelled and modified animal forms with great knowledge and spirit. Their most characteristic pottery was black, but they also made vessels of a fine, warm, yellowish body, formed on the potter's wheel, and having painted decorations analogous in style to those on archaic Greek vases.

PORCELAIN.—China.—According to their own records, pottery was made in the Chinese empire in the reign of their mythical Emperor Hwang-ti about 2690 B.C. The Chinese were, moreover, the first to manufacture porcelain; but doubt exists as to the date of the earliest manufacture of porcelain as distinct from pottery. There is no proof that the new ware which appeared in the Han Dynasty (206 B.C.–220 A.D.) was porcelain, but the name can be applied to certain extant specimens dating from the T'ang Dynasty (618–906). The pro-

ductions of the Sung period (960–1279) are highly prized and include the green-glaze celadon porcelain, Ju, Ting, and Chün wares. The Ming period (1368–1643) was prolific in the blue and white and *blanc de Chine* ware. Subject to fluctuations caused by revolutionary troubles, the porcelain manufacture has continued to flourish in China to the present day, the most famous centre of the industry being King-te-chin in the province of Kiang-si. In this town alone there were at the end of the 18th century some 3000 porcelain furnaces; but the place was ruined by the Tai-ping insurrection, and the industry suffered a set-back. Chinese porcelain exhibits endless variety in form and painted decoration. The mythical dragon, the kylin or mythical lion, the spotted



Fig. 23.—Chinese Porcelain Vase.

deer, domestic fowls and other birds are favourite subjects on Chinese ware. Of all Chinese porcelain that now most sought after is the old blue ware such as was at first copied and imitated by the Delft manufacturers. Crackle ware, in which the glaze shows signs of separation from the body, is a peculiarity of oriental manufacture. The Chinese appear to possess the secret of causing the cracks in the glaze to be large or minute at will. Ruby glazed ware (the *Sang de bœuf* of the French) and rich chromatic splashed glazes are also highly treasured in Chinese porcelain.

Japan.—A knowledge of Chinese porcelain first passed into Japan at the beginning of the 16th century, when a Japanese potter went to China to acquire the art of porcelain-making, and after his return carried on the manufacture in his native country with great success. Korean potters established a flourishing industry at Arita (Hizen) in the next century. It is, however, more in the manufacture of pottery than of porcelain that the Japanese exhibit pre-eminent skill. Their most famous manufacture consists of Satsuma ware, so called from having been established in the province of that name at the end of the 16th century by the formerly powerful princes of Satsuma. It is of a pale yellowish colour, covered with minute crackles in the glaze, and very richly enamelled and gilt. The so-called Satsuma manufactured last century is yellower in colour and more elaborately decorated than genuinely old pieces, and was principally made at Awata near Kyōto. The Japanese potters generally display a remarkable power in moulding pottery and finishing its surface so as to imitate other substances, such as woods of various kinds, basket-work, &c. Among their most remarkable products are examples of delicate moulding in Banko ware, which consists of small teapots and other vessels of a brownish and grayish unglazed earthenware, extremely light and thin in body, and very much appreciated among the native population for tea-making. The Japanese excel in the manufacture of egg-shell porcelain, so called on account of the extreme thinness of the body. Among their other porcelain manufactures Kaga or Kutani ware is the most outstanding, being characterised by painted ornaments in a rich ruby or green colour, which is generally lavishly gilt. The chrysanthemum is a favourite and frequent flower in their vases, the crane and other birds figure most effectively, and figures of warriors and ladies are frequently employed in the resourceful and varied ornamentation of Japanese ware. The principal centres of the pottery industry in Japan are in the province of Hizen, where at Arita is produced Imari ware; the province of Owari, whence comes Seto ware; Kaga, for ware of that name; Kyōto, where Raku-ware has been made for over three centuries; and Mino.

Persia.—Chinese pottery seems to have been known in Persia as early as the T'ang Dynasty, a circumstance not to be wondered at, seeing that country was then, and for centuries before, the principal highway of commerce between the far East and Europe. Many evidences exist of the acquaintance of the Persians with the ceramic products of China; this is especially evident in the blue and white wares, and in the Gombroon ware, a species of soft porcelain made in Persia and modelled both in form and decoration on Chinese originals. But Persia also had a manufacture of pottery and of enamelled tiles of an original and distinctive character, in which on a fine white enamelled glaze brilliant metallic lustres were employed in a most effective and original manner.

Porcelain in Europe.—In the 13th century Marco Polo visited the porcelain-factories of China. In 1487 Lorenzo de' Medici received from the sultan of Egypt a present of Chinese porcelain, that being the first record we possess of the appearance of the ware in Europe. The Portuguese were the first to import porcelain direct from the East; and subsequently large quantities were brought by the Dutch and by the East India Companies of other nations. No sooner did the ware become known in Europe than strenuous efforts were put forth in many quarters to imitate it. A certain amount of porcelain is alleged to have been made in Venice about 1470; but the earliest European porcelain of which any examples exist is

that which was made by Francesco de' Medici, Grand-duke of Tuscany, about 1580. The quantity of this porcelain made appears to have been small, and it is now of great value. Nearly a century later the art was revived at Rouen and at Paris, but it was not till 1693 that a permanent and well-established industry was founded in France at St Cloud. Thereafter it was taken up in Lille and Chantilly. At Vincennes it was begun in 1745; in 1753 Louis XV. became a partner in that concern. In 1756 the works were transferred to Sèvres, and in 1760 that establishment became entirely national property; and so it has continued amid all fluctuations of government to the present day. Hard porcelain was first made at Sèvres in 1764; but the fame of that establishment rests on its soft porcelain, in which body, glaze, and enamel colours blend together into a singularly smooth and lustrous whole.

But in Europe it was in Germany that the secret of making hard or kaolinic porcelain was first discovered. After years of labour and innumerable trials, which resulted only in the production of a kind of opaque glass or stoneware, Böttger (q.v.), an alchemist who had entered the service of Frederick Augustus II. of Saxony, succeeded in 1709 in making a white hard porcelain at Meissen, near Dresden. The china-clay and china-stone he employed had previously been discovered by Schnorr at Aue. Extraordinary precautions were taken to prevent the process of the manufacture from being revealed; but, notwithstanding the oaths imposed on the workmen and the other means employed

for their supervision, the secret was betrayed by one Stölzel, who fled to Vienna, where the imperial factory was established in 1718. Subsequently factories under national protection were established at St Petersburg in 1744, at Höchst in 1746, at Berlin in 1751, and at Ludwigsburg in 1758. Works at which soft porcelain was principally made were established at Doccia near Florence in 1735, at Capo di Monte near Naples in 1743, and at Buen Retiro in Spain in 1759. The Royal Copenhagen porcelain factory was established in 1779-80, but porcelain had been previously produced in Denmark. The products of all these manufactories have attained considerable reputation.

In Great Britain, manufacturers have at all times devoted themselves principally to the making of a variety of soft porcelain. The works at Chelsea, Bow, and Derby were established about 1745, and



Fig. 24.
Dresden Candelabrum.

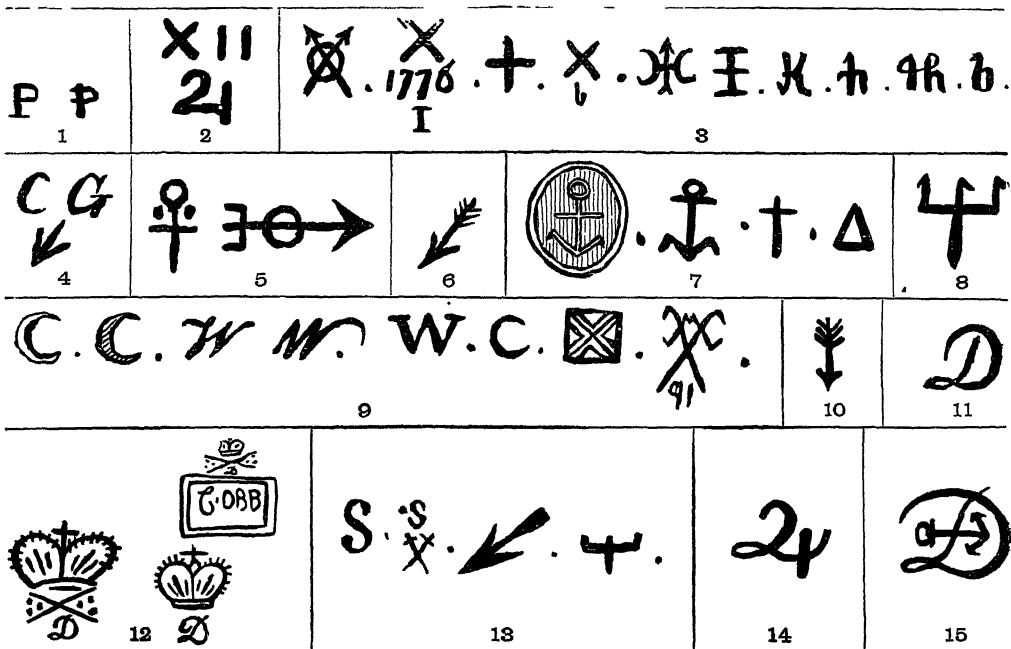


Fig. 25.—Marks on English Ware:

- (1) Pennington, Liverpool, 1760-80; (2) Plymouth, about 1760; (3) Richard Champion, Bristol, 1772-90; (4) Charles Green, Leeds, 1790; (5) Bow, 1780-90; (6) Absolon, Yarmouth, about 1790; (7) Chelsea, 1780-84; (8) Swansea, Wales, 1790; (9) Worcester, 1760-80; (10) Yarmouth, about 1790; (11) Derby, 1751-69; (12) Crown, Derby, 1780-1880; (13) Shropshire, 1772-99; (14) Cookworthy, Plymouth, 1760; (15) Derby-Chelsea, 1770.

in 1751 the manufacture began at Worcester, where it still continues. Hard porcelain-making was begun by Cookworthy at Plymouth in 1768, after he had discovered china-clay in Cornwall. But his works continued only for about three years. Cookworthy's patent rights were then transferred to Richard Champion, who continued the manufacture at Bristol till 1781. In Staffordshire porcelain was

first made at Longton Hall in 1752, but it was not till about the close of the 18th century that Staffordshire porcelain became artistically and technically fine in the hands of Thomas Minton, who founded the famous works of Minton and Company, and of Josiah Spode (afterwards Copeland and Company). In the later part of the 18th century valuable porcelain was also made at Lowestoft, Coalport,

Nantgarw, Swansea, and some other centres. The manufacture of Parian or statuary porcelain, which is an unglazed modification of English soft porcelain, was introduced by Copeland and Minton about 1846.

It is a common practice to place on pottery and porcelain distinctive marks, either painted on or stamped into the bottom of the article. These indicate either the manufactory in which the pieces were made, or the workman, and sometimes the decorator, employed on them; and in the case of Chinese and Japanese ware the marks give the dynasty or date of execution. It is only in the case of Sevres porcelain that the habit of marking a date by letters of the alphabet was practised. In Chinese pottery date-marks are found indicating that the piece was made as far back as the Han Dynasty; but there is reason to believe that many of these early marks are forged, and at most are only copies of more ancient examples which have now ceased to exist. On some pieces of early majolica the date, place, and name of the artist are given. The great European manufactories have generally marks which indicate the place of making only; but there are other means of arriving approximately at the date. The illustrations (fig. 25) show the marks employed at various important English works; but many of the manufacturers imprinted or impressed their names in full. In connection with these marks and names it should be borne in mind that it is easier to forge marks and names than it is to produce works equal to the originals imitated, the excellence and value of which causes such forgeries to be put in circulation. A vast quantity of forged porcelain is in existence.

The literature of pottery and porcelain is exceedingly voluminous. A bibliography was first attempted by Champfleury, Curator of the Museum and Library of the Sevres Manufactory: *Bibliographie Céramique: Nomenclature Analytique de toutes les publications faites en Europe et en Orient* (Paris, 1881). The bibliography was greatly extended by Solon in his elaborate work, *Ceramic Literature* (London, 1910). Among other standard works by Solon are *The Art of the Old English Potter* (1885); *The Ancient Stoneware of the Low Countries* (1892); *Old English Porcelain* (1903); *Italian Majolica* (1907). Important books more recently published are W. Burton, *History of Porcelain* (1921), Josiah Wedgwood and his Pottery (1922); M. M. Evans, *Lustre Pottery* (1920); A. L. Hetherington, *The Early Ceramic Wares of China* (1922, abridged ed. 1924); A. L. Hetherington and R. L. Hobson, *The Art of the Chinese Potter* (1924); R. L. Hobson, *British Museum: a Guide to English Pottery and Porcelain* (3d ed. 1923) and a similar *Guide to the Pottery and Porcelain of the Far East* (1924), *The Wares of the Ming Dynasty* (1923), *The Later Ceramic Wares of China* (1925); B. Rackham and H. E. Read, *English Pottery* (1924); *Pottery and Porcelain*, translated from the Danish of E. Hannover by B. Rackham, containing a comprehensive bibliography; M. J. Ballot, *Musée du Louvre: La céramique française, Bernard Palissy et les fabriques du XVI. siècle* (Paris, 1924).

Pottstown, a borough of Pennsylvania, on the Schuylkill River, at the mouth of Manatawny Creek (both crossed by bridges), 35 miles WNW. of Philadelphia. It has iron and steel works (foundries, furnaces, rolling-mills, nail-factories), car-works, &c. Pop. 17,400.

Pottsville, capital of Schuylkill county, Pennsylvania, is built on the side of steep hills, on the Schuylkill River, at the entrance of Norwegian Creek, 93 miles NW. of Philadelphia. It is in the midst of a rich anthracite and iron region, and has great steel works and other industries. Pop. 22,000.

Pot-wallopers (from *pot*, and *wallop*, 'to boil or bubble'), the popular designation of a class of electors forming the constituency of various English boroughs (e.g. Taunton, Preston) before

the Reform Act of 1832, and defined in Sir James Stephen's *Commentaries* as 'such as cook their own diet in a fireplace of their own.' At Taunton in the 18th century 'several inmates or lodgers would, some little time before the election, bring out their pots, and make fires in the street, and boil their victuals in the sight of their neighbours, that their votes be not called in question' (Defoe's *Tour through Great Britain*, 4th ed. 1748).

Pouched Mouse (*Dipodomys*), a genus of small, lean, long-tailed, agile rodents, with cheek-pouches. The best-known species is *D. philippu*, from the waste regions of California, where it seems to find a sparse diet of seeds and roots, and in the dry season no drink but dew.

Pouched Rat (*Pseudostoma* or *Geomys*), a genus of plump, short-tailed, hamster-like rodents, with cheek-pouches which open externally and are used as receptacles for food. One of the best-known species is *P.* or *G. bursarius*, sometimes called 'Gopher.' Like the other species it is a native of North America, and inhabits the territory east of the Rocky Mountains and west of the Mississippi. It is a burrower like the mole, active in the warm weather, hibernating in the cold, sluggish above ground, but very active in its subterranean progress. The cheek-pouches are very large, and are crammed with roots, seeds, &c., but not with earth as the Indians used to maintain. Being voracious gnawers, the pouched rats do much damage to the roots of trees and crops.

Poughkeepsie, capital of Dutchess county, New York, on the east bank of the Hudson River, 73 miles by rail N. of New York City, is finely situated on a tableland, about 200 feet above the river. The Hudson is here crossed by a steam-ferry, and spanned by an important railroad bridge. The city is well built. Its manufactures include moving-machines, iron-ware, clothing, &c. Two miles to the north is the Hudson River State Hospital for the Insane, and the city contains a number of charitable institutions. But Poughkeepsie has most reason to be proud of its educational facilities, the chief of which is Vassar College (q.v.). Poughkeepsie was settled by the Dutch about 1680; in 1778 it was the state capital, and in 1788 the New York Convention met here to ratify the constitution of the United States. Pop. 35,000.

Poulpe. See OCTOPUS.

Poultice, an application to diseased or painful parts, for the purpose of promoting suppuration, relieving pain, and stimulating or soothing the skin, according to circumstances. A poultice may be composed of any moist pulpy substance of sufficient consistence to retain the water without dripping or soaking through the flannel or linen covering in which it is generally applied. The making of a poultice well is a matter of some nicety, and unless the proper consistence is given to the mass the application is apt to do more harm than good. The linseed-meal poultice is the most easily made, and most satisfactory of all soothing applications. The meal is stirred gradually into a sufficient quantity of boiling water, placed in the bottom of a small basin or teacup, until a perfectly smooth pulp is formed of the proper consistence, and in quantity sufficient to cover completely, to the thickness of three-quarters of an inch, the whole pained part. The pulp is then spread on flannel, or poured into a flannel bag, and applied as soon as the heat will permit it to be borne. If it is to be applied to a wound, threatening abscess, &c., where a softening effect on the superficial tissues is desired, some antiseptic substance such as boric acid is added, and the poultice put directly in contact with the skin. If applied for pain, or

some deeper inflammation where heat is chiefly needed, the poultice should be covered with cotton-wool or several layers of flannel. It will then retain its heat longer. The bread and milk, or even bread and water or bran poultice, is also very good; as is the oatmeal-porridge poultice. Starch poultices are much used for softening and removing crusts in some skin affections. Charcoal may be used alone, or sprinkled on the surface of the poultice before it is applied, or it may be made with a non-irritating antiseptic lotion instead of plain water (e.g. corrosive sublimate, 1 to 2000). Carrot poultices are in great favour with the people in some parts of the country. Hemlock poultices, made of the fresh leaves, or of the dried leaves, with the aid of some powder of the leaves, form a valuable sedative application in painful diseases; and poppy-heads, or even opium, are sometimes infused in the water of which a poultice is made, for the same purpose. A stimulating poultice may be made by sprinkling oil of turpentine, or chloroform, or mustard in moderate quantity on the surface of any ordinary poultice. When considerable irritation of the skin in a short time is desirable, a mustard poultice is used. For the danger of poulticing the eye, see EYE.

Poultry (Fr. *poule*, 'a hen'; Lat. *pullus*, 'a chicken'; Eng. *pullet*) is the term by which are known the birds brought by man into domestication, and usually embraces the ordinary fowl, ducks, geese, turkeys, and guinea-fowl. From the time when man began to abandon his nomadic manner of life and settle down into settled habitations, poultry in one form or another have been brought into subjection, taking the place of the wild birds which, when he wandered, he was able to snare or kill, but which fled from him when he chose one abode. Only in Asia is the ordinary fowl found in a wild state, chiefly in India. Here is yet to be found the *Gallus ferrugineus*, or *G. bankiva*, which, from its resemblance in every way to the modern fowl and the freedom with which the two breed together, is accepted as the progenitor of nearly all our domesticated varieties. At one time it was thought to be the parent of all, and this was the view of Darwin; but later researches have led to a modification of this opinion; there is no wild breed of fowl to which the Brahma and Cochon type of fowl can be traced. The Jungle-fowl of India, or *G. bankiva*, has plumage and colour not very dissimilar to the game fowl, and this type prevails largely in the great dependency. From the time of the ancients poultry have been bred and kept. Many records found in the writings of early days refer to the fighting qualities of the cock, and in some countries he was bred largely, if not chiefly, for this propensity. Theognis, Aristophanes, Aristotle, Diodorus, Æschylus, Plutarch, Plato, and Pliny all make reference in their writings to the fowl, which seems to have gradually spread over Europe, being, it is supposed, brought into Britain by the Romans, since whose time it has been an important member of our domesticated animals. The fighting qualities of game fowls have always been specially studied, and Cock-fighting (q.v.) was once a recognised sport in the United Kingdom, followed by all classes of society.

Poultry are valued for two purposes: (1) for their flesh, and (2) for the eggs produced by them. In those varieties which are specially bred for the table the flesh is abundant, fine in texture, excellent in flavour, and easily digested. It enters very largely into the food-supply of the country in an ever-increasing ratio, and is strongly recommended to invalids or persons of weak digestion. Eggs (q.v.) are consumed to an even greater extent, and more generally than can ever be the case with poultry; for they are within the reach of all persons, and are

used for every form of cooking, as also largely for manufacturing purposes.

Although the breeds of poultry are not so numerous as are those of pigeons, the development of breeds since the era of poultry shows has been very great, and we have now some forty distinct varieties, several of which are again subdivided by different colours. There are about twenty varieties of ducks, seven of geese, and six of turkeys domesticated. Ducks are most prolific layers, and there is always a good demand for their eggs, especially by cooks and confectioners. The breeds of ducks valued mainly as layers are the Indian Runner and the Pekin. Those most esteemed for the table are the Aylesbury and Rouen, while the most popular dual purpose breeds are perhaps the Khaki Campbell and Buff Orpington. Fowls may be divided into four classes—viz. table breeds; laying or non-sitting breeds; general purpose breeds; and fancy or ornamental breeds.

Table Poultry.—Characterised by rapid growth, fine quality of flesh, and great breast development. **Dorkings.**—Old English breed, square bodied, white legs and feet, and five toes; four colours. **French.**—Seven varieties, all marked by large size, rich flesh, chiefly dark-legged. **Game.**—Have great breast muscles and fine flesh; not so large as the breeds already named; nearly half a score colours of game fowl may be found. **Indian Game.**—A very large breed, bred chiefly in Cornwall; beautiful in flesh quality, but darker than Dorkings or French, and heavier in bone; can be fed up to a great size. In addition to these may be named Aseels and Malays, which are good as table fowls.

Laying or Non-sitting Poultry.—In these the laying powers have been greatly developed (some varieties producing upwards of 200 eggs per annum), and the maternal instinct has been suspended by disuse. They are chiefly of the Mediterranean family, but not exclusively so. These Mediterranean varieties have large single combs, a lightish body, and include Anconas (speckled), Andalusian (blue), Leghorns or Italians (of which are ten colours), Minorcas (black), and Spanish (black with long white faces). **Hamburghs.**—Under this term are two families, the Yorkshire and Lancashire Pheasant Fowls (spangled and black), as also the Redcaps, and the Dutch (pencilled), all very beautiful, and the most prolific layers we have. **Houdans.**—Another French breed, with a crest, pale legs, and five toes. **Polish or Polled.**—Have a very large crest, are good layers, but are delicate; of these there are six colours. **Scotch Greys.**—A cuckoo-plumaged fowl, with pale legs, good flesh, and suitable for cold climates.

General Purpose Poultry.—Breeds which are not specially good in any one quality, but well balanced and good all round; chiefly of the Chinese type—i.e. heavy in leg and bone, large in size, and with high tails. **Brahmas.**—A Chinese fowl modified in Europe and America; two colours. **Orpingtons**, white, black, or buff, and **Rhode Island Reds**, a comparatively new breed of American origin, are valuable general purpose breeds. **Langshans.**—Like the Cochon, of Chinese origin; an excellent layer of eggs with buff-tinted shells, and a capital table fowl; one variety, black in plumage. **Plymouth Rocks.**—A variety of American making, cuckoo in plumage, and excellent in economic qualities. **Wyandottes.**—Also of American origin; equal as a layer and for the table; four colours. All these make excellent mothers, as do most of those in the table-poultry section, and are very hardy.

Fancy or Ornamental Poultry.—These include the breeds which are either bred alone for their beauty or peculiarity of plumage, or by reason of diminutive size are of no service for economic

purposes. They embrace the Game Bantams (six varieties), Bantams (thirteen varieties, but constantly being added to, many from China and Japan), Japanese Long-tailed, Silkies, Sultans, Frizzled, Naked Necks, Runpless, &c.

That poultry can be made profitable is undoubted, although many attempts to establish poultry-farms as such have ended in failure. Considerable profit is often made by those who breed and exhibit pure-bred poultry, whilst the advantage of having fresh egg- and home-fed poultry is sufficient inducement to many who have the opportunities of keeping a few fowls, apart from the pleasure derived from them. Poultry can be kept under many conditions, and have been found to thrive in the most unlikely places, but all their wants must be artificially supplied. To maintain them in health they should have a house dry above and below, with 16 square feet of floor space for every half-dozen fowls of the medium-sized varieties, an outside shelter in which is placed a dust bath, this being the way in which their skin and feathers are cleansed, and an open run without. If they can be given full liberty it is all the better, for which reason movable houses placed out in fields or parks are the best; but often it is impossible to do this, and then not less than 6 square feet of ground should be allowed to each fowl if the run is laid in gravel or sand, or 100 square feet per bird if in grass, or it will all be eaten off and the ground left bare. Absolute cleanliness is essential for them in houses, nests, and runs, and the ground should be changed every two or three years, or it is liable to become foul from the richness of their manure. Fowls naturally eat grain, slugs, worms, &c., and, if the latter are not obtainable in the ground by them, some substitute must be provided. For laying birds it is found that soft food is very beneficial, and it should be given in the morning, with hard corn in the later part of the day. Sitting hens should be provided for apart from other stock, as they require to be in a quiet place. The time of incubation is twenty-one days. When the brood has made its appearance the hen and chickens should be placed out in a coop, and the latter fed every two hours for the first fortnight, every three hours for the next two weeks, and after that four times a day until they reach maturity. Artificial incubation and brooding are very largely adopted by poultry-breeders, and have been brought to a remarkable state of perfection, the machines now sold working with great regularity and precision (see INCUBATION). The advantage of incubators is that they can be used at any period of the year, and are not dependent upon the weather, as is the case with hens. There are now innumerable varieties of incubators on the market, mostly of British and American manufacture. This plan of working is largely employed in France and America. Poultry are polygamous, and from four to ten hens should be placed with each cock bird, according to breed and the season of the year.

Poultry-farming.—Many attempts have been made to establish poultry-farms, but they have often ended in failure, and it has come to be widely believed that poultry will not pay. The reasons for this failure have been twofold: first, that the amount of space necessary to keep the fowls in health when in large numbers, and the consequent increase in labour, were too heavy charges against the enterprise; and second, the placing of a large number of birds together, under conditions which were unhealthy, induced disease, and so ruined the scheme. The great mistake has been made in attempting poultry-farming as a separate industry, rather than as part of a larger enterprise. Where it can be grafted upon other work, an addition to the business of farming or fruit-growing, it can

be, and has been, made successful in several notable instances. In these there is no separate charge for land; the labour is not on account of it alone; a large portion of the food needed by the fowls is obtained by themselves from the ground, and such as is given is at the first cost; the produce can generally be sold with what other is going to market, and especially if dairying or fruit-growing be also entered into, those who purchase milk or butter or fruit being generally willing to buy the eggs and chickens; and, finally, the land is enriched by the manure of the fowls, whilst its employment for other purposes will prevent its becoming foul, the great danger when only poultry are kept on the land, for disease is speedily induced by foul ground. The force of events during recent years has compelled many British farmers to take up what were at one time regarded as minor pursuits, and branches of farming which in themselves are not sufficient to give a living—for which reason they were neglected for larger things—have received attention. Or, as it has been expressed, 'commercial poultry will only pay as an accessory to something else, whether it be a farm or a household—to eat scraps which would otherwise be wasted . . . and to give to the land, in the shape of manure, properties which cannot otherwise be obtained except by a heavy outlay.' When we look to France, where poultry are bred to such an enormous extent, we find that poultry-farms as such have no existence, but that fowls are kept by every farmer and cottager. The same remarks apply to Italy, Denmark, and Ireland, from all of which countries England receives large supplies of eggs and poultry. In the wine districts of France fowls are permitted to wander amongst the vines all the year round, except just when the fruit is forming, and they do a most serviceable work in cleaning and manuring the ground. The poultry houses are placed in the vineyards, and in many cases are made sufficiently narrow to pass between the rows of plants.

In France, in the Surrey and Sussex districts of England, and also at Aylesbury, where so many ducks are fattened every year, systems of fattening are extensively carried on, but as a rule, in France especially, those who rear the birds do not fatten. Fattening is a business by itself, birds being purchased from the breeders when about eight weeks old. They are put into pens and fattened for a period varying from three to ten weeks, either by hand or with machines. Some of the latter are very elaborate, but as a rule they are simple. The head of the fowl is held in the left hand, and a brass nozzle, attached to a piece of india-rubber tubing, and connected with a cylinder, is inserted into the mouth of the bird. In this cylinder is a supply of liquid food, made of buckwheat or some other meal, milk, and a little fat, and it is so arranged that when a pedal is pressed by the foot a portion of the food, varying according to the stage of fattening—for it is increased in quantity each day until the process is completed—is injected through the tube and nozzle into the bird's crop. By this means the fattening is carefully and skilfully conducted, and there can be no doubt of the result, as every one who has tasted a well-fattened French fowl will be able to testify. In the La Bresse, Le Mans, and La Sarthe districts of France the number of fowls fattened every year is enormous, and the best specimens realise very high prices. The flesh is beautifully tender and white, and much more abundant than would be possible on an unfattened fowl. In Surrey and Sussex the method adopted is somewhat different, in that the birds are either fed by hand or with heavy crank cramming-machines, powerful enough to force semi-liquid food into the crop of the fowl.

Here the process does not last more than three weeks. When the birds are killed they are immediately plucked, and placed, before they become quite cold, on shaping boards, so made as to give them the best appearance. In Ireland there is very little fattening carried on, and consequently the poultry from that country are poor and sell at about the lowest price on the English market.

Where poultry are kept in large numbers the best method of housing is by means of movable or portable dwellings, for these can be transferred about from place to place, giving the fowls fresh ground and distributing their manure, which is very valuable indeed, over the land. Under no circumstances should more than fifty be kept in one flock; and it will be found in practice that they will not wander far from their home, or mix with each other, even if the houses be placed in adjoining fields. The ordinary methods of management are applicable here. There can be no question that the increase in the size of farms, which has taken place within the last half of the 19th century, has done much to discourage poultry-keeping, and the opposite tendency ought to have a reactive effect (see *PEASANT PROPRIETORS*). Much might be done in the way of encouraging poultry-keeping by cottagers, who could maintain them with the minimum of cost and the maximum of results. A very important factor in successful poultry-keeping is the selection of right breeds, and it is essential that the produce should be marketed as speedily as possible. An egg two days old is worth twice as much as when two weeks laid, a fact which should always be borne in mind, but is too often forgotten. In the great cities and densely populated districts there is a constant demand for fresh eggs, and at high prices. To secure the best returns all eggs and poultry should be sent to market clean, well packed, and in the best possible condition. The supply of the commoner varieties of poultry produce is very large, and the prices obtained are consequently small, but there is no limit to the demand for high-class qualities at remunerative figures.

See *Wright's Book of Poultry* (ed. by Lewer); *The Encyclopedia of Poultry* (ed. by J. T. Brown); also numerous popular works. See also *ARTICLES, DUCK, GOOSE, GUINEA FOWL, TURKEY, EGG, FOOD, INCUBATION, &c.*

Pounce, powdered rosin, or some gum-resin such as mastic, sandarach, or copal, and also the powder of cuttle-fish bones, formerly used for sprinkling over freshly-written writing to prevent blotting; fine sand was often substituted for pounce.

Pound (Old Eng. *pund*, Ger. *pfund*, Lat. *pondus*, 'weight'), long the unit of weight in the western and central states of Europe, differing, however, in value in all of them. The symbol 'lb.' for it is equally general, and is derived from the Latin word *libra*. The old English pound, which is said to have been the standard of weight from the time of William the Conqueror till that of Henry VII., was derived from the weight of 7680 grains of wheat, all taken from the middle of the ear, and well dried. For the difference between the present avoirdupois and troy pound, see *AVOIRDUPOIS, WEIGHTS AND MEASURES*. In the British Pharmacopœia of 1864 the troy ounce was given up, and the pound avoirdupois and the ounce avoirdupois were adopted. See also *LIVRE, MARK*.

The pound weight of silver, a common money standard among the ancient Romans, was introduced by them into the countries they conquered, and thus the term 'pound' became a designation of a certain amount of coined money. Thus, nowadays, the English pound is considered as something (a coin or otherwise) equivalent to 20

shillings, but originally it denoted the pound of silver which was coined into 20 shillings. From Edward I.'s time the coins were more and more diminished in size, that monarch coining 25 shillings from a pound of silver; while from the same weight of bullion his various successors coined 30, 45, 48, 96, 144, 288, in the time of Elizabeth 60, and under George I. 66 shillings to the pound of silver, and this rate still continues, the term 'pound' being severed from its original meaning, and signifying 20 shillings of the present coinage. The sovereign of gold was first struck under Henry VII.; its value rose to as much as 30 shillings; under Charles II. it was fixed at 21 shillings, and the sovereign was superseded by the Guinea (q.v.) till 1817 (see *MONEY, MINT*). The pound Scots, originally of the same value as the English one, sank in value after 1355 till in 1600 it was but one-twelfth of the value of the English pound, and was accordingly worth 1s. 8d.; it was divided into twenty shillings, each worth an English penny. The Treaty of Union provided that the money thereafter used should be of the same standard and fineness throughout the United Kingdom.

Pound, in English law, means an enclosure, of which there was generally one in every parish or manor, in which stray cattle were put and detained until the damage done by them was paid for. Whenever a stranger's or neighbour's cattle trespass on another's lands the latter can seize them, and take them to the pound, or impound them, as it is called, *damage feasant*, and can keep them there till the expenses are repaid. There was a distinction between pound overt, or common pound, and pound covert, or close pound; in the former case the owner of the beasts could go and feed and water his cattle while impounded, and it was his duty to do so; but not in the latter case. Now it is compulsory for the impounder in all cases to supply the cattle with food, otherwise he incurs a penalty; and if impounded cattle are not sufficiently fed a stranger who feeds them may not only trespass on lands to do so, but can recover the costs from the owner of the beasts. Goods distrained, if liable to be stolen or damaged, should be deposited in pound covert. At Madresfield, near Malvern, a public pound was repaired so recently as 1888; but practically they are quite obsolete, since the law now permits a person distraining for rent to secure the distress on the premises (see *DISTRESS*). In the United States estrays are generally liable to be sold for the benefit of the poor of the place where they are found, or for some other public use.

Pound, EZRA, American poet, was born at Hailey, Idaho, in 1885, but has lived in England since 1909. His published work includes *Personæ* (1909), *Exultations* (1909), and *Lustra* (1917). His best work reveals a striking originality of thought and expression, that is apt, however, to degenerate into technical eccentricity. The revolutionary becomes absorbed in problems of metrie, and inspiration runs to seed.

Poundal, a name sometimes used for the absolute foot-pound-second unit of force, which will produce in one pound a velocity of one foot per second, after acting for one second.

Pounds, JOHN. See *RAGGED SCHOOLS*.

Poushkin. See *PUSHKIN*.

Poussin, NICOLAS, a painter of great celebrity, was born at Les Andelys in Normandy in June 1594, went at the age of eighteen to Paris, and studied under Ferdinand Elle, the Fleming, Lallemand, and others, but chiefly improved himself by drawing from casts, and drawings and prints after Raphael and Giulio Romano, in the collection of

M. Courtois, who accorded him access to them. After a long and hard struggle he attained the object of his desire—the means of visiting Rome. He was thirty years of age when he arrived there, and a considerable period elapsed after that before he obtained much employment. At length, however, he received several important commissions from the Cardinal Barberini, which he executed so successfully that he afterwards rapidly acquired fame and fortune. After an absence of sixteen years he returned to Paris with M. de Chanteloup, and was introduced by Cardinal Richelieu to Louis XIII., who appointed him his painter in ordinary, with apartments in the Tuileries and a small salary. But in 1643, annoyed by intrigues against him, he returned to Rome; and there, after producing a large quantity of admirable work, he died on 19th November 1665. His style is a combination of classical ideals and Renaissance tendencies; his colours have changed so as to interfere with the harmony of his pictures, whose noble designs may be admirably studied in the numerous engravings of them. The finest collection of his works is in the Louvre; but some of the best are in the National Gallery, at Dulwich, and in English private collections.—His nephew, Gaspar Dughet (1613–1675), assumed his uncle's name, and as GASPARD POUSSIN became famous as a landscapist, his renderings of the Roman Campagna being especially noted. He worked also in tempera and fresco.

See works on Nicolas Poussin by St Germain, Bouchitté (1858), Poillon (2d ed. 1875), Emile Magne (1914), and Mrs Sutor (1923).

Pout. See BIB. The names Horned Pout and Bullpout are given in America to the siluroid *Amiurus*, also called Catfish (q.v.).

Poverty Bay. See GISBORNE.

Powan (*Coregonus clupeoides*), or Freshwater Herring, a species of 'Whitefish' inhabiting Loch Lomond and Loch Eck. See COREGONUS, GWYNIAD, POLLAN, VENDAGE.

Powell, BADEN, physicist and theologian, was born in London in 1796, was educated at Oriel College, Oxford, in 1821 became vicar of Plumstead, and in 1824 was made F.R.S. From 1827 till his death, 11th June 1860, he was Savilian professor of Geometry at Oxford. He published a history of natural philosophy (1834), treatises on the calculus (1830), optics (1833), and the undulatory theory of light (1841); but he is best known by his contribution to the *Essays and Reviews* (q.v.), and by other theological works, then regarded as dangerously 'liberal'—such as *Essays on the Plurality of Worlds* (1856), *Christianity without Judaism* (1857), *Natural and Divine Truth* (1857), and *The Order of Nature* (1859).—His son, SIR ROBERT STEPHENSON SMYTH BADEN-POWELL, Bt. (1922), born 22d February 1857, was educated at Charterhouse. He joined the 13th Hussars in 1876, and served in India, Afghanistan, South Africa, Ashanti, and Matabeleland, and was promoted in 1897 to the command of the 5th Dragoon Guards. In the Transvaal war he held the town of Mafeking successfully against the Boers from 12th October 1899 to 18th May 1900; and in quite an exceptional degree was himself the inspiration and mainspring of the defence. Besides being ranked amongst national and popular heroes, he was created a lieutenant-general, and was inspector of cavalry in 1903–7, and retired in 1910. His forte is scouting, on which he has published several brilliant pamphlets, as well as on his campaigns, cavalry instruction, and pig-sticking. He founded the Boy Scouts (q.v.).

Powell, JOHN WESLEY (1834–1902), geologist, was born at Mount Morris in New York State, and

became major in the civil war. He was afterwards professor of Geology in Illinois; in 1868 explored the cañon of the Colorado; in 1879 he was made director of the new Bureau of Ethnology; and in 1881 he was appointed also director of the United States Geological Survey. His works include *Exploration of the Colorado River* (1875), *The Arid Region of the United States* (1879), and *Contributions to North American Ethnology*.

Powell, MARY. See MILTON.

Power is a legal term, to some extent identical in meaning with such terms as liberty, faculty, &c. A public officer is empowered to do certain acts which are not permitted to private persons. An individual, not under disability, has power to bind himself by contract, and to dispose of his property: if he chooses to settle his property he may effect the purposes of the settlement by conferring powers on himself and others; he may, for example, reserve to himself a power of revocation; he may give power to a person who takes a life interest to charge the inheritance with portions for daughters, &c. Powers of appointment are commonly used in English settlements to enable parents to appoint or distribute settled property among their children. Such powers must be exercised in good faith, and with the forms prescribed by the settler who confers them. A power of attorney is a deed whereby one person appoints another to do some act on his behalf or to represent him generally. A, for example, may make B his attorney, to manage his estate and receive the rents during A's absence abroad. Forms of such powers are given in Davidson, Prideaux, and other books of precedents; the difficult legal questions which arise in regard to powers over settled property are discussed in the treatises of Sugden and Farwell.

Power. For the Mechanical Powers, see MECHANICS; and for various motive powers, see AIR-ENGINE, DYNAMO-ELECTRIC MACHINES, INTERNAL-COMBUSTION ENGINES, STEAM, PNEUMATIC DESPATCH, FUEL, &c.; see also HORSE-POWER, TRANSMISSION OF POWER. For the 'Great Powers' of the world, see BALANCE OF POWER.

Powers, HIRAM, American sculptor, was born a farmer's son at Woodstock, Vermont, July 29, 1805. While still a boy he went to Cincinnati, Ohio, where he became an apprentice to a clock-maker, and about the same time formed the acquaintance of a German sculptor, who taught him to model in clay. Subsequently he was employed for seven years making wax figures and fitting them with machinery for the Cincinnati museum. In 1835 he went to Washington, where he executed the busts of several distinguished persons. Two years later he was enabled to proceed to Italy to study his art, and he resided in Florence till his death on 27th June 1873. There he produced his statue of 'Eve,' which excited the admiration of Thorwaldsen, and in 1843 the still more popular 'Greek Slave,' of which six copies in marble, with cast copies innumerable, were produced. Of his 'Fisher Boy' (1846) three copies were ordered. Among his other works the chief were 'Proserpine,' 'Il Penseroso,' 'California,' 'America,' and busts of Washington for the state of Louisiana, of Calhoun for South Carolina, and Daniel Webster for Boston, as well as those of J. Q. Adams, Andrew Jackson, Marshall, Van Buren, and other distinguished Americans.

Powhatan. See POCAHONTAS.

Powis Castle. See WELSHPOOL.

Poynings' Act. See IRELAND.

Poynter, SIR EDWARD JOHN, President of the Royal Academy, was born in Paris, 20th March

1836, the son of Ambrose Poynter, architect, and great-grandson of Thomas Banks, sculptor, R.A. He was educated at Westminster and Ipswich grammar-school. The winter of 1853-54 was spent in Rome, where he made the acquaintance of Frederick Leighton, then a young man painting his picture of 'Cimabue,' who allowed Poynter to work in his studio, drawing from the models and drapery from which he was studying for his picture. In 1856 he went to study in Paris, and in 1860 settled finally in London. In 1868 he was made an A.R.A., in 1876 an R.A. In 1871 he was appointed Slade professor, and in 1876 Director for Art and Principal of the training-schools at South Kensington—appointments which in 1881 he resigned as interfering too seriously with his time for painting. From 1896, when he was knighted, to 1918 he was P.R.A., and in 1902 he was made a baronet. He died 26th July 1919. Poynter's output was a large one, including water-colours, portraits, designs for the coinage (1894), and cartoons for mosaics in the Houses of Parliament (1869-70), and for decorations in St Paul's (1882-84). His best known pictures are 'Israel in Egypt' (1866), 'The Catapult' (1868), 'Visit to Æsculapius' (1880), and the series of canvases painted (1872-79) for the Earl of Wharncliffe and now at Wootley Hall. While he was Director at South Kensington, he published a volume of Lectures on Art. Poynter was the last representative of the 19th-century classic movement in painting, which reached its climax with Leighton. This classicism is manifest not only in the choice of Greek and Roman subjects, but also in the monumental and sculpturesque feeling for design. Though it is a style of painting that is always dignified, it is apt to lose its freshness and become conventional.

Poznań. See POSEN.

Pozzo di Borgo, CARLO ANDREA, COUNT, was born near Ajaccio in Corsica, 8th March 1764, and was educated at the university of Pisa. An advocate in Ajaccio, in 1790 he joined Paoli (q.v.), becoming thenceforth the enemy instead of the friend of Bonaparte. Paoli made him president of the Corsican council of state in 1794, and subsequently secretary of state; but in 1796 he was obliged to seek safety from the Bonapartes in London. Two years later he went to Vienna and effected an alliance of Austria and Russia against France. In 1803 he entered the Russian service as a councillor of state, and was employed in many important diplomatic missions. After the battle of Jena he laboured to unite Napoleon's enemies against him, and again in 1809 and 1812. He also effected the seduction of Bernadotte, crown-prince of Sweden, from the Napoleonic cause; and after the allies had driven Napoleon across the Rhine, Pozzo di Borgo drew up the famous declaration, 'that the allies made war not on France, but on Napoleon.' It was he who urged the allies to march on Paris. He represented Russia at Paris and the Congress of Vienna, at the Congress of Verona, and in London, but retired from public life in 1839, and settled in Paris, where he died, 15th February 1842. See *Notice Biographique* by Vuhrer (Paris, 1842).

Pozzuoli, a city of Southern Italy, on the Bay of Naples, 6 miles W. of Naples, with which it is connected by railway. Its cathedral is built into the Temple of Augustus. The market-hall, generally called the Temple of Serapis or Serapeum, had a rectangular colonnade of thirty-six pillars, surrounding a round temple with sixteen pillars. Some have alleged that the outer enclosure surrounded a market-place. Some of the pillars still standing are much eaten into by the lithodromus mollusc

(see BORING ANIMALS), showing that this volcanic coast was for a considerable time submerged to a depth of 13 feet beneath the sea, and subsequently upheaved again. Part of the ruins are still under the sea-level. There are the remains of two amphitheatres, in one of which Nero fought as a gladiator, and which could seat 30,000 spectators; in it wild beasts refused to injure St Januarius and his companions, thrown to them by persecutors. There are also remains of a circus, tombs, villas, &c., and of the ancient harbour of Puteoli. Behind the town is the Solfatara (anciently called *Forum Vulcani*, as being the entrance to Vulcan's forge), a half-extinct volcano, from which issue currents of hot sulphureous gases, inhaled by sufferers with chest complaints, and springs of saline water, used as a remedy for cutaneous diseases. In the neighbourhood are Avernus (q.v.); the royal hunting-lodge Astroni; Lake Lucrinus, celebrated for its oysters; the ruins of Baïæ (q.v.) and Cumæ (q.v.); and the Grotta del Cane (q.v.). Of a very different interest are the military engineering works, the Stabilimento Armstrong, a little to the west of Pozzuoli; this is a branch of the famous Armstrong works at Elswick, near Newcastle, established here (1888-90) with the support of the Italian government. Pop. 24,000. The ancient *Puteoli* probably founded by a colony of Samians in 520 B.C. under the name of Dicæarchia, seems to have come under Roman domination in 334 B.C., and was made a Roman colony in 194 B.C. Towards the end of the republican period it became, like Ostia, mainly a port of Rome, and during the empire it was the first emporium of commerce in Italy. St Paul landed here in 61 A.D. See Dubois, *Pozzuolos antique*, Paris, 1907. Puteoli was destroyed by Alaric, Genserik, and Totila, and, though rebuilt by the Byzantine Greeks, it was sacked by the Saracens (10th century) and the Turks (1550), and ruined by earthquakes (1198 and 1538).—For the volcanic earth found here and elsewhere, and called *Pozzuolana* or *Puzzolana*, see CEMENTS.

Practice, in Arithmetic, is the name given to a method, or rather a system of expedients, for shortening or avoiding the operation of compound multiplication. The nature of the expedients will be best understood by an example: Suppose that the price of 64,875 articles at £2, 17s. 6d. is required. It is obvious that the price, at £1, would be £64,875; therefore, at £2, it is £129,750; at 10s. it is the half of that at £1, viz. £32,437, 10s.; at 5s., the half of this last sum, or £16,218, 15s.; and at 2s. 6d., the half of this, or £8109, 7s. 6d. The sum of these partial prices gives the whole price.

Prado, a famous street and picture gallery in Madrid (q.v.).

Praed, WINTHROP MACKWORTH (1802-39), was born 26th July 1802, at 35 John Street, Bedford Row, London. His name Winthrop came from American connections; Mackworth had been the surname of his father, who was a serjeant-at-law. After some training at a private school he went to Eton. Here he was more famous for literature than athletics, and was one of the most brilliant contributors to the well known *Etonian*. From Eton he passed in 1821 to Trinity College, Cambridge, distinguishing himself rapidly in Greek and Latin verse, and cultivating the lighter letters with increased success in Charles Knight's *Quarterly Magazine*, where he had for co-mates De Quincey, Macaulay, Moultrie, H. N. Coleridge, and others. In 1825, having won many college honours, he became tutor to the son of the Marquis of Ailesbury, intending to qualify for the bar, to which four years later he was called. In November 1830

he entered parliament for St Germain's. He subsequently became member for Great Yarmouth, and later for Aylesbury, which he represented at his death on 15th July 1839. From 1834 to 1835 he was secretary to the Board of Control.

But for his short life Præd might possibly have been successful as an orator and politician. As it is, he derives his existing reputation from the finished and facile verses which he wrote almost from his childhood. He is the Coryphæus of the little band of rhymers whom criticism, according to its taste and fancy, either dignifies or stigmatises as writers of *vers de société*—a term in its stricter sense applied to those pieces which treat only of the sayings and doings of the fashionable world. The majority of Præd's efforts belong exclusively to this class; and in this line his note is so individual, his rhythm so brilliant, and his wit so bright, that it has hitherto been found more easy to imitate than to excel him. A typical example of this side of his talent is the poem called *A Letter of Advice*. But he is also admirable in a kind of metrical *genre-peinture*—e.g. *The Vicar*, which, in the opinion of many, reaches a higher poetical elevation; while in *The Red Fisherman*, *Sir Nicholas*, and one or two other pieces, he not unskillfully emulates the manner of Macaulay and Hood. His characteristics as a verse-writer are point, elegance, and vivacity; it is his defect that these excellent gifts are but seldom relieved by any graver note. His collected verses, popular in America long before they were gathered together in England, appeared in 1864 in two volumes, with a memoir by the Rev. Derwent Coleridge; in 1887 followed his prose essays; and in 1888 his nephew, Sir George Young, edited his political poems. The best modern study of Præd is to be found in Saintsbury's *Essays in English Literature* (1890).

Præfect, a common name applicable to various Roman functionaries. The most important was the *Præfectus urbi*, or warden of the city, whose office existed at an early period of Roman history; but was revived under Augustus, with new and greatly altered and extended authority, including the whole powers necessary for the maintenance of peace and order in the city, and an extensive jurisdiction civil and criminal. The *Præfectus prætorio* was the commander of the troops that guarded the emperor's person.

Præfloration. See *ÆSTIVATION*.

Præfoliation. See *VERNATION*.

Præmonstratensians. See *PREMONSTRATIENSIS*.

Præmunire, the name given, in English law, to a species of offence of the nature of a contempt against the sovereign and his government, and punishable with forfeiture and imprisonment. The name is derived from the first words (*præmunire* or *præmonere facias*) of a writ originally introduced for the purpose of repressing papal encroachments on the power of the crown. The attacks of the popes on the rights of private patrons, by bestowing bishoprics, abbacies, &c., on favourites, often aliens, and the pope's insisting on deciding in his curia cases that ought to have been tried in the king's courts, were especially unpopular in England, and were the immediate cause of various statutes of præmunire. Severe penalties were imposed on those who gave or sought to enforce obedience to the papal encroachments. The Statute of Provisors (1350; see *ENGLAND, CHURCH OF*) was an early act of this sort; the first act called Præmunire was passed in 1353; but the name of Præmunire is specially used of an act of 1393, in which Richard II. re-enacted and strengthened the statute of Edward III. Under Elizabeth it was made a breach of the Statute of

Præmunire to refuse the oath of supremacy. By later statutes a number of offences of a miscellaneous description were rendered liable to the penalties of a præmunire, as (by 6 Anne, chap. 7) the asserting that any person, other than according to the Acts of Settlement and Union, has any right to the throne of these kingdoms. The knowingly and wilfully solemnising, assisting, or being present at any marriage forbidden by the Royal Marriage Act is declared by Geo. III. chap. 11 to infer a præmunire.

Præneste. See *PALESTRINA*.

Prætor was, among the ancient Romans, the title given to the consuls as leaders of the armies of the state; but it was specially employed to designate a magistrate whose powers were scarcely inferior to those of a consul. The prætorship, in this specific sense of the term, was first instituted in 366 B.C., as a compensation to the patricians for being obliged to share with the plebeians the honours of consulship. It was virtually a third consulship; the prætor was entitled *collega consulibus*; he was elected by the same auspices and at the same comitia. For nearly thirty years patricians alone were eligible for the office; but in 337 B.C. the plebeians made good their right to it also. The prætor's functions were chiefly judicial. Though he sometimes commanded armies, and, in the absence of the consuls, exercised consular authority within the city, yet his principal business was the administration of justice both in matters civil and criminal; and to the edicts of successive prætors the Roman law owes much of its development and improvement. Originally there was only one prætor; but as the city and state increased, and their relations with other nations became more complicated, others were added. In 246 B.C. a second prætor was appointed, to settle disputes that might arise between Romans and foreigners temporarily resident at Rome, for trading or other purposes, hence called *prætor peregrinus* ('foreign prætor'), to distinguish him from the original *prætor urbanus* ('city prætor'). In 227 two new prætors were appointed, to administer affairs in Sicily and Sardinia; and in 197 two more for the Spanish provinces, or six in all. Sulla increased the number to eight, and Julius Cæsar to sixteen. Augustus reduced the number to twelve; but at a later period we read of eighteen, if not more. The city prætorship was reckoned the highest; and after a person had filled this office he sometimes received the administration of a province with the title of *proprætor* or *proconsul*.

Prætorian Guard (Lat. *Prætorie Cohortes* and *Prætoriani*), a body of soldiers organised for the purpose of protecting the person and maintaining the power of the emperors. We read of a *prætorie cohors*, or select guard of the most valiant soldiers, attached to the person of Scipio Africanus, but it is to Augustus that the institution of them as a separate force was owing. He formed nine or ten cohorts, each consisting of a thousand men (horse and foot), but kept only three of them in Rome, the rest being dispersed in cities not far off. Tiberius, however, assembled the nine cohorts at the capital in a permanent camp, and Vitellius increased their number to sixteen. The Prætorians served at first for twelve, and afterwards for sixteen years; they received double pay; the privates were held equal in rank to the centurions in the regular army, and on their retirement each received 20,000 sesterces. They soon acquired a dangerous power, which they exercised in the most unscrupulous manner, deposing and elevating emperors at their pleasure. Aspirants for the imperial dignity found it advisable, and even necessary, to bribe them largely; while those who acquired that dig-

nity without their assistance were accustomed on their accession to purchase their favour by liberal donations. The Prætorians, however, had no political or ambitious views; they were simply an insolent and rapacious soldiery, fond of substantial gratifications, and careless how they got them. After the death of Pertinax (193 A.D.) they actually sold 'the purple' for a sum of money to Didius Julianus; but in the same year their peculiar organisation was entirely broken up by Severus, who formed new cohorts altogether out of the best legions serving on the frontiers, which he increased to four times the number of the old. After several other changes Constantine (312) dispersed them among his regular legions.

Pragmatic Sanction (sometimes *Pragmatic Rescript*), a solemn ordinance or decree of the head of a kingdom relating either to church or state affairs. The term originated in the Byzantine empire, and signified a public and solemn decree by a prince (*pragmatikos*, 'business-like,' later, 'versed in affairs,' 'official'), as distinguished from the simple rescript, which was a declaration of law in answer to a question propounded by an individual. This name is given to several important treaties, of which the principal are (1) that of Charles VII. of France, issued at Bourges in 1437, in which the rights of the Gallican Church (q.v.) were asserted; (2) the instrument which settled the empire of Germany in the House of Austria (1439); (3) the ordinance by which Charles VI., German emperor, having no male issue, settled his dominions on his daughter, the Archduchess Maria Theresa; (4) the settlement of the succession of the kingdom of Naples, which was ceded by Charles III. of Spain, in 1759, to his third son and his descendants.

Pragmatism. William James tells us in his *Pragmatism* (p. 46) that this term 'was first introduced into philosophy by Mr Charles Peirce in 1878. In an article entitled "How to Make our Ideas Clear" . . . Mr Peirce, after pointing out that our beliefs are really rules for action, said that, to develop a thought's meaning, we need only determine what conduct it is fitted to produce.' There is no thought-distinction so fine 'as to consist in anything but a possible difference of practice. To attain perfect clearness in our thoughts of an object, then, we need only consider what conceivable effects of a practical kind the object may involve—what sensations we are to expect from it, and what reactions we must prepare.' 'This is the principle of Peirce, the principle of pragmatism.' But the principle attracted no notice until James himself, in 1898, brought it forward again in an address entitled 'Philosophical Conceptions and Practical Results,' and this date may therefore be taken as the beginning of the pragmatist movement. Between this date and the publication in 1907 of James's own book *Pragmatism*, papers and books by Dewey, Schiller, and others had been published in which pragmatist views were developed and illustrated, and James was always anxious to give these writers full credit for their contributions to the common cause. But they themselves recognise James as the source of their inspiration, and in any case there can be no question that James is the outstanding representative and exponent of pragmatism to the world at large. For this pre-eminence there are several reasons. He had already made a great name for himself by his *Principles of Psychology* (1890); he had a marvellous gift for vivid and telling exposition; but above all he exemplifies so well in his own philosophical discussions the spirit of pragmatism itself. He is always trying to drive straight at the real or important issues, is impatient of merely verbal dis-

putes and the minor points of controversy, ready, on the other hand, to accommodate himself and his formulæ as much as he can to his opponent's point of view. Hence it is his exposition of pragmatism that must in the main be taken as the standard one.

Pragmatism is primarily a *method*. It consists in trying to interpret every scientific or philosophical notion by tracing its 'practical consequences.' 'What difference would it practically make to any one if this notion rather than that notion were true? . . . Whenever a dispute is serious, we ought to be able to show some practical difference that must follow from one side or the other's being right.' James elsewhere explains that by 'practical' he means 'particular' or 'concrete' and not merely 'utilitarian'; and this is important, because much controversy has turned upon this very point of the wider or narrower meaning of the term practical in the definition of pragmatism. In the narrower sense of the term no one would expect, e.g., to make any practical use of the difference between the physics of Einstein and of Newton, but in the wider sense of the term the difference has practical consequences, if it sets men of science upon making astronomical observations, and still more if these observations reveal facts which agree with the one theory and not with the other. Again, when James speaks of bringing out the 'practical cash-value' of a notion, he immediately explains his meaning by saying you must 'set it at work within the stream of your experience.' The pragmatic test of a theological notion would be to ask what significance it has for religious experience, of a scientific theory to ask how far it compels men of science to take account of it, to undertake new experiments and investigations. So far as pragmatism is simply a method, it of course does not guarantee any particular results. Just as historians may use the same historical method and yet arrive at different conclusions, so philosophers may use the same pragmatic method without agreeing in their metaphysical conclusions. The method as a method, at any rate, must not be saddled with the metaphysics to which any one thinker is led by using it. Hence James is careful to explain (*Meaning of Truth*, Preface and p. 220) that the metaphysical views of himself and his fellow-pragmatists Dewey and Schiller—his own Radical Empiricism, for instance—go beyond the common ground of their pragmatism proper.

On the other hand, the pragmatic method is taken to involve a common *doctrine as to the nature of truth*. If every idea is to be construed in the light of its consequences, these consequences will also determine whether it is true or false. Suppose that I have the idea that the right-hand branch of a road leads to a certain village, the idea will be true if by taking that branch I actually arrive there. As a well-known formula says, an idea is true in so far as it 'works.' 'True ideas are those that we can assimilate, validate, corroborate and verify. False ideas are those that we cannot' (*Pragmatism*, p. 201). There is an obvious objection to our example. Why, it may be urged, do you say that the idea *will be* true? Surely if it is true at all it is true already, whether you continue your walk or not. Now, of course, it would be true already in the mind of a native of the district; but if I am only putting it forward as a tentative suggestion, it will not be a truth in my mind until I have actually verified it by continuing my walk or looking at a map or inquiring from some one who knows already. But it is precisely of truth *experienced as such* that the pragmatist is talking. With a truth that is not experienced by anybody, that simply 'obtains' and is a sort of 'spiritual double' of the facts, he will have nothing to do.

To assume a truth of this sort, 'a stagnant property inherent in the idea,' or 'an inert static relation' between the idea and its object, is anathema to the pragmatist. It is the essence of what he calls 'intellectualism,' and this vice of thought he denounces at every opportunity. Unfortunately he does not always exercise sufficient care in verifying the actual presence of the vice, and by his rather indiscriminate denunciations becomes himself responsible for a good deal of misunderstanding. It is almost obvious, for instance, that between pragmatism broadly interpreted and what is called the 'coherence' theory of truth there can be no serious quarrel. Yet nobody is more freely denounced by the pragmatists than Bradley: in their dislike of the metaphysics to which his logic led him they seem to lose sight of the kinship between his logic and their own. Their real enemy is rather to be found in the kind of logic which asserts that 'there is no problem at all in truth and falsehood; some propositions are true and some false, just as some roses are red and some white' (B. Russell).

When we set an idea to work in order to ascertain its truth, and when we find by trial that it succeeds or fails, we evidently presuppose some sort of reality or material whose acceptance of, or resistance to, the idea decides the success or failure of its working. The idea has to measure itself against the relevant facts of experience which have already established themselves or are assumed without question. The detective who is trying to work out a theory of a crime must make his theory square with the admitted facts of the case and the acknowledged results of medical science. The pragmatist, as James points out, can quite well speak of truth as consisting of the agreement of the idea with the facts or with reality, provided we understand the agreement in such a sense. 'Reality' is indeed an essential presupposition of the pragmatist's doctrine. 'For him, as for his critic, there can be no truth if there is nothing to be true about. . . . This is why as a pragmatist I have so carefully posited "reality" *ab initio*, and why, throughout my whole discussion, I remain an epistemological realist' (*Meaning of Truth*, p. 195).

Such, in outline, are the main positions of pragmatism as taught by James. Schiller's version, which he prefers to call humanism, presents two chief features of difference. He emphasises more than James does the psychological side of the quest for truth, the motives from which it springs and the interests which it seeks to satisfy—in short, the fact that our thinking is working throughout within the limits and under the conditions of human experience. Secondly, he is inclined to reduce to a bare minimum the 'reality' or material which we have seen to be a presupposition of the doctrine; and of course there is a sense in which experienced reality, like experienced truth, undergoes expansion and modification; in fact the expansion and modification of the latter obviously involve a corresponding difference in the former. The explorer who verifies his ideas about the unknown source of a river extends at the same time the bounds of experienced fact. But it must be admitted that such a mode of statement is open to misconstruction. The special features of Dewey's version are more difficult to state clearly and shortly; his writings are far less pointed and effective than James's, though his teaching has been influential. His interest is primarily a logical one in exhibiting and analysing the instrumental function of thought. Instrumentalism is the name which he uses to designate his version of the pragmatic doctrine. He draws a sharp distinction between thinking and the rest of our experience, and regards thinking as the instrument by which

the problems or discords that emerge in experience are resolved.

It would take up too much space to mention more than a small selection from the writings of the leading pragmatists and the controversial literature. The following list may be taken as sufficiently representative: James, *Pragmatism and Meaning of Truth*; Schiller, *Studies in Humanism*; Dewey, *Essays in Experimental Logic*. Of J. B. Pratt's *What is Pragmatism?* James says that 'for its clearness and good temper [it] deserves to supersede all the rest of the anti-pragmatic literature.' Bradley's criticisms may be seen in his *Essays on Truth and Reality* (chapters iv. and v. with the Appendices to the latter), and B. Russell's *Philosophical Essays* contains two on pragmatism. A French book, *Le Pragmatisme Américain et Anglais*, by E. Leroux (1923), is said to be discriminating and fair and to provide a good bibliography.

Prague (Ger. *Prag*, Czech *Praha*), the capital of Bohemia, and now of the Czechoslovak republic, is situated at the base and on the slope of the hills which skirt both sides of the islet of Moldau, 217 miles by rail NNW. of Vienna and 118 SSE. of Dresden. It offers a highly picturesque appearance from the beauty of its site, and the numerous lofty towers (more than seventy in number) which rise above the many noble palaces, public buildings, and bridges of the city. The fortifications have been gradually demolished since 1866. The Burg, on the Hradschin (240 feet), the ancient residence of the Dukes of Bohemia, dates mainly now from the 16th and 17th centuries, and has 440 rooms. The neighbouring cathedral of St Vitus (1344) is still unfinished, though building was resumed in 1867. Here are the splendid royal mausoleum (1589) and the shrine (1736) of St John of Nepomuk (q.v.), containing 1½ ton of silver. Of other Catholic churches the chief are the domed Jesuit church of St Nicolas, with its lavish decorations, and the Teyn church (1407), the old Hussite church, with the grave of Tycho Brahé, and its marble statues of the Slavonic martyrs, Cyril and Methodius. Of the bridges the most striking is the Karlsbrücke (1357–1503), 543 yards long, with gate-towers at either end, and statues of John of Nepomuk and other saints. It was greatly damaged by flood in September 1890, but has been restored. Other noteworthy objects are the town-hall (1381–1384), the Pulverturm (1475), the Czech Theatre, the old Jewish graveyard, the vast Czerni Palace, the Picture-gallery, and the Premonstratensian monastery of Strahow. Prague has, besides, numerous public gardens and walks in the suburbs, with several parks open to the public in its neighbourhood. The suburb of Karolinenthal, which is traversed by a great railway viaduct, and is of modern growth, has some fine buildings, numerous gardens, barracks, and manufacturing establishments; and somewhat farther north is the great botanical garden, with the neighbouring public walks on the Moldau. The university, founded in 1348, had 10,000 students at the beginning of the 15th century; but subsequently it had a long period of decay. It was divided in 1882 into two universities, German and Czech. Prague has also polytechnics (German and Czech), academies of art and science (German and Czech), a great library, a fine observatory, museums, a botanical garden, &c. Some Russian institutions have been established in the town, including the small Ukraine university (1921). The manufactures include machinery, chemicals, leather, cotton, linen, gloves, beer, spirits, &c. Prague is the great centre of the commerce of Bohemia, and the seat of an important transit trade. Pop. (1880) 293,322; (1921) 676,657.

History.—Prague was founded, according to popular tradition, in 722 by the Duchess Libussa, but really grew out of the settlements forming around the two castles of Hradschin and Wyše-

chrad to which a German settlement was added in the 12th century. In the 14th century its munificently endowed university brought foreigners to it from every part; but in 1424 Prague was conquered and almost destroyed by the Hussites, who had made a successful stand against the Emperor Sigismund's army. In the Thirty Years' War it suffered severely, and in 1629 the battle was fought at the White Mountain, near the city, in which the Elector-Palatine, Frederick V. (q.v.), was completely defeated, and compelled to renounce his assumed crown. Swedes and Imperialists successively gained possession of the town during the war; and a century later it again fell into the hands of different victors, having been compelled in 1744 to capitulate to Frederick the Great, who here on 6th May 1757 defeated 60,000 Austrians under Prince Charles of Lorraine. Until the downfall of Napoleon the city continued to suffer more or less directly from the troubles in which the House of Austria was involved. Since then, however, it has made rapid strides, and enjoyed prosperity and quiet, except in 1848, when the meeting of the Slavonic Congress within its walls called forth such strongly marked democratic demonstrations on the part of the supporters of Pan Slavism that the Austrian government dissolved the conclave, and restored quiet by the summary method of causing the old and new town to be bombarded for two days. In 1866 Prague was occupied bloodlessly by the Prussians, who here on 23d August concluded a treaty with Austria. See Count Lützow's *Story of Prague* (1903).

Praha. See PRAGUE.

Praia Grande. See RIO DE JANEIRO.

Prairie (Fr. 'meadow'), the name given by the early French explorers of the northern portion of the Mississippi Valley, to the vast fertile and treeless plains which extend from Western Ohio and Southern Michigan across the states of Indiana, Illinois, Missouri, Arkansas, Iowa, Kansas, Nebraska, and North and South Dakota, including the southern portions of Wisconsin and Minnesota. The prairie region also extends northward into Canadian territory. These great plains or savannas are sometimes flat, but oftener rolling like the long swells of the ocean, and rise in gradual elevation from 300 to 1500 feet above the sea. See AMERICA.

Prairie Dog, a genus (*Cynomys*) of small rodents closely allied to the European Marmot (q.v.); these animals have received their vernacular name on account of the barking sound



Prairie Dog (*Cynomys ludovicianus*).

which they utter. They live associated together in colonies consisting of numerous burrows excavated by the animals themselves; their range is entirely

restricted to the parks and plains of the Rocky Mountain plateau region in North America, and there appear to be two distinct species, *C. ludovicianus* in the middle states, *C. columbianus* nearer the Rocky Mountains. They have been popularly supposed to share their habitations, and to live in friendly relations, with rattlesnakes and owls. As regards the rattlesnake, it is more than probable that its occurrence in the burrows of the rodent is to be explained by a desire to make a meal of its neighbours, while the owl may have a similar purpose in view; it is also possible in both cases that the burrows may be merely utilised as a temporary hiding-place. The Prairie Marmot is rather larger than a large rat, and is of a brownish-gray colour, the under surface grayish white.

Prairie Hen. See GROUSE.

Prākṛit (from *prākṛita*, 'natural,' 'common,' as opposed to *samskrīta*, 'polished,' 'refined') is the collective name in Hindu grammarians and writers on poetics of a number of literary dialects, representing stereotyped forms of vernaculars current in India for some centuries before and after the Christian era. The most important of these is Ardha-Māgadhī, the sacred language of the Jains, whose canon was redacted in it in the 5th century A.D. It represents a later form of the speech used by Mahāvīra, the founder of Jainism, and probably also by the Buddha, and it has affinities with the court dialect of Pāṭaliputra (Patna), the capital of the empire of Aśoka. Of the more eastern dialect of Māgadhī little is preserved. The southern dialect, Māhārāṣṭrī, was employed in an important lyric literature from the 3rd century A.D. and became established as the language of lyric portions of the drama. The prose of the drama is in Sauraseni, the dialect of Mathurā, the home of the drama. The non-canonical works of the Jains are written partly in dialects which have been styled Jain Sauraseni and Jain Māhārāṣṭrī. The Pāśācī, perhaps a dialect of the Vindhya rather than of the north-west, was used for the *Bṛhatkathā* of Guṇādhyā, a famous book of stories and fables. Based on a western Prākṛit, but with assimilation in grammar to the vernacular, there is the Apabhraṃśa, in several varieties, which was used as a literary medium by some later Jain writers. Pāli (q.v.) on the other hand, may be classed as an older Prākṛit.

The Prākṛits are not derived from Sanskrit; like it, they are refined versions of vernaculars, but they are derived from vernaculars at a considerably later stage of development and, save in the case of Sauraseni, of different geographical situation. Recent writers, accordingly, have used the terms Primary Prākṛits to denote the early Indo-Āryan vernaculars, one of which, in the form in which it was used by the Brahmins and other educated persons, gives birth to Sanskrit; Secondary Prākṛits, of which the dialects above mentioned are literary forms; and Tertiary Prākṛits, or Apabhraṃśas, the forerunners of modern vernaculars, but this terminology is not Indian.

See R. Pischel, *Grammatik der Prākṛit-Sprachen* (Strassburg, 1900); R. O. Franke, *Pāli und Sanskrit* (Strassburg, 1902); H. Jacobi, *Bhavisatta Kaha von Dhanañjaya* (Munich, 1918); *Sanatkuṃḍaracaritam* (Munich, 1921); *Linguistic Survey of India* (in progress).

Prase, a rarish green variety of Quartz (q.v.).

Praseodymium. See DIDYMIUM.

Prater. See VIENNA.

Pratique is, strictly, a limited quarantine. A ship is said to have performed pratique when her captain has convinced the authorities of a port that his ship is free from contagious disease; and he is thereupon permitted to open trade and communication with the shore.

Prato (often called *Prato in Toscana*), a walled town of Italy, by rail 10½ miles SE. of Pistoia and 11 NW. of Florence. It has a citadel and a cathedral, begun in the 12th century, in the Tuscan Romanesque style, and continued till the 15th century, with frescoes by Filippo Lippi, and a famous external pulpit by Donatello and Michelozzi (though the see has been united with that of Pistoia since 1653). There are several other interesting churches, including the early Renaissance Madonna delle Carceri. There are manufactures of straw-plait, cloth, woollens, and paper and brass works. Pop. 60,000.

Prawn, a name applied to many of the higher crustaceans (tribe Caridea), in such families as Pandalidae, Hippolytidae, and Palaemonidae. They are nearly allied to shrimps (Crangonidae). The majority, e.g. *Palaemon serratus*, live in shoals in shallow coastal waters; a few go up rivers and into lakes, e.g. *Palaemonetes* in Europe and America; and some brilliantly phosphorescent forms occur at great depths in the ocean. Prawns are lightly built, very active, voracious animals, often semi-transparent, usually brightly coloured. Many, e.g. the Aesop prawn (*Hippolyte varians*) show a remarkable power of changing their colour to suit their surroundings, literally putting on a garment of invisibility. Colour-cells on the surface expand and contract in obedience to stimuli which pass from the eyes to the nervous system. The adults sometimes have a fixed colour-pattern which has also become adjusted to their habitual environment. Many prawns are very palatable; they may be caught in putting nets or in osier baskets like those used in trapping lobsters. Most prawns are a few inches long, but many freshwater forms (notably in the family Atyidae) of tropical countries may attain to the length of a foot. For illustration, see CRUSTACEA.

Praxinoscope. See ZOETROPE.

Praxiteles, one of the greatest sculptors of ancient Greece, of whose life little is known, except that he was a citizen of Athens, and lived in the 4th century B.C. His principal works—nearly all of which have perished—were statues of Aphrodite (at Cos, Cnidus, Thespiae, and elsewhere, of which that of Cnidus was the most famous), Eros (at Thespiae), Dionysus (at Elis, Athens, Megara, and other places), Apollo (the best representing Apollo as the Python-slayer), and Hermes carrying Dionysus (found at Olympia in 1877). Feminine beauty and Bacchic pleasures were his favourite subjects; and in his treatment of these he displayed unrivalled sweetness, grace, and naturalness. His gods and goddesses were not very divine, but they were ideal figures of the fairest earthly loveliness.

Prayer is a universally acknowledged part of the worship due to God; not merely petition, but praise, adoration, confession of sin, and thankful acknowledgment of mercies received. It is a simple and natural expression of dependence, which seems almost necessarily to follow from a belief in the existence of a god. Accordingly we find it both where the object of worship is one Supreme Being and in systems of polytheism. But a difficulty presents itself in respect to what may be called the theory of prayer. How does prayer fit into the natural chain of cause and effect? How can it be supposed to influence the divine mind or will? How can a belief in its power be reconciled with any view of the divine decrees, from the most absolute doctrine of predestination to the most modified scheme which recognises the Creator as supreme in the universe? Such questions bring up the same difficulty which attends all other questions of the relations between the

human will and the divine, the freedom of man and the sovereignty of God. But whatever seeming inconsistencies may be implied in speculation concerning them, the necessity of prayer and the power of prayer are acknowledged equally by men of the most opposite views; and generally with an acknowledgment of the inability of the human mind to solve some of the problems which are thus presented to it. The extreme predestinarian includes prayer among the means decreed of God along with the end to which it contributes. By many who would concede no other function, prayer is regarded as of great value in its reflex influence on the feelings of the worshipper. It tends to merge in communion with God. The Protestant churches all hold that prayer is to be made to God alone; but in the Roman Catholic Church, and to some extent in the oriental churches, prayer of a kind is made also to saints, the Virgin Mary, and angels. But as the worship (*douleia*) of the saints differs from that (*latreia*) offered to God, so the invocation of saints and angels is not for the purpose of obtaining mercy or grace from them directly, but in order to ask their prayers or intercession with God on our behalf. For this practice Catholics rely not on the direct authority of Scripture, but on the unwritten word of God conveyed by tradition from very early times. The inscriptions in the catacombs prove that the church of the first centuries invoked the saints; and the famous fathers of the 4th century expressly insist on such invocation. Protestants hold that prayer ought to be conducted in a language known to the worshippers. The Church of Rome has, on the contrary, maintained the general use of the Latin language, even though that language is unknown to most of the worshippers.

Forms of prayer for public use grew up in the earliest times, naturally and inevitably: the Lord's Prayer being doubtless regarded as a warrant and a model. Apparently the most primitive collection is that in the eighth book of the pseudo-Clementine *Apostolic Constitutions* (q.v.). The prayers in connection with the celebration of the eucharist in the Greek and Roman communions are dealt with at LITURGY. The most important post-Reformation collection of prayers, that of the Anglican Church, is dealt with in the next article. But most of the leading reformers prepared prayer-books. Luther's date from 1523 and 1526, Calvin's from 1538 (from Strasburg) and 1541 (from Geneva), John Knox's for the Church of Scotland (based on that of Geneva) from 1554. The growth of Puritan feeling in Britain led the Nonconformists, Presbyterians, and others to underrate the advantages of set forms of prayer, and to exalt the value of what is assumed to be the spontaneous utterance of the heart. And ultimately it became usual to regard liturgical forms as essentially Episcopalian and un-Presbyterian, though the forms of church government are irrelevant to the question of the best mode of guiding congregational prayer.

PRAYER FOR THE DEAD, in the Roman Catholic, the Greek and other oriental churches, is offered with the intention and expectation of obtaining for the souls of the deceased an alleviation of their sufferings after death on account of venial sins, or of the penalty of mortal sins, remitted but not fully atoned for during life. The practice of praying for the dead is usually associated with the doctrine of Purgatory (q.v.) or with the belief in a progressive intermediate state (see HELL). It being once supposed that relations subsist between the two worlds, that their members may mutually assist each other, it is almost a necessary consequence of the doctrine of purgatory that the living ought to pray for the relief of their suffering brethren beyond the grave. It seems

certain that some such doctrine existed in most of the ancient religions. Its existence among the Jews is attested by the well-known assurance in 2 Maccabees, chap. xii., that 'it is a holy and wholesome thought to pray for the dead, that they may be loosed from their sins.' Catholics contend that the doctrine as well as the practice is equally recognisable in the early Christian church. They rely on the parable of Lazarus and the rich man (Luke, xvi. 19-31), as establishing the intercommunion of this earth with the world beyond the grave; and on Matt. xii. 32, as proving the remissibility of sin or of punishment after death; as well as on 1 Cor. xv. 29, as attesting the actual practice among the first Christians of performing or undergoing certain ministrations in behalf of the dead. The Fathers of the 2d, 3d, and still more of the 4th and following centuries frequently allude to such prayers, as Clement of Alexandria, Tertullian, St Cyprian, and especially St John Chrysostom, Cyril of Jerusalem, and St Augustine. The liturgies, too, of all the rites without exception contain prayers for the dead; and the sepulchral inscriptions from the catacombs, which reach in their range from the 1st to the 5th century, contain frequent prayers in even greater variety. In the services of the mediæval and later church prayers for the dead form a prominent and striking element (see *REQUIEM*). The Protestant churches without exception repudiated the practice. In the burial service of Edward VI.'s First Common Prayer-book some prayers for the deceased were retained; but they were expunged from the Second Book; and no trace is to be found in that sanctioned under Elizabeth. Still it is not expressly prohibited, and it is cherished as a private and pious aspiration by not a few within the modern Church of England, as, in Coleridge's phrase, 'something between prayer and wish—an act of natural piety sublimed by Christian hope.'

On the doctrine of prayer, see Bickersteth, *Treatise on Prayer* (1856); Canon Liddon, *Some Elements of Religion* (1872); Newman Hall, *Prayer: its Reasonableness and Efficacy* (1875); Jellett, *The Efficacy of Prayer* (Donellan Lecture, 1877); the treatises on Apologetics, and manuals of Theology. On prayer for the dead, see Plumptre, *The Spirits in Prison* (1884); Luckock, *After Death* (1879), and *The Intermediate State* (1890). For modern scientific objections, see Romanes, *Christian Prayer and General Laws* (1874); Tyndall's British Association lecture (repub. 1874); and a series of articles in connection with Tyndall's 'Prayer Test' in *Contemp. Rev.*, vols. xx.-xxii., by Tyndall, Galton, and others, with answers by M'Cosh, the Duke of Argyll, and others. For other questions connected with prayer, see the articles *AVE, PATERNOSTER, KNEELING, ROSARY, SAINTS, FAITH-HEALING*.

Prayer, BOOK OF COMMON. By this name are known the service-book of the Church of England and the corresponding formularies of other Episcopal churches which have either been derived from the Church of England or largely influenced by it, such as the Episcopal Church of the United States of America, the Church of Ireland, and the Episcopal Church in Scotland. The full title of the English Book of Common Prayer (viz. 'The Book of Common Prayer, and Administration of the Sacraments, and other Rites and Ceremonies of the Church, according to the use of the Church of England: together with the Psalter, or Psalms of David, pointed as they are to be sung or said in Churches; and the Form or Manner of Making, Ordaining, and Consecrating of Bishops, Priests, and Deacons') declares the varied character of its contents, and indicates that the volume includes many services besides those (viz. Morning and Evening Prayer) to which the term 'Common Prayer' is strictly applied in the technical language of liturgiologists. Thus it will be seen that this compendious service-book embraces elements

corresponding to parts not only of the Breviary (q.v.), but also of the Missal (q.v.), the Pontifical (q.v.), and the Manual of the mediæval English Church, from which they were chiefly derived.

It is not our province here to consider generally the influences which operated to bring about the Reformation in England. It must suffice to observe that in regard to liturgical changes the main objects aimed at by the English Reformers were (1) to rid the services of features which were regarded as the outcome of superstition and ignorance (e.g. the invocation of saints, unhistorical and absurd legends read among the 'lessons,' &c.); (2) to introduce a more continuous and more extensive reading of Holy Scripture in the public services; and (3) to present all the services of the church in a language 'understood of the people.' The publication in 1890 (from a MS. in the British Museum) of the draft, revised by Cranmer, of a reformed Latin breviary shows us how much the mind of the most influential of the English reformers had been influenced by the corresponding labours of Cardinal Quiñones (see *BREVIARY*). The first and second of the objects above referred to were aimed at in this projected work of Cranmer, which was probably abandoned because the bolder design of giving the people all the services of the church in their native tongue had begun to be contemplated. Parts of the preface of Quiñones's breviary were transferred, with some modifications, to the preface of the First Prayer-book, and still appear in the prefatory remarks entitled, in the present prayer-book, 'Concerning the Service of the Church.'

The first vernacular service put forth by authority for public use was the Litany (1544), differing in but few particulars from the form still to be found in the prayer-book. On the death of Henry VIII. liturgical reformation was less impeded, the advisers of the young king being favourable to change. The administration of the cup to the laity having been sanctioned by convocation and enjoined by parliament (1 Edward VI. chap. 1), a form for communion 'in both kinds,' in the English tongue, to be added to the Latin mass, was issued in 1548. But this form served only a temporary purpose, for in the following year (1549) was published and authorised the complete prayer-book in English, known as the First Prayer-book of Edward VI. In this book, with singular ability, attaining at times the level of genius, Cranmer and his coadjutors translated and adapted the breviary services of Matins, Lauds, and Prime, so as to construct the 'Morning Prayer' of the Book of Common Prayer; while, in a similar manner, Vespers and Compline were brought into the form of the 'Evening Prayer.' The English services were shortened chiefly by the great reduction of the number of psalms to be 'sung or said' daily. The lectionary was so arranged that the greater portion of the Old Testament was read through systematically yearly, while the whole of the New Testament (the Apocalypse excepted) was read through thrice. The old English missals formed the basis of the English communion service, but therewith were combined the new features which had appeared in the 'Order of the Communion' (1548). The other services, as those for baptism, matrimony, burial, &c., were similarly framed, with much discrimination, from the corresponding mediæval services. The ecclesiastical books of the Eastern Church were not wholly unknown to the Reformers, as is testified to by their adoption of the so-called 'Prayer of St Chrysostom,' and by the unquestionable fact that the *Quicumque Vult*, the so-called Athanasian Creed, was translated by them from a Greek and not a Latin text. Occasionally the revisers did not scruple to adopt features from more modern sources (e.g. the *Pia Deliberatio* of the

reforming Archbishop Hermann of Cologne). The liturgical revision of 1549 was conducted in a spirit at once conservative and critical, and is marked by a singular combination of independence with reverence for the past.

Owing partly to home influences and partly to the influence of resident foreign reformers (Bucer, Peter Martyr, &c.), Cranmer and his associates ceased to be content with the doctrinal colouring of the First Prayer-book; and in 1552 there appeared a revised book (the Second Prayer-book of Edward VI.), marked by many changes mainly favourable to more Protestant views. As a characteristic example may be cited the change made in the words used at the communion in delivering the consecrated elements. In 1549 the words ran 'The body of our Lord Jesus Christ, which was given for thee, preserve thy body and soul unto everlasting life,' 'The blood of our Lord Jesus Christ,' &c. In 1552 these words were expunged, and for them were substituted 'Take and eat this in remembrance that Christ died for thee, and feed on him in thy heart by faith, with thanksgiving,' 'Drink this in remembrance,' &c. In a similar spirit the 'Invocation' of the Holy Ghost on the elements—'that they be unto us the body and blood of thy most dearly beloved Son'—was removed (together with use of the sign of the cross) from the prayer of consecration. From the baptismal service the exorcism, trine immersion, anointing, and the use of the chrisom (or white robe) were omitted. From the burial service prayers for the dead were removed. The vestments of priests and deacons were reduced to the surplice, and those of the bishop to a rochette, for all ministrations. Among changes then made, though of little or no doctrinal significance, may be mentioned the addition of the sentences, introductory address, general confession, and absolution to morning and evening prayer, and of the decalogue and responses to the communion service.

On the accession of Queen Elizabeth the personal ecclesiastical sentiments of that masterful monarch made themselves sensibly felt. In the newly-revised prayer-book of 1559 (Elizabeth's Prayer-book) very few changes were made, but they pointed in one direction. The vestments and ornaments of the prayer-book of 1549 were again enjoined; in the litany the words 'From the tyranny of the bishop of Rome and all his detestable enormities, good Lord, deliver us' were omitted; in the communion service the words of Edward's two books at the delivery of the elements were combined in the form still in use; the declaration concerning kneeling (the so-called 'Black Rubric') appended to the communion service of Edward VI.'s Second Prayer-book was omitted.

During Elizabeth's reign the Puritan and Calvinist party within the church increased in strength, and its hopes were raised high on the accession of James I., educated as he had been in Scotland under Presbyterian influence. At once the Millenary Petition craving the removal of 'offences' from the prayer-book was presented to James, and the Hampton Court Conference (see HAMPTON) followed, but was disappointing in its results to the Puritans, alterations made being comparatively few and unimportant: certain chapters of the Apocrypha (Tobit, v. vi. and vii., and Dan. xiv.) were removed from the lectionary; the words 'or remission of sins' were added as explanatory of the word 'absolution' at morning prayer; a prayer for the queen and royal family, together with some special thanksgivings, as 'for rain,' 'for fair weather,' &c., were inserted. The only changes of much significance were (1) the addition to the catechism of the part treating of the sacraments (attributed to Overall, Dean of St Paul's, and

certainly not favourable to Puritan views), and (2) the insistence on baptism being administered by the 'lawful minister,' as the church's order; while the *validity* of baptism administered by any person using water and the prescribed form of words is still implied in the text of the service. The revision did not, as other revisions, receive parliamentary sanction, James deeming the authority of the crown sufficient for changes, which he was careful to style 'explanations,' as though they were not additions.

The Book of Common Prayer 'for the use of the Church of Scotland' (1637), commonly known as 'Laud's Prayer-book,' was a revision of the English prayer-book, in the construction of which Wedderburn, Bishop of Dunblane, and Maxwell, Bishop of Ross, were chiefly concerned, their English advisers being Laud, Wren, and Juxon. It is mainly remarkable for its reverting in the communion service to some of the characteristic features of the First Prayer-book of Edward VI.—e.g. (1) the 'Invocation,' and (2) the commemoration of the faithful departed. It is also interesting to notice that the Scottish revision anticipated and happily met some of the difficulties that have since been raised in respect to the Athanasian Creed. The prose psalter of this prayer-book was taken from the authorised version of the Bible. The word 'presbyter' was used instead of 'priest.' The calendar records the names of certain Scottish saints—e.g. Columba, Ninian, Serf, Queen Margaret, &c. The attempt to force this prayer-book upon the Scottish people in an arbitrary manner, emphasised, as it was, by the riot in St Giles' Cathedral, Edinburgh, on the occasion of its first being read (23d July 1637), and the national uprising that followed are parts of civil history. It should be added that the Scottish prayer-book, which had seemed to be strangled at its birth, was twenty-four years afterwards among the most potent influences affecting the revision of the English prayer-book.

During the Great Rebellion it was enacted by an ordinance of parliament (January 3, 1645) that the 'Westminster Directory for the Public Worship of God' should take the place of the prayer-book; and a subsequent ordinance of the same year (August 23) made the use of the prayer-book in public 'or in any private place or family' punishable by a fine of £5 for the first offence, £10 for the second, and a year's imprisonment for the third. This harsh measure went a long way to provoke the reaction of the Act of Uniformity (1662).

On the Restoration, in the vain hope of satisfying contending ecclesiastical parties a royal commission was issued (March 25, 1661) to twelve bishops and twelve Presbyterian divines 'to advise upon and review the Book of Common Prayer, comparing the same with the most ancient liturgies which have been used in the church in the primitive and present times . . . and, if occasion be, to make such reasonable and necessary alterations, corrections, and amendments as shall be agreed upon for the giving satisfaction to tender consciences,' &c.

The meetings of the commission were held in the Savoy Palace in the Strand, London, and hence the name 'Savoy Conference.' Among the best known of the divines of the Episcopal side were Bishops Cosin, Sanderson, and Brian Walton, with Drs Pearson, Gunning, and Heylin. Among the Presbyterians the most eminent were Baxter (who submitted a liturgy composed by himself within a few days), Calamy, Bates, Manton, and Reynolds. Subsequently royal letters were addressed to Convocation directing the revision of the Book of Common Prayer, and the use of the revision which resulted was enjoined (19th May 1662) by parliament (Act of Uniformity, 14 Carol. II. chap. 4).

Among the more noteworthy changes made may

be mentioned a new preface (by Bishop Sanderson); the adoption of the authorised version for the epistles and gospels; the introduction of the prayer for parliament, of the prayer 'for all conditions of men,' of the general thanksgiving, and some of the special thanksgivings; and the reintroduction in a modified form of the commemoration of the departed in the communion service. While the general framework of the prayer-book was preserved intact, very many minute changes were made, more particularly in the rubrics. Speaking generally, the changes, when they possess any distinctive doctrinal colouring, were marked by the dominant influence of the church party; very few of the suggestions of the Puritan party were adopted. Two entirely new services were added: (1) a service for the baptism of adults; and (2) a form of prayer and thanksgiving to be used at sea, with a special view to 'his majesty's navy.' Certain printed copies of this prayer-book, certified as correct, and having the great seal attached are known as the *Scaled Books*. One is in the Tower of London, one in each of the Courts of Law at Westminster, and one with each cathedral chapter.

In the reign of William III. a further attempt was made to revise the prayer-book with a view to the comprehension of dissenters. A royal commission sat and reported, but nothing came of it. In 1871 the table of lessons now in use was approved by Convocation and authorised by parliament, and in the following year certain abbreviations in the daily service were similarly sanctioned. These changes apart, the prayer-book remains that of 1662. In 1906, however, Convocation received the King's Letters of Business for the revision of the prayer-book, and in 1927 important deviations from and additions to the book of 1662 were approved by the Church Assembly and awaited parliamentary sanction. The changes put forward are 'permissive'—to be used at the discretion of the minister, or, where difference arises between the minister and the people as represented in the parochial church council, at the order of the bishop after consultation with minister and people. In the proposed revision there is an alternative table of lessons; also an alternative calendar showing an increase of saints' days; the orders for morning and evening prayer may be shortened, and alternative orders are also given; the singing or saying of the Athanasian Creed, of which a revised translation is given, is no longer required; when used, part only of the litany may be sung or said; the number of occasional prayers and thanksgivings is increased, and permission is given to the minister to offer prayer in his own words; from the collects, epistles, and gospels archaisms are in part removed; an alternative order for communion is provided (here, according to some, the doctrine of the real presence is implied), and in a rubric special vestments are appointed; in the baptism services the love rather than the wrath of God is stressed and an alternative order (parents may require the use of the order of 1662) is provided for the public baptism of infants, while in the other services there are slight changes in phraseology, &c.; an alternative order for confirmation is given; there is an alternative form of marriage service (usable at the discretion of the minister if the parties so desire) in which the crudities of the 1662 service are removed and in which, as in the questions asked and vows taken, the equality of the woman with the man is recognised; the order for the visitation of the sick is enlarged, and in an alternative order for the communion of the sick the reservation of the sacrament is made permissible; in the burial service alternative psalms, lessons, and words of committal (the soul is commended into the hands

of God) are provided, and there is a new order for the burial of a child; in an alternative form the commination is much moderated; minatory verses of the psalms are marked as omissible; the use of hymns and anthems is recognised in a rubric; an appendix contains wholly new matter—orders for prime and compline, the collects, epistles, and gospels for the lesser feasts and fasts, a devotion, an exhortation; and there are other lesser changes.

In Ireland the first book ever printed in Dublin was the First Prayer-book of Edward VI. It appeared in 1551. The Second Prayer-book of Edward was never introduced. Elizabeth's prayer-book was enjoined by the Irish parliament in 1560, and similarly in 1662 the prayer-book as revised after the Savoy Conference. On the disestablishment of the Irish Church (1869) a revision of the prayer-book was carried through by the General Synod, after a long contest between church parties. In 1878 the revised prayer-book was published. Among the more important changes are (1) the removal of the rubric preceding the Athanasian Creed; (2) the addition of a question and answer to the Catechism declaring that the body and blood of Christ are 'taken and received only after a heavenly and spiritual manner'; (3) the absolution in the visitation of the sick changed into the form in the communion service; (4) lessons from the Apocrypha removed. In 1909 a committee was appointed to undertake a new revision.

In the Episcopal Church of the United States of America a revised edition of the English prayer-book was authorised and published in 1789. The changes made were very numerous. They included: (1) the removal of the Athanasian Creed; (2) the introduction, at the suggestion of Seabury (q.v.), of the 'invocation' on the elements in the communion service. A further revision was undertaken in 1881, and the result published in 1892. In many particulars it reverts to the English prayer-book which had been abandoned in 1789; but neither of the two features noticed above was altered. In 1913 a new revision was undertaken; the changes were approved in 1925, and after their ratification a new prayer-book was to be published in 1928.

In the Episcopal Church in Scotland the English prayer-book is formally declared to be the 'duly authorised service-book of this church for all the purposes to which it is applicable' (Canon xxxiii.); but a Scottish service for the Holy Communion (brought to the form in current use in 1764) is also in use. At all consecrations, ordinations, and synods the form in the English prayer-book is required to be used. The Scottish Communion Office is based on the corresponding service in Laud's prayer-book, but many important changes have been made. Among the most noteworthy are (1) the transposition of the place of the prayer of consecration in relation to the prayer for 'the whole state of Christ's Church'; (2) the omission of the words 'militant here in earth'; (3) the alteration in the order of the parts of the prayer of consecration, so that it runs, (a) words of institution, (b) oblation, (c) invocation; (4) the substitution, in the invocation, of the words, 'that they may become the body and blood,' &c., for 'that they may be unto us the body,' &c. In 1911 the Scottish liturgy as a whole was revised and the revision authorised for permissive use. And in 1919 a more complete revision was undertaken, the results appearing in a series of reports.

For the materials from which the prayer-book has been mainly constructed, consult Maskell's *Monumenta Ritualia Ecclesiae Anglicanae* (2d ed. 1882), and *The Ancient Liturgy of the Church of England* (3d ed. 1882); *Missale ad usum Sarum* (Burntisland ed. 1861-67); *Breviarium ad usum Sarum*, edited by F. Procter and C. Wordsworth (1879-86); *Breviarium Romanum Quignonianum*, edited

by J. W. Legg (1888). Successive changes made in the English Prayer-book and the Scottish Prayer-book (1637) may be studied in Keeling's *Liturgic Britannica* (2d ed. 1851) and in J. Parker's *The First Prayer-book of Edward VI.* (1877). For the history, &c., of the prayer-book, see Proctor's *History of the Book of Common Prayer* (1855; revised and rewritten by Frere, 1901; Bishop Dowden's *The Prayer Book in its Literary and Liturgical Aspects* (1900); E. Daniel's *The Prayer-book: its History, Language, and Contents*; J. H. Blunt's *Annotated Book of Common Prayer* (revised ed. 1884); Cardwell's *History of Conferences connected with the Revision of the Book of Common Prayer* (2d ed. 1841). Parker's *Introduction to the History of the successive Revisions of the Book of Common Prayer* (1877) is invaluable. See also Brightman's *Sources and Revisions of the Book of Common Prayer* (1915); *A Prayer-Book Revised* (by High Church scholars, 1913); two reports issued by the S.P.C.K. in 1916 and 1922; *A Suggested Prayer Book* (1923); *A New Prayer Book* (1923); and the *Book Referred to in the Prayer Book Measure, 1927* (1927). Cranmer's attempts at a revision of the Breviary are exhibited in *Edward VI. and the Book of Common Prayer* (1890), by Gasquet and Bishop. Much curious information on the mediæval liturgies of England will be found in the *Lay Folk's Mass Book*, edited for the E.E.T.S. by T. F. Simmons (1879). Among commentaries on particular parts of the prayer-book, Scudamore's *Notitia Eucharistica* (2d ed. 1876) and Bulley's *Variations in the Communion and Baptismal Offices* (1842) are of much value. A facsimile of the MS. of the prayer-book attached to the Act of Uniformity (1662) was produced in photo-lithograph in 1890. On the history of the Scottish and American Communion Offices, see Dowden's *Annotated Scottish Communion Office* (1884), Hart's edition of *Seabury's Communion Office* (1874), and Hurlington's *Short History of the Book of Common Prayer* (New York, 1893). And see Harford and others, *Prayer-Book Dictionary* (1925).

Prayer Beads, a name given to the polished seeds of a tropical leguminous plant, *Abrus precatorius* or Crabs'-eyes, formerly much used for stringing into rosaries, necklaces, &c.

Praying Wheel, an instrument for offering prayers by mechanical means, used exclusively by the Lamaist Buddhists, on the assumption that the efficacy of prayer consists in the multiplicity of its repetition. These instruments are of various shapes and sizes, from small cylinders turned by hand to huge ones driven by water or wind. Long strips of paper with a written or printed formula, which translated reads 'The Jewel in the Lotus, Amen,' repeated hundreds or even thousands of times, are wrapped round these cylinders, and as the cylinders revolve the paper rolls uncoil, and so the prayer is said.

Preaching, or systematic instruction in religion given by word of mouth, traces its ancestry to the function of the ancient Israelitish prophets. Justin Martyr (*Ap. maj.* chap. 67) and Tertullian (*Apol.* chap. 39) describe the exhortations that followed the reading of Scripture in their time; but Origen was the earliest preacher in the modern sense of the word. In the early church the bishop was long responsible for the preaching, although presbyters and deacons came to be employed, as Origen was before his ordination, and Constantine frequently. Monks were not allowed to preach until the special preaching-orders were organised in the middle ages, nor yet women, although the Montanist heretics permitted them. Sermons were usually delivered on Sundays, as part of the regular religious service, and approbation was expressed by stamping of feet and clapping of hands, a practice which Chrysostom condemned. After the 9th century preaching appears to have declined, and indeed it never seems to have flourished much at Rome. The mediæval sermon gradually took the form of a short address after mass; but, with the rise of the Franciscan and Dominican orders, we find a great revival of preaching, in form popular, racy, the anecdotes told and spiritualised

perforce (*Exempla*) often anything but edifying in themselves. Among the most famous of the mediæval preachers were Antony of Padua, Bernard of Clairvaux, Bonaventura, Berthold the Franciscan of Regensburg, John of Monte Corvino, Savonarola, John Tauler of Strasburg, and Francis Coster (1531-1619). The Reformers were preachers to a man, and the swift progress of the new doctrines was in great measure due to the power with which they were given forth from the pulpit. As sacramentarianism lost hold of men's consciences, the higher appeared the value of the sermon. Wyclif and his Poor Priests, and after him the Lollards, established an evangelical tradition of the supremacy of the pulpit as a means of grace, which we find at its greatest strength in Puritanism. Seventeenth-century preaching was very scriptural, and put in the foreground the fall of man, the doom of sin, the redemption of Christ, the sanctifying work of the Holy Spirit. Its weakness was a tendency to be over-abstract, and to become theological rather than religious. In the unspiritual barrenness of the 18th century preaching became mainly ethical and apologetic; but, as Dr Johnson says, men at last got tired of hearing the apostles tried once a week for the crime of forgery, and turned for relief to listen to the earnest direct harangues of a Wesley and a Whitefield. The whole century could show no preachers to be compared with Latimer, Donne, Hall, Andrewes, Jeremy Taylor, Howe, Baxter, as well as Fuller, Sanderson, South, Barrow, and Tillotson: still less with their magnificently eloquent French contemporaries Saurin, Bourdaloue, Bossuet, Fénelon, Massillon, La Rue, and Fléchier. Reading gained ground in the 18th century, and sermons were bought, borrowed, or stolen by preachers less honest than Sir Roger de Coverley's chaplain. The great French preachers recited their sermons, apparently finding it easier than Englishmen to revive premeditated emotion.

Pre-Adamites. See ADAM.

Prebend. See CATHEDRAL.

Precedence, the order in which individuals are entitled to follow one another in a state procession or on other public occasions. In England the order of precedence depends partly on the statute of 1539, partly on subsequent statutes, royal letters-patent, and ancient usages. Among questions of precedence depending on usage there are some which can hardly be considered so settled as to be matter of right, and are in a great degree left to the discretion of the crown, which generally refers any disputed question to the officers of arms. In Scotland the Lyon Court has the direct jurisdiction in all questions of precedence.

It is a general rule of precedence that persons of the same rank follow according to the order of the creation of that rank; and in the precedence of the English peerage it has been fixed that the younger sons of each preceding rank take place immediately after the eldest son of the next succeeding rank. Married women and widows take the same rank among each other as their husbands, except such rank be professional or official, and it is an invariable rule that no office gives rank to the wife or children of the holder of it. Unmarried women take the same rank with their eldest brother; the wife of the eldest son, of any degree, however, preceding the sisters of her husband and all other ladies in the same degree with them. Marriage with an inferior does not take away the precedence which a woman enjoys by birth or creation; with this exception, that the wife of a peer always takes her rank from her husband. The following tables exhibit the precedence of different ranks as recognised by law in England.

TABLE OF PRECEDENCE IN ENGLAND.

<p>The Sovereign. The Prince of Wales. Sons of the Sovereign. Grandsons of the Sovereign. Brothers of the Sovereign. Uncles of the Sovereign. The Sovereign's brothers' or sisters' sons. Ambassadors. Archbishop of Canterbury. Lord High Chancellor. Archbishop of York. Prime Minister. Lord President of the Privy-council. Speaker of the House of Commons. Lord Privy Seal. Lord Great Chamberlain. } Above all of Earl Marshal. } their degree; Lord Steward. } if Dukes, above Lord Chamberlain. } all Dukes, &c. Dukes, according to their creation : (1) of England, (2) Scotland, (3) Great Britain, (4) Ireland, (5) since the Union. Eldest sons of Dukes of the Blood Royal. Marquises, in same order as Dukes. Dukes' eldest sons. Earls, in same order as Dukes. Younger sons of Royal Dukes. Marquises' eldest sons. Dukes' younger sons. Viscounts, in same order as Dukes.</p>	<p>Earls' eldest sons. Marquises' younger sons. Bishops of London, Durham, and Winchester. All other English Bishops according to seniority of Consecration. Secretaries of State, if Barons. Barons, in same order as Dukes. Treasurer of H.M. Household. Comptroller of H.M. Household. Vice-chamberlain of H.M. Household. Secretaries of State, under degree of Baron. High Commissioners. Viscounts' eldest sons. Earls' younger sons. Barons' eldest sons. Knights of the Garter, if Commoners. Privy-councillors, if of no higher rank. Chancellor of the Exchequer. Chancellor of the Duchy of Lancaster. Lord Chief-justice. Master of the Rolls. President of Probate Court. Lords Justices of Appeal. Judges of the High Court of Justice. Viscounts' younger sons. Barons' younger sons. Sons of Life Peers. Baronets of either kingdom, according to date of patent.</p>	<p>Knights Grand Cross of the Bath. K. Grand Commanders of Star of India. K. Grand Cross of St Michael and St George. K. Grand Commanders of Indian Empire. K. Grand Cross of the Royal Victorian Order. K. Grand Cross of British Empire. Knights Commanders of the above Orders. Knights Bachelor. Judges of County Courts and of Mayor's and City of London Court. Serjeants at Law. Masters in Lunacy. Companions of above Orders, and of Distinguished Service Order; Members of Victorian Order (4th class); Officers of the British Empire; Members of Imperial Service Order. Eldest sons of the younger sons of Peers. Baronets' eldest sons. Eldest sons of Knights in order of their fathers. Members of Royal Victorian Order (5th class) and of British Empire. Younger sons of younger sons of Peers. Baronets' younger sons. Knights' younger sons. Naval, Military, and other Esquires by office.</p>
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At the coronation of Charles I. the rule of precedence of the nobility of England was introduced in Scotland; and it was arranged that peers of England (or their sons, &c.), of a given degree, should within England take precedence of peers of Scotland of the same degree; and that in Scotland this precedence should be reversed. But by the acts of union with Scotland and Ireland the precedence in any given degree of the peerage has

been established as follows : (1) Peers of England; (2) Peers of Scotland; (3) Peers of Great Britain; (4) Peers of Ireland; (5) Peers of the United Kingdom, and Peers of Ireland created subsequently to the Irish Union.

The order of precedence in Scotland is recorded in the Lyon Office. It is founded partly on usage and partly on the statutes of 1623 and 1661, but was carefully revised in 1905, and is as follows :

<p>The Sovereign. Lord High Commissioner during sitting of General Assembly. The Duke of Rothesay (Prince of Wales). Younger sons of the Sovereign. Grandsons of the Sovereign. Brothers of the Sovereign. Uncles of the Sovereign. Nephews of the Sovereign. Lords-Lieutenant of Counties, Lord Provosts of cities being <i>ex-officio</i> Lords-Lieutenant of Counties of Cities, and Sheriffs Principal when within their jurisdiction, in the order named. Lord Chancellor of Great Britain. Moderator of General Assembly. Prime Minister. Keeper of Great Seal of Scotland (Secretary for Scotland), if a peer. Keeper of Privy Seal of Scotland, if a Peer. Hereditary High Constable of Scotland. Master of the Household in Scotland. Lord Chancellor, or Lord Keeper, if Baron. Dukes, as in English precedence. Eldest sons of Dukes of the Blood Royal. Marquises, as in England. Eldest sons of Dukes. Earls as in England. Younger sons of Royal Dukes. Eldest sons of Marquises. Younger sons of Dukes.</p>	<p>Keeper of Great Seal of Scotland (Secretary for Scotland), if not a Peer. Keeper of the Privy Seal, if not a Peer. Lord Justice-general. Lord Clerk-register. Lord Advocate. Lord Justice-clerk. Viscounts, as in England. Eldest sons of Earls. Younger sons of Marquises. Barons, as in England. Eldest sons of Viscounts. Younger sons of Earls. Eldest sons of Barons. Knights of the Garter. Privy-councillors. Lords of Session (by date of appointment) and Chairman of Land Court. Younger sons of Viscounts. Younger sons of Barons. Sons of Law Life Peers. Baronets. Knights of the Thistle. Knights of St Patrick. Knights Grand Cross of the Bath. Knights Grand Commander of the Star of India. Knights Grand Cross of St Michael and St George. Knights Grand Commanders of the Indian Empire. Knights Grand Cross of the Royal Victorian Order.</p>	<p>Knights Grand Cross of the British Empire. Knights Commanders of the above Orders. Solicitor-general for Scotland. Lyon King-of-Arms. Sheriffs Principal. Knights Bachelor. Sheriffs Substitute. Companions of the above Orders. Commanders of the Royal Victorian Order. Commanders of the British Empire. Companions of the Distinguished Service Order. Members of Fourth Class of Royal Victorian Order. Officers of the British Empire. Companions of the Imperial Service Order. Eldest sons of younger sons of Peers. Eldest sons of Baronets. Eldest sons of Knights of the Garter, of the Thistle, and of St Patrick. Eldest sons of Knights. Members of Fifth Class of Royal Victorian Order. Members of the Order of the British Empire. Younger sons of Baronets. Younger sons of Knights. King's Counsel. Esquires. Gentlemen.</p>
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There are rules for precedence for the members of the different professions, recognised among themselves, but giving no general social precedence. No rank, for instance, in the army, however high in itself, entitles its holder to precedence. Doctors in the universities are ranked thus : (1) Divinity, (2) Law, (3) Medicine. Official rank may often place its possessor, upon occasion of public ceremonies, in a position far above others of higher dignity than himself, but this, of course, confers no rank in the general order of civil precedence; on the other hand, men of official rank, who have higher personal precedence, are placed according to the latter; the wives and children of all those who

derive their places on the scale from official rank have no consequent privilege. One of the leading principles of the law of precedence is that it emanates solely from father or husband, and cannot be acquired through a female unless in the case of a peeress in her own right.

Preceptor, the head of certain provinces of the order of the Templars (q.v.).

Precession, the name given to a slow motion of the earth, under the action of the sun and moon, which causes the poles of the heavens (which must remain always vertically above the poles of the earth) to describe circles on the sphere of the

heavens about the poles of the ecliptic as centres. As the places of stars on celestial charts are marked with reference to the celestial poles, this motion of these poles causes all such charts to become less and less accurate with the lapse of time. A correction for precession has therefore to be applied to such charts in order to find the true places of stars at any epoch other than that for which they are constructed. This motion of the earth also causes the Equinoxes (q.v.) to recede slowly along the ecliptic, so that the sun comes to them, in his annual course, a little *earlier* each year. Hence the name, 'Precession of the Equinoxes.'

The physical cause of this motion is the attraction of the sun and moon for the protuberant part of the earth around the Equator (see EARTH). This causes the earth slowly to turn on itself, as a spinning top *gyrates* when its speed slackens before it falls. As this disturbing force on the earth is small relatively to its mass, this turning takes place at the mean rate of only 50''·1 per annum. It requires, therefore, 25,868 years for the equinoxes to describe a complete circle on the ecliptic. For a very interesting case of the effect of precession, see POLE-STAR. In actual observation the effects of precession are complicated with those of Nutation (q.v.) and of change of inclination of the ecliptic.

Précieuses. See RAMBOUILLET.

Precious Stones. See STONES (PRECIOUS).

Precipitate Ointment is of two kinds, the *red* and the *white*. The former contains red oxide of mercury, the latter ammoniated mercury chloride, or white precipitate. In both cases great care is necessary that the mercury preparations are in a very fine state of division, and are intimately mixed with the ointment base. Both ointments are highly stimulating, and are of service in cutaneous eruptions. The *red* ointment is also employed in chronic conjunctival ophthalmia.

Precipitation, in Chemistry, is an operation in which decomposition occurs in a fluid, either through the action of the air, or of a gas, or of a chemical agent in solution; and is accompanied by the deposition of a solid substance that was previously held in solution or has been formed by chemical action.

Precognition. See CRIMINAL LAW (*Scots*).

Predella (Ital.), the step or ledge sometimes seen at the back of an altar; also the frieze or band of pictures along the bottom of an altarpiece.

Predestination, the eternal decree of God, whereby 'the elect' are foreordained to salvation. The correlative decree, whereby others are held to be foreordained to perdition, is commonly distinguished by the other term—Reprobation. The theory of predestination had its origin in the attempts of theological system to define the relations of the human and the divine will, and to reconcile the phenomena of human freedom with the belief in divine omnipotence. God's absolute will is represented by it as determining the eternal destiny of man, not according to the foreknown character of those whose fate is so determined, but according to God's own mere choice. They who are thus foreordained to eternal life are led to believe and live by the 'irresistible grace' of the Holy Spirit. In human salvation, therefore, God's will is everything, man's nothing. The principal scripture passage is Rom. viii. 29, 30. It was in the discussions between Pelagius and Augustine that the predestinarian view of the divine 'decree' was first fully evolved; and since their time opinion in the church has run in two great currents—the one perpetuating the influence of Pelagius,

who regarded that decree as subordinated to the divine foreknowledge of human character; the other that of Augustine, who maintained the absolutism of that decree, and its independence of all prior human conditions. Pelagius recognises a possibility of good in human nature; Augustine denied any such possibility apart from the influences of divine grace. The one held that the choice of salvation lay in man's will; the other that man's will had no active freedom or power of choice since the fall. In 529 the system of Augustine was established by the Council of Arausio (Orange) as the rule of orthodoxy in the Western Church; but the reaction against the strictly logical nature of his dogma has been perpetually manifested by representatives of the more humane, though perhaps less logical doctrine of Pelagius, in every period of the church. Gottschalk, a German monk of the 9th century, carried the doctrine to its most extreme development. The Thomists (see AQUINAS), as predestinarians, opposed the Scotists, though Thomists insisted that God willed the salvation of all and has provided the means. The reformers Luther, Zwingli, and Calvin were Augustinians, though the Lutheran doctrine as formulated by Melancthon is plainly different from that of Calvin and the Reformed Church. Some Jesuits are Congruists or modified Thomists; others admit that predestination to grace, but deny that predestination to glory, is irrespective of merit. Jansenism was a revival of Augustinianism. Arminius and the Synod of Dort mark a new period of the controversy. With such opposite representatives as Laud and Hales, a large part of the Church of England 'bade John Calvin good-night.' The followers of Wesley and Whitefield differed on this great doctrine. Even the Presbyterian churches, or large sections of them, have modified their high predestinarian doctrine in at least the statement of it. The common Augustinian doctrine of the Calvinistic symbolical books is called 'infra-lapsarianism'; moderate Calvinists or 'sub-lapsarians' hold that the fall of man (*lapsus*) was foreseen but not decreed by God (thus trying to avoid ascribing to God the origin of sin); while extreme predestinarians or 'supra-lapsarians' affirm that God not only foresaw and permitted, but decreed the fall of man, overruling it for good. Jonathan Edwards (q.v.) is a modern representative of rigid Calvinism. Catholics hold that the question is one rather of metaphysics than of faith.

See the article WILL and works there quoted, and the articles on Augustine, Pelagius, Calvin, Jansen, &c.; the theological handbooks of dogmatics; Luthardt, *Vom freien Willen* (1863); Forbes, *Predestination and Free-will* (1878); Canon Mozley, *Treatise on the Augustinian Doctrine of Predestination* (1878).

Predicables. This is a term in the scholastic logic connected with the scheme of classification. There were five designations employed in classifying objects on a systematic plan: *genus*, *species*, *difference* (*differentia*), *property* (*proprium*), and *accident* (*accidens*). The first two—Genus and Species—name the higher and lower classes of the things classified; a Genus comprehends several Species. The other three designations—Difference, Property, Accident—express the attributes that the classification turns upon. The Difference is what distinguishes one species from the other species of the same genus; as, for example, the peculiarities wherein the cat differs from the tiger, lion, and other species of the genus *felis*. The Property expresses a distinction that is not ultimate, but a consequence of some other peculiarity. Thus, 'the use of tools' is a property of man, and not a difference, for it flows from other assignable attributes of his bodily and mental organisation, or from the specific differences that characterise

him. The Accident is something not bound up with the nature of the species, but chancing to be present in it. Thus, the high value of gold is an Accident; gold would be gold though it were plenty and cheap. See CATEGORIES, GENERALISATION.

Pre-established Harmony. See LEIBNIZ.

Pre-existence. The notion that human souls were in existence before the generation of the bodies with which they are united in this world was anciently, and is still, widely spread throughout the East. The Greek philosophers, too, especially those who held the doctrine of transmigration, as the Pythagoreans, Empedocles, and even Plato—if with him transmigration is not simply a symbolical myth—were familiar with the conception. Plato taught that all human souls had existed from the very beginning, still and silent, in the realm of potentiality, and Origen introduced the theory into Christian theology. Among the early Christians the assumption of such pre-existence was connected with the belief that God had created the souls of men before the world, and that these were united with human bodies at generation or at birth. Another view long prevalent in the Western Church was that of Traducianism, according to which children received soul as well as body from their parents through natural generation. The third theory, which ultimately became that of the orthodox, was Creationism, according to which each soul is created successively. Almost every one is familiar in dreams, and even in a waking state, with a haunting sense of a want of reality in the common objects around, and a vague consciousness that everything one sees or hears has happened before, when we seem, in the words of Tennyson,

To lapse far back in a confused dream
To states of mystical similitude.

There is a striking expression of this experience in Sir Walter Scott's *Diary*, under 17th February 1828, and also an interesting allusion in *Guy Mannering*. And Wordsworth has given supreme poetical expression to it in his *Intimations of Immortality* (the germ of which will be found in a less known poem of Vaughan the Silurist). Direct intellectual interest in the doctrine of pre-existence has nearly ceased, yet the dream has again and again haunted individual thinkers. See M'Taggart, *Human Immortality and Pre-existence* (1915).

Prefect (Fr. *préfet*, from Lat. *præfectus*; see PRÆFECT), the administrative head of a modern French department (see FRANCE), whose duties correspond with those of the old *Intendant* before the Revolution.

Pregnancy. The first symptom which calls attention to the occurrence of pregnancy is usually absence of the menstrual flow. This may, of course, be suppressed by many other causes; and, exceptionally, may persist during the first few months of pregnancy. 'Quickening,' or the sensations experienced in consequence of the movements of the fetus, is usually noticed in the fourth month. Of the changes which take place elsewhere than in the generative organs the first and most noticeable is sickness, usually occurring in the early morning, and not persisting beyond the first three months. 'Longings,' or cravings for special, and sometimes very curious articles of diet, are not unusual. The heart becomes enlarged in order to provide the increased blood-supply necessary for the nutrition of the fetus. There is often an increased liability to toothache, fainting, and other disturbances of health; and not unfrequently the disposition is altered, and an unnatural fretfulness or irritability manifests itself. In some cases, on the other hand, the health is exceptionally good. The duration of pregnancy is, in the great majority of cases, about

275 days; but, as variations of a week or ten days in either direction are common, it is impossible to predict the exact date of delivery. Well authenticated cases have occurred where it has been prolonged to nearly 300 days. It may, of course, come to an end at any time prior to its proper term (see FŒTUS). There is a curious condition called *spurious pregnancy*, which may so closely simulate true pregnancy in all its main features as entirely to deceive the patient as well as others. It is generally associated with Hysteria (q.v.) or some allied mental disturbance (see MARY I., and SOUTHCOTT). A careful examination enables a medical man to detect the mistake; but it may be difficult to persuade the patient and her friends of it. As a work of reference for others than specialists, Chavasse's *Advice to a Wife on the Management of her Health* (1842; new ed. 1915) may be recommended, and for nurses, Johnstone's *Text-book of Midwifery* (5th ed. 1926).

CONCEALMENT OF PREGNANCY is a criminal offence, or rather it is taken to be the main proof of the offence of concealing the birth of a child in certain circumstances. See BIRTH.

Prehnite, a hydrous silicate of alumina and lime. It differs from zeolites in yielding water only at a red heat. It is a widely diffused mineral, and, although first discovered at the Cape of Good Hope, has been found in great beauty in some places on the continent of Europe and in Scotland. Prehnite exhibits a great variety of forms, being found in crystals in fan-shaped and cockscomb-like groups, granular, reniform, fibrous, &c. It is sometimes colourless, but more generally greenish, and sometimes yellowish. It occurs, as a product of the alteration of various silicates, in veins and cavities chiefly in basic igneous rocks, such as dolerite and basalt. Less commonly it is met with under similar conditions in granitoid and schistose rocks, and occasionally in lodes associated with copper.

Prelate (Lat. *prælatus*, 'one set over'), in Church law, is the name given to the holders of those higher dignities in the church, to which, of their own right, is attached a proper jurisdiction, not derived by delegation from any superior official. In this sense the name comprises not only prelates of the first class, as bishops, but also the heads of religious orders, abbots or priors of religious houses, and other similar ecclesiastical dignitaries. In the pope's court and household many of the officials, although not possessing episcopal or quasi-episcopal jurisdiction, have the insignia and title of prelate; and these honours are frequently bestowed on clergy whose duties keep them far from Rome.

Prelude (Lat. *præ*, 'before,' and *ludo*, 'I play'), the introductory movement of a musical work (see INTRODUCTION). The first movement of a suite was usually a prelude; and the term is especially associated with the pieces prefaced by Bach to his celebrated clavichord and organ fugues. It has also been applied, without special significance, by Chopin to his collection of short pieces, op. 28. Its form is indeterminate, but the piece is always in the same key as that succeeding it.

Premature Interment. See BURIAL.

Premature Labour. See ABORTION, FŒTUS, BIRTH.

Premier. See TREASURY, CABINET.

Pre-millenarians. See MILLENNIUM.

Premonstratensians (called also NORBERTINES), an order of regular canons, founded by St Norbert, a canon of Cleves, in 1119, at a place in the forest of Coucy, pointed out in a vision, and thence called Prémontré (Lat. *Pratum Monstra-*

tum, 'the meadow pointed out'). Their habit was white, hence in England they were commonly called the White Canons. Norbert organised his new order, which was substantially a branch of the Canons Regular of St Augustine, as well with a view to the sanctification of the members as to their usefulness in effecting the reformation of the age. Himself a man of remarkable piety and austerity of life, his rule is a return to the primitive fervour of the monastic institute; and the great work which he proposed for his brotherhood, in addition to the daily choral services of the church, was the practical instruction of the people, and the direction of consciences in the confessional. It was taken up with ardour, and spread rapidly in France and the Low Countries, and afterwards—on Norbert's being chosen, in 1127, Archbishop of Magdeburg—in Germany; the abbot of the mother-house at Coney, however, retaining the rank of general and of superior of the entire order. In 1512 all the abbeys in England and Wales were placed under the Abbot of Welbeck. There, just before the dissolution, were thirty-five houses; in Scotland there were six, one of them Dryburgh. It does not seem at any time to have made much progress, or at least to have established many houses, in Italy or Spain. In the same spirit of reformation Norbert established an order of nuns, which attained to equal success. Hélyot states that at one time there were as many as a thousand Premonstratensian abbeys, besides provostships and priories, and 500 houses of nuns, mostly in France, Germany, and the northern kingdoms. Lecuy, the last abbot of Prémontré, died so late as 1834. The abbeys were proscribed at the Revolution, and even in Germany, Belgium, and Austria there remain only miserable fragments of their former splendour, though the 20th century has seen a revival.

Prentice Pillar. See ROSLIN.

Prenzlau, or PRENZLOW, an agricultural town of Prussia, stands at the northern end of Lower Lake Ucker, 67 miles by rail NNE. of Berlin. It has a beautiful Gothic church (1325-40). Pop. (1925) 21,565.

Pre-Raphaelitism. English art of the 18th century had in its genesis one national peculiarity. There being no demand for it from church or state, it had to find its patrons (i.e. its means of existence) in the wants of the people. Hogarth, the first distinctly national subject-painter, found his themes in the social manners of his day, which were valued by the true instinct of the common people. Portrait-painters of national origin there had been before his time, but these, good and bad alike, had been followers of foreign masters introduced by the court and supported by its patronage. That art other than architecture was not necessarily an exotic in England is proved convincingly by the many beautiful examples of monumental portraiture produced by native workmen before the Wars of the Roses. The bronze effigies of Henry III. and Queen Eleanor in Westminster Abbey were executed by William Torel, citizen of London, in 1291-92, and those of Richard II. and Queen Anne of Bohemia by Nicholas Broker and Godfrey Prest, coppersmiths and citizens of London, in 1395-97. Austin of London furnishes an excellent and later example of this in his monumental tomb in the Beauchamp Chapel, Warwick. Those wars, followed as they were by the Reformation and in quick succession by the parliamentary troubles, smothered native art and necessitated the calling in of foreign aid; for it must be remembered that under the happiest conditions a native artist cannot be produced in less time than a full generation.

Hogarth having once arisen with full daylight

of an independent inspiration, it was no longer possible for the mannered reproductions of the imitators of Kneller and Lely to satisfy the spirit of an age now awakened from its long sleep. Hogarth at first gained a footing by portraiture, and when later he devoted himself to subject-pictures he found a poor support by the sale of his engravings to the strictly middle classes. Amongst the wealthy there were two incentives to interest in art, one of these being found in ancestral dignity, the other in that love of sport so indelibly stamped upon English character. Sir Joshua Reynolds and Gainsborough arose, inspiring portraiture with their own precious grace and loveliness; animal-painters now well-nigh forgotten (such as Stubbs and his fellows) satisfied the latter; and Wilson as a landscape-painter made a heroic effort to graft upon the sportsman's instinct a larger love of nature. It has always been regarded as fortunate that at this time the reigning monarch, George III., declared his interest in the higher aims of art, an interest which expressed itself first in the establishment of the Royal Academy, and later in the patronage of Benjamin West for subjects of an exalted character. Although it is just that many of the works of this painter have since suffered a reversal of judgment, his picture of the 'Death of General Wolfe' will always remain a noble illustration of English history, largely justifying the king's favour. The great war for supremacy which at that time absorbed the nation's life, together with the almost ruinous debt then contracted, made further royal patronage impossible. It is easy now for any thoughtful person to trace how the high standard originally set was largely instrumental in sustaining the character of the art that followed. Its effects may be seen in the noble nature of the best works of Romney, Copley, Raeburn, Opie, Girtin, Blake, Lawrence, Stothard, Constable, Wilkie, Haydon, De Wint, Crome, Turner, Leslie, and not less in the decorative designs of houses by the Adams brothers, in Wedgwood ware, in gold and silver work, and in furniture.

It is rarely that any cause for rejoicing may be found in the disastrous war of the beginning of the 19th century, but undeniably it did great things for the strengthening of English character, and this was the case in no direction more surely than in that of art. When in the peace of 1814 the Continent was thrown open, it is noted by three great painters, Haydon, Leslie, and Constable, that England stands supreme in painting among the nations, and this verdict was endorsed by the judgment of many able foreigners. The selection of Sir Thomas Lawrence to paint the members of the Holy Alliance is a convincing proof of this opinion, and the recognition of Constable by France in 1820 is further evidence to the same effect. But alongside of virtuous influences there had been at work a deadly academic dogma which the few far-seeing of that generation recognised as threatening destruction to the still struggling English school, an influence which had already completely destroyed decorative design. To glance at the members' lists of exhibitions of that day and to recognise how many then held great are now perfectly unknown, brings this to the proof. These painters were creatures of orthodox rule, line, and system, seeing whose influence Constable in 1821 prophesied 'in thirty years English art will cease to exist.' Following up this forecast of the great landscape-painter, Leslie thirty years later finds the fulfilment of Constable's prediction in the death of Turner.

It remained for the young generation to find out what lay at the root of the decay and also its remedy. How to get free from the prejudice which blinds the eye to established errors is the prelim-

inary problem to effecting all reformation. The attempt made in Germany in the beginning of the century to cultivate what was called 'Early Christian Art,' was participated in by W. Dyce, D. MacIise, and a few other artists in England. But for youthful seekers after a perfect method these efforts, even where they expressed much of English individuality, were not unbouedly promising, because they lacked the full inspiration of nature. One of the earnest young students of the day was William Holman Hunt, who, already feeling his way as a practical painter, was led by circumstances to study in exceptional degree the works of the greatest old masters, and he perceived that in every school progress ended when the pupils derived their manner through dogmas evolved from artists' systems rather than from principles of design taught by nature herself. He determined therefore, for his own part, to disregard all the arbitrary rules in vogue in existing schools, and to seek his own road in art by that patient study of nature on which the great masters had founded their sweetness and strength of style. Without any idea of 'forming a school,' but for his own development alone, he began to study with exceptional care and frankness those features of nature which were generally slurred over as unworthy attention; and to this purpose he found most timely encouragement in the enthusiastic outburst of Ruskin's appeal to nature in all vital questions of art criticism, as expressed by him in *Modern Painters*.

At this period an increasing intimacy was cemented between W. Holman Hunt, aged nineteen, and John Everett Millais, who was already at the age of seventeen the precociously efficient medal student of the Royal Academy and an emulator of the pseudo-classical Etty. This youthful friendship led to frequent consultations over the needs of the growing generation of artists, and Millais declared his confidence in the closer study of nature, which he determined to adopt as soon as work to which he was committed should be completed.

Dante Gabriel Rossetti was at this time also fascinated by the newly-revived principle of patient striving after nature, but he had not yet become a practical painter, and there was no certainty that he would do so. He had, before his intimacy with Holman Hunt, begun the study of art under Ford Madox Brown, a painter who had distinguished himself by some of the most admirable contributions to the Westminster Hall competition, works which Rossetti had the independent good sense to admire. In the year 1848 (when Holman Hunt was engaged on a picture of *Rienzi*, of which he had already completed the painting of the landscape from nature, and other complicated preparatory work) D. G. Rossetti placed himself with Holman Hunt in his studio in Cleveland Street, where he followed a course of study specially devised for him by the older student to enable him to cope with the difficulties of a picture undertaken in pure experiment, in which finally he triumphed; this picture is now well known as 'The Girlhood of the Virgin.'

Millais, on his part, forthwith took for his first subject to be treated on the new principles a design from Keats's *Isabella*. This was originally intended for one of a series of etchings which the three, now formed into a band called the Pre-Raphaelite Brotherhood, had undertaken to publish. It is the justly famous picture now in the Liverpool Art Gallery.

The three artists, as representing the Pre-Raphaelite body, appeared in the exhibition season of 1849, Millais with 'Lorenzo and Isabella,' Holman Hunt with 'Rienzi,' Rossetti with 'The Girlhood of the Virgin,' and excited the most flattering atten-

tion; but by the following year a storm of enmity of the most bitter kind was raised against them. Their pictures this second year were 'Christian Priests Escaping from Druid Persecution,' by Holman Hunt; 'Christ in the House of his Parents,' by Millais; Rossetti's picture of the 'Annunciation' he exhibited (as he had done with his picture of the previous year) at another exhibition than the Academy. Many journals now joined the onslaught upon the three young artists, but undeniably the most damaging attack was one made by Charles Dickens in *Household Words*. (From this date to his life's end Rossetti discontinued public exhibition.) With this attack the bitter feeling against the young men so increased that in the following year (1851) one influential journal advocated that their pictures should be removed from the walls of the Royal Academy a few weeks after the opening of the exhibition. Thus, in the third year of its joint existence, the new school was threatened on all hands by powerful opponents, when there appeared in the *Times* three letters from Ruskin denouncing the spirit of jealousy and injustice with which the young men had been assailed. He pointed out the merits of the works and the great influence for good which the revival was likely to exercise upon the English school. Later followed a succession of pictures from the hands of the three young painters, works the titles of which have become familiar throughout England.

Among the works of Holman Hunt are 'Rienzi' (1849), 'Christian Priests Escaping from Druid Persecution' (1850), 'Two Gentlemen of Verona' (1851), 'Claudio and Isabella' (1853), 'Strayed Sheep' (1853), 'Light of the World' (1854), 'Scapegoat' (1856), 'Finding of Christ in the Temple' (1860), 'Isabella and the Pot of Basil' (1867), 'Christ the Carpenter' (1874), 'The Triumph of the Innocents' (1885). Amongst those of J. E. Millais are 'Isabella' (1849), 'Christ in the House of his Parents' (1850), 'Ferdinand lured by Ariel' (1850), 'The Huguenot' (1852), 'Ophelia' (1852), 'The Order of Release' (1853), 'L'Enfant du Régiment' (1855), 'Vale of Rest' (1859), 'Autumn Leaves' (1865), 'Chill October' (1870), 'A Flood' (1870). Amongst those of D. G. Rossetti are 'The Girlhood of Mary Virgin' (1849), 'The Triptych. Llandaff Cathedral' (1856), 'Giotto painting the Portrait of Dante' (1859), 'Mary Magdalene at the Door of Simon the Pharisee' (1861), 'Beata Beatrix' (1865), 'The Blessed Damozel' (1877), 'La Donna della Finestra' (1879), 'The Day Dream' (1880), 'Dante's Dream' (1881), 'Found,' 'Proserpine' (1882). Many of these pictures exist in replica.

Rossetti makes reference to many of his pictures in his sonnets. The title Pre-Raphaelite was adopted not without some sarcastic spirit intending to reflect upon the use of the name of the prince of painters by artists of the day to justify their own flimsy and un-Raphaelic art; but it had also a more serious justification in the conviction that Raphael's latest style, having been adopted, as that of an emulator, from the system built up with slow effort by Michael Angelo and Leonardo da Vinci, did not at last altogether escape those marks of decadence entirely unknown in the works of his immediate forerunners. This defect the seekers after the second Renaissance traced to the remoteness of Raphael from those influences of the training of humility which the study of nature had directly or indirectly given in full measure to Michael Angelo and Leonardo da Vinci. The first pictures of the new school had upon them, together with the initials of the painters, the letters P.R.B., meaning Pre-Raphaelite Brotherhood; when public hostility became highly injurious (the meaning of the letters having been revealed, contrary to the original intention) this practice was abandoned.

Besides the three working founders, some few friends were enrolled as hopeful converts, with the idea that they would assist the movement.

These were James Collinson and Thomas Woolner among artists, W. M. Rossetti, brother of the painter, and F. G. Stephens, who followed other professions than art. There can now be little question that the Pre-Raphaelite school has exercised a powerful influence upon modern art; whether it has done so to the extent hoped for by its promoters lies with the future to reveal. One ambition which it had from the beginning was the restoration of decorative art; this has been much retarded by the hindrances of opposing forces; still, a great movement, clearly traceable to the revival, has taken place. There is no question that many established painters of the time were beneficially affected by the new impulse, but still more was this the case for the men who followed them. Unfortunately for the school, its recognition came too late for it to profit by the temporary patronage of art extended by government in the decoration of the Houses of Parliament, for which all the commissions were bestowed before the Pre-Raphaelite school could claim attention; their work, therefore, has been confined to the limits of private patronage, which for the poetic and ambitious art they aimed at is too limited a sphere. Works of national importance are the only entirely appropriate field for the highest efforts.—W. H. H.

[With the above article by Holman Hunt, compare the same writer's work, *Pre-Raphaelitism and the Pre-Raphaelites* (1913); Sizeranne, *La Peinture Anglaise Contemporaine* (trans. 1898); Destrée, *Les Préraphaélites* (1894); Bate, *The English Pre-Raphaelite Painters* (1899); also the articles in this work on ROMANTICISM, and on ROSSETTI, MILLAIS, HOLMAN HUNT, and the other artists mentioned.—ED.]

Prerogative, ROYAL. See DIVINE RIGHT, PARLIAMENT, SOVEREIGN, PARDON, REPRIEVE.

Prerogative Court, in England, was the court wherein all wills were proved and administrations taken out. It was so called because it belonged to the prerogative of the archbishop to take charge of these matters, which formerly fell under ecclesiastical superintendence. Hence there was a Prerogative Court for the province of Canterbury and another for the province of York. This jurisdiction was entirely taken away in 1858 from the ecclesiastics, and transferred to a new court called the Probate Court. See PROBATE.

Presburg (Ger. *Pressburg*, Czech *Bratislava*, Hung. *Pozsony*), a town of Czechoslovakia, stands on the left bank of the Danube, 40 miles by rail E. by S. of Vienna and close to the Austrian and Hungarian frontiers. It is backed by the spurs of the Little Carpathians, and is a pleasant town. Its principal buildings are the cathedral, a Gothic edifice of the 13th century (restored in the middle of the 19th), in which the kings of Hungary used to be crowned; the church of the Franciscans (1290-97); the town-house (1288), with a natural history collection; the parliament house, in which the Hungarian representatives used to meet until 1848; and some private houses. The royal castle (1645) was destroyed by fire in 1811, and is now a ruin. The university was founded in 1919 to take the place of the Hungarian university of 1914. Presburg's position on the Danube (with a new harbour), and on a network of canals and railways, favours its development as a centre of international trade. Pop. 93,000. Presburg grew to be a prominent town during the 11th and 12th centuries, and was frequently chosen for conferences and meetings between the rulers of Austria and Hungary. From 1541 (when the Turks seized Buda) down to 1784 it was the capital of Hungary. The town was taken by Bethlen Gabor in 1619, by the Austrians in 1621, and was bombarded by Davout in 1809. Here on 26th December 1805

Napoleon concluded a treaty with the emperor after the battle of Austerlitz.

Presbyopia (Gr., 'old sight'), a change in the power of vision, not usually noticed till about forty-five years of age, when near objects come to be less distinctly seen than those at a distance. See EYE.

Presbyterianism. The name Presbyter is from the Greek *presbyteros*, 'elder.' The elders formed one division of the great council of the Jews, with the priests and scribes (Mark, xiv. 43); and every synagogue had its body of ruling elders (Luke, vii. 3, viii. 41). From these the name and some portion of the duties were transferred to the Christian church. We have no record of the first appointment of elders, but we find them as recognised rulers in the church of Jerusalem so early as the year 44 (Acts, xi. 30). The duties entrusted to them are these: (1) They had charge of the collections for the poor which were sent by the hands of Barnabas and Saul (Acts, xi. 30). (2) They are specially named as taking part in the council which was held at Jerusalem about the year 51 (Acts, xv. 2), and at the meeting of the church there when Paul reported his success among the Gentiles (Acts, xxi. 18). (3) They took part in the ordination of Timothy (1 Tim. iv. 14). (4) They were the pastors and bishops of the congregations. Thus the apostle Paul, addressing the elders of Ephesus, says, 'Take heed . . . to all the flock over which the Holy Ghost hath made you overseers (bishops) to feed the church of God' (Acts, xx. 28). And writing to Timothy, he says, 'Let the elders that rule well be counted worthy of double honour, especially they who labour in word and doctrine' (1 Tim. v. 17). Elders also are found in all the churches. We have seen them in the mother-church of Jerusalem; and when Paul and Barnabas went forth on their first missionary journey, about the year 46, they ordained elders in every church (Acts, xiv. 23). Accordingly we find them in Ephesus about the year 60 (Acts, xx. 17), and in the same city a few years later (1 Tim. v. 17, with chap. i. 3), and in Crete. Titus is commanded 'to ordain elders in every city' (Tit. i. 5). These are the scripture facts on which the system of Presbyterianism as a government by elders is based. It does not recognise the bishop as the superior of the presbyter, for they were originally two names of the same persons. Thus in Titus, i. 5, 7, the apostle writes, 'Ordain elders in every city . . . for a bishop must be blameless,' and in Acts xx. those who in verse 17 are termed elders in verse 28 are termed bishops. On the original identity of the bishop and presbyter Bishop Lightfoot says, 'It is a fact now generally recognised by theologians of all shades of opinion, that in the language of the New Testament the same officer in the church is called indifferently bishop (*episkopos*) and presbyter.' There are two instances in which the term 'bishop' occurs apart from his being described as 'elder,' just as there are many examples of the elder being mentioned without his being termed bishop (Phil. i. 1; 1 Tim. iii. 2). In the writings of Clement of Rome, about the end of the 1st century, there is the same identity between the elder and the bishop; but from this period onwards the distinction between the two begins to appear, though Jerome in the 4th century writes: 'Among the ancients bishop and presbyter are the same, for the one is a term of dignity, the other of age.' See the articles BISHOP, CHURCH HISTORY, ORDERS (HOLY).

It used to be claimed that Presbyterianism survived in the ancient Celtic Church; but the Celtic polity, though differing widely from diocesan Episcopacy, was very, unlike Presbyterianism (see

IRELAND, SCOTLAND, COLUMBA, CULDEES). The Waldenses (q.v.) were perhaps anti-episcopal. But Presbyterianism as we know it first asserted itself at or after the Reformation, when earnest attempts were everywhere made to restore to the church primitive doctrine and form. In Germany, France, and the Continent, from the relationship of church and state, its free development was prevented (see CONSISTORY). It was Calvin (q.v.) in Geneva who, though not its originator, gave Presbyterianism the form which, with modifications, it has ever since retained. It occupies a middle position between diocesan Episcopacy and Congregationalism, and may be styled ecclesiastical republicanism. The congregation elects its own minister and elders, and by deacons or managers regulates all its financial affairs. The session, consisting of the minister and elders, has the spiritual oversight of the congregation. The ministers, with one or more elders from each congregation, constitute the presbytery (formerly sometimes called *classis*) of a defined district, having a general superintendence of the congregations; to it appeal may be made from congregations or sessions. Some churches still retain as part of the regular organisation the synod, consisting of a number of presbyteries in a province, and a court of appeal from presbyteries; other churches dispense with this intermediate court. The General Assembly or General Synod is the highest court, and consists of all the presbyteries or their representatives.

Presbyterianism was for a short time dominant in England, but is now most fully represented in Scotland, the north of Ireland, the British Dominions, and the United States. 'The alliance of the Reformed Churches holding the Presbyterian System' was founded at London in 1875, and has held 'Pan-Presbyterian' councils in different parts of the world, meeting every four years, with the exception of the war-period 1914-18. All churches are eligible 'having a creed in harmony with the consensus of the Reformed Confessions.'

England.—The principles of the Puritans (q.v.) were essentially Presbyterian, although many of them were so much occupied with questions of doctrine and discipline, and with resistance to power exercised, as they believed, contrary to the word of God, that they paid little heed to the development of their principles in church government. Yet in 1572 a presbytery was formed at Wandsworth, in Surrey, by ministers of London and its neighbourhood, separating from the Church of England; and other presbyteries were soon formed, notwithstanding the extreme hostility of Queen Elizabeth. When the Westminster Assembly met in 1643 the Puritans of England were generally inclined to adopt Presbyterianism as their system of church government, although some still preferred a modified Episcopacy, and some had adopted the principles of Independency or Congregationalism. The Presbyterians were, however, the strongest party at the beginning of the Civil War, although the Independents gained the ascendancy afterwards. The establishment of Presbyterian church government in the Church of England was voted by parliament (the Long Parliament), 13th October 1647; but it was never really established. The influence of the Independents prevented it. London and its neighbourhood were, meanwhile, formed into twelve presbyteries, constituting the Provincial Synod of London, which continued to hold regular half-yearly meetings till 1655, the meetings of presbyteries being continued till a later date; but the whole Presbyterian system was overturned by Cromwell's Committee of Triers, appointed for the examining and approving of all persons elected or nominated to any ecclesiastical office. Cromwell's policy aimed at bringing all ecclesiastical matters

under the immediate control of the civil power. The Restoration was followed by the fruitless Savoy Conference (q.v.), and soon after by the Act of Uniformity, which came into force on 24th August 1662; and on that day about 2000 ministers in England and Wales resigned their benefices, or submitted to be ejected from them, for conscience' sake. The first Nonconformists were mostly Presbyterians, but a small minority of Independents among them prevented the institution of a regular Presbyterian system, and the consequence was that the Nonconformists of England became in general practically Independent. Antinomianism and Arminianism soon appeared among them, and were followed by Socinianism or Unitarianism to such an extent that the name *Presbyterian* became synonymous in England with *Socinian* or *Unitarian*; old endowments, legacies of Presbyterians, being in many instances enjoyed by Unitarians. Meanwhile, there sprang up in England a few congregations connected with the Church of Scotland, and with the 'Secession Church' (see UNITED PRESBYTERIAN CHURCH). The number of such afterwards very much increased. At the time of the formation of the Free Church of Scotland (q.v.) the greater number of the English Presbyterian churches connected with the Church of Scotland sympathised with the cause of the Free Church, and took the name of the Presbyterian Church in England. In 1876 a union, which had been long desired, was consummated between the synod more intimately related to the Free Church of Scotland and the congregations belonging to the United Presbyterian Church. The name assumed by the united church is the Presbyterian Church of England, which in 1925 had over 85,000 adherents and 360 ministers.

Scotland.—The Presbyterian Churches of Scotland are separately treated in the articles SCOTLAND (*Church History*), FREE CHURCH OF SCOTLAND, UNITED PRESBYTERIAN CHURCH, UNITED FREE CHURCH, and CAMERONIANS. The most important are the Church of Scotland with over 1800 ministers and 780,000 communicants, and the United Free Church with over 1600 ministers and 535,000 communicants. Since 1907 negotiations for union between these two churches have been on foot.

Ireland.—The Irish Presbyterian Church originated in the settlement of Ulster by Scottish colonists during the reign of James I. After various struggles a Presbyterian church was founded by the formation of a presbytery at Carrickfergus in 1642. The Presbyterian population of Ulster was greatly increased in number by immigration from Scotland about the middle of the 17th century; and, notwithstanding many difficulties, from the opposition of prelates and of the civil power, the church continued to increase. It is a curious fact that the Presbyterian ministers received a pension from government, under Charles II., in 1672, which *Regium Donum* (q.v.), however, was not regularly paid until the reign of William, when it was augmented, although only to the paltry amount in all of £1200 a year. It was afterwards repeatedly augmented, till it reached the amount of £70 for each minister. A seminary for the education of ministers was erected at Killaleah; and in 1710 the synod of the Presbyterian Church resolved to institute the preaching of the gospel to the Irish in their own language. During this period of its history the Irish Presbyterian Church experienced the utmost opposition from the High Church party. Afterwards dissensions sprang up within it, and these with reference to the most important doctrines. A body opposed to the doctrine of the Westminster Confession of Faith was organised as the Presbytery of Antrim. But the doctrine of the Westminster Confession was more and more

departed from the Irish Presbyterian Church itself, which became to a large extent Arian or Unitarian. In 1830 a separation took place from the Arians, who then formed the *Remonstrant Presbytery of Ulster*. In 1840 a union took place of the Irish Presbyterian Church forming the *Synod of the Ulster and Secession Church of Ireland*, an offshoot of the Scottish Secession Church, which then reckoned 141 congregations in the north of Ireland. The Irish Presbyterian Church, adhering to the Westminster Confession, has not only displayed much zeal for the advancement of Protestantism in Ireland, but also of Christianity in other parts of the world. The act disestablishing the Irish Church in 1869 provided also for the discontinuance of the *Regium Donum* to the Presbyterians, with reservation of annuities for life to ministers already entitled to it; and further gave power for commutation of annuities for a capital sum, of which advantage was taken to a very large extent, so that a fund was formed for paying annuities and leaving a large surplus as the nucleus of a Sustentation Fund for the ministers. The Presbyterian Church in Ireland comprises about 600 ministers and 109,500 communicants.

United States.—The first Presbyterians in America were emigrants from Scotland and Ireland. The first Presbyterian congregations in America were organised in Maryland before the close of the 17th century—the oldest that of Rehoboth, dating about 1690, and a synod, consisting of four presbyteries, was constituted in 1716. Dissensions ensued; but in 1758 the American Presbyterian churches were united in one; and in 1788 a General Assembly was instituted, the whole number of congregations being then 419, and of ministers 188. The increase of the church was rapid, and in 1801 a scheme of union was adopted between Presbyterians and Congregationalists, under which hundreds of congregations were formed in the state of New York and elsewhere. About the beginning of the 19th century the Cumberland Presbyterians (q.v.) separated from the main body; and in 1838 the American Presbyterian Church was divided into two great sections, commonly known as *Old School* and *New School* Presbyterians, the former holding high Calvinistic doctrines, the latter a somewhat modified Calvinism. They re-united in 1869, notwithstanding the dissensions and new divisions caused by the struggles between the Northern and Southern States on the question of slavery, forming the Presbyterian Church in the United States of America. The Southern sections had meanwhile formed the Presbyterian Church in the United States. One half of the Cumberland Presbyterians united with the former in 1906, the other half remaining independent. A revision of the Confession has been carried out since 1890. There are several other Presbyterian churches in the United States, each having its own theological seminaries and colleges, such as the Reformed, the United Presbyterian, the Reformed Dutch and German. In 1923 there were more than 15,000 Presbyterian churches altogether with two and a half million members.

British Dominions.—By the middle of the 18th century Presbyterian ministers were labouring in Nova Scotia and Quebec, the various divisions of the home churches being represented at an early stage; but most of the early ministers came from the Secession Church. A union between the sections representing the Free and United Presbyterian Churches took place in 1861, and in 1925 a union between the Canadian Presbyterian, Methodist, and Congregational Churches (though this union left behind about 150,000 dissidents, who decided to continue as the Presbyterian

Church of Canada). Presbyterians in Canada number altogether about 1,400,000, and in Australia, New Zealand, and South Africa about 660,000, 300,000, and 190,000 respectively. See the articles on the various dominions.

On Presbyterianism, as against Episcopacy and Independency, see, in the 17th century, works by Gillespie, Lutherford, Bailie, 'Smectynnuus,' Byfield, Baxter, Clarkson; in the 18th, Welles, Hall, John Brown, Whytock; in the 19th, Barnes (1835, 1840, 1843), Miller (1842), Smyth (1843), and King (1854); also Macpherson, *Presbyterianism* (1843); Bannerman, *Worship of the Presbyterian Church* (1854); Janet G. Macgregor, *The Scottish Presbyterian Polity* (1926); histories by W. Stephen (1894-96) and J. Macpherson (1901); W. M. Macphail, *The Presbyterian Church* (1908); Lord Balfour of Burleigh, *Historical Account of Presbyterianism in Scotland* (1911); J. N. Ogilvie, *Presbyterian Churches of Christendom* (1925). See also CALVIN, KNOX, ASSEMBLY (GENERAL), ELDER, CHURCH HISTORY, REFORMATION, CONFESSIONS, WESTMINSTER ASSEMBLY. For Presbyterian missions, see MISSIONS. For Presbyterianism in England, see Madrie, *Annals of English Presbyterianism* (1872); Drysdale's *History of the Presbyterians in England* (1889); W. A. Shaw, *The English Church during the Civil War* (1900); K. M. Black, *The Scots Churches in England* (1906). For Ireland, see IRELAND; also Reid, *History of the Presbyterian Church in Ireland* (1867); Irwin, *Irish Presbyterianism* (1890). For America, see Webster, *History of the Presbyterian Churches in America* (1857); Gillett, *History of the Presbyterian Church in the United States* (1864); *American Presbyterianism* (1885).

Presbytery. For presbytery as a part of Presbyterian church government, see the preceding article. In ecclesiastical architecture the presbytery is the space in the choir of a church in which the high altar is placed; the name is sometimes extended to the whole choir.

Prescot, a manufacturing town of Lancashire, 8 miles E. by N. of Liverpool. To manufactures (introduced from Yorkshire in 1730) of watch-movements, watch-tools, small files, &c., have been added the making of electric cables, bookbinding, and printing. Prescot was the birthplace of John Kemble. Pop. 9900.

Prescott, a city of Arizona, till 1891 the capital, lies in a picturesque mountain-valley, some 5000 feet above sea-level, 80 miles N. by W. of Phoenix. Gold, copper, and silver are extensively mined. The industries include stock-raising, lumbering, and irrigation farming. Pop. 5000.

Prescott, WILLIAM HICKLING, historian, was born at Salem, Massachusetts, May 4, 1796. His father was a prosperous lawyer; his grandfather, Colonel William Prescott (1726-95), was a distinguished soldier in the Revolution, to whose memory a statue was erected on Bunker Hill in 1881. He entered Harvard College in 1811, and graduated in 1814. Early in his college course he had his left eye blinded by a piece of bread playfully thrown by a fellow-student, and the other was soon sympathetically affected, so that he was obliged to live for months in a darkened room. He next travelled in England, France, and Italy, married in 1820, and abandoned the study of law for literature. He now devoted himself to severe study, and formed splendid literary projects, in spite of the grievous disadvantage of being able only to use his remaining eye for brief periods. His first studies were in Italian literature, and it was not till the beginning of 1826 that he had found the work of his life within the range of Spanish history. Fortunately his means were ample, so that he was able to procure the services of assistants, and to live amid conditions of comfort. By constant habit he gained the power of carrying a great deal in his memory, and after he had revolved the whole of a chapter in his mind he quickly transferred it to paper by means of his

stylus and an ingenious writing-case specially constructed for the blind. His first secretary knew no Spanish, yet he went through the seven quarto volumes of Mariana's History with him. So he laboured with almost unexampled courage and patience at his *History of Ferdinand and Isabella* (3 vols. Boston, 1838), which quickly carried his name across the ocean to the Old World, and was straightway translated into French, Spanish, and German. He next devoted six years to the *History of the Conquest of Mexico* (3 vols. 1843), and four years to the *Conquest of Peru* (2 vols. 1847). These works deservedly brought him a great reputation; he was chosen a corresponding member of the French Institute, and on a visit to Europe in 1850 was received with the highest distinction. In 1855 he published two volumes of his *History of Philip II.*, and a third volume in 1858, but died of apoplexy before its close at Boston, January 28, 1859. Prescott's style alone would have assured him popularity, and to this day he remains unrivalled among English historians for vigorous and direct narrative and for sustained splendour of colour. His imagination worked all the more freely because he saw but with the inward eye, and the splendid visions that it wove gave his pages the vivid colours of reality and life. He is not a philosophical historian, but he is a master of narrative and incident, and there is not a dull passage in all his histories.

See the complete edition of Prescott's works in 22 volumes, ed. Munro (1904); and the Life of him by George Ticknor (1864; new ed. Lond. 1875). There are also books by Ogden (1905) and Peck (1905).

Prescription is the written direction given by physician or surgeon to the chemist, and may demand an official or an extemporaneous compound. Official compounds (or preparations, as they are frequently termed) are those for which formulæ are introduced into the national pharmacopœias, and are therefore supposed to be always at hand in the laboratory of the dispensing chemist (such, for example, as *Mistura Ferri Composita*, *Pulvis Ipecacuanhæ Compositus*—i.e. Dover's Powder—*Confectio Sulphuris*, &c.); while extemporaneous compounds are those which are devised on the instant with the view of meeting the various peculiarities which almost every case of disease presents. In some cases, where no chemical action is apparent or probable, a mixture of two or more drugs seems to modify the physiological effect of each ingredient. For example, Dover's Powder contains as its active ingredients ipecacuanha and opium, and yet in well-regulated doses it neither exhibits the nauseating properties of the former nor the narcotic influence of the latter substance. The selection of the most eligible form of the remedy is of extreme importance. The physician here has to determine whether he shall prescribe his remedy in the form of pill, powder, or mixture; whether he shall administer it as an injection into the lower bowel; whether the patient shall (in certain cases) inhale it; &c. As a general rule we should accommodate the form and flavour of our remedies, provided we do not sacrifice their virtues, to the taste of the patient, who usually prefers pills to draughts or powders. The unpleasant taste of many medicines which must be given in the fluid form may often be obviated by the skill of the prescriber. Castor-oil, cod-liver oil, and copaiba are most easily taken on the surface of orange-wine, or water containing a bitter tincture. The taste of solution of potash and of lime-water is best covered with milk. Unpleasant drugs are now frequently given either in gelatine capsules or in rice-paper cachets, which dissolve in the stomach; and small powders are often for convenience compressed into the form of tablets.

In conclusion it may be remarked that it is the custom to write prescriptions in the Latin language, to abbreviate well-known words, to use symbols for weights and measures, and to commence each prescription with the symbol *R*, which signifies *Recipe*, 'take.' As an illustration, we append a prescription for a tonic draught (where *f. 3* stands for fluid ounce; *f. 3* for fluid drachm; *℥* for minim; *gr.* for grain; *M.* for *misce*, 'mix'):

(Name of Patient.)

<i>R</i> Quinin. Sulph.,	<i>gr.</i> j
Tinct. Calumbæ,	<i>f.</i> 51
Acid. Sulphuric Dil.,	<i>℥</i> x
Syrup. Aurant.,	<i>f.</i> 3iss
Infus. Calumbæ,	<i>ad f.</i> 5j

M. Fiat Haustus ter quotidie sumendus.

Date.

(Initials or name of prescriber.)

As a parallel to this retention in western Europe of a mediæval usage, it may be mentioned that in the palmy days of the republic of Athens the Attic-speaking practitioner was held bound to write his prescriptions in the ancient Doric dialect; the reason in this case being that the schools of medicine in the Doric colonies of Magna Græcia and elsewhere were long the most celebrated.

Prescription, in Roman law, means a clause inserted in the preface to the formula under which an action was tried. The prescription *longi temporis* directed that the claimant should not succeed if the defendant had been so long in possession of the property in dispute that equity would not allow him to be disturbed. In England lapse of time may affect property rights in various ways. The right of a claimant to bring an action may be taken away by statutes of Limitation (q.v.), or the law may regard the long enjoyment of the possessor as evidence to show that his rights had a lawful origin. Possessory title to land is now gained under the express provisions of the modern statutes of limitation. In proving title by prescription to easements (such as rights of way, ancient lights, &c.) and other incorporeal rights over the land of another the claimant relies on immemorial enjoyment; but the courts would always infer the immemorial character of the right from a comparatively short period of actual enjoyment. And now, under the Prescription Act of 1832, the period is fixed at twenty years in the case of lights and other easements and thirty years in the case of profits (such as common of pasture, and the like). For the rules of the act, see Shelford's *Real Property Statutes*.

In the law of Scotland prescription is a method both of acquiring and of losing a right; hence it is divided into positive and negative. The positive prescription was introduced by Statute 1617, chap. 12. As that statute has been interpreted by decisions, possession of heritable subjects for forty years, on the requisite titles, recorded in the appropriate register, is sufficient to secure an owner against any one alleging a better title; or to determine the extent of an estate, where a question arises either as to what is comprehended under a general description or as to whether a specific piece of property has been carried under a clause of parts and pertinents; or to merge a title of property in the higher title of superiority. The possession must be uninterrupted and co-extensive with the right claimed. The Conveyancing (Scotland) Act, 1924 (14 and 15 George V., chap. 27), sect. 16, following upon an Act of 1874, simplifies the title necessary for founding prescription, by enacting that 'any *ex facie* valid, irredeemable title,' recorded in the appropriate register, shall be sufficient; and shortens the prescriptive period by enacting that possession

for twenty years continually and together, following on such recorded title, shall be equivalent to possession for the old period of forty years.

The negative prescription of obligations was first introduced by the Statute 1469, chap. 29, which declares that unless a person follow an obligation and take document thereon within forty years, his right shall prescribe and be of no avail. By the Act 1617, chap. 12, this prescription was extended to heritable bonds and other heritable rights, and it was enacted that the years of minority of the party against whom the prescription was used should not be counted. The Conveyancing (Scotland) Act, 1924, (sect. 17), shortened the prospective period from forty to twenty years. For several shorter prescriptions, see DEBT. In Scotland if, within twenty years after the commission of a crime, no step has been taken to bring the offender to justice, it would appear that the right to prosecute falls to the ground.

Presentment. See CRIMINAL LAW.

Preserved Provisions. Under the term *preserves* is usually included fruit, either whole or broken, or the juice of fruit, preserved by boiling with sugar. Whole fruit is boiled in clear syrup in such a manner that the sugar penetrates the fruit completely. It is then drained and dried at a gentle heat, so that the absorbed sugar crystallises in the substance and on the surface of the fruit, which is then known as *candied*. Jam consists of fruit boiled with an equal weight of sugar. Fruit jellies consist of the juice of the fruit only, boiled with sugar, this vegetable jelly consisting principally of *pectin* (see FRUIT). If well made, preserves can be kept for years, but the quality deteriorates after twelve or eighteen months, owing to crystallisation and other changes taking place in the sugar. Fruits are also preserved by covering with water in suitable vessels, heating to a high temperature, and closing the vessel whilst hot.

Meat, vegetables, etc., may be preserved in a number of ways, which may be classed roughly: (1) desiccation; (2) use of cold; (3) by chemical compounds (antiseptics); (4) by exclusion of air.

(1) In preventing putrefactive changes the simple process of drying is effective both with meat and vegetables. Dried vegetables are prepared largely for use on board ship, and the soup tablets so extensively used nowadays consist of meat and vegetables dried and pressed together. Jerked Beef (q.v.) and Pemmican (q.v.) are prepared chiefly by drying in the sun.

(2) The use of cold, on which a great industry has been built up, as in America, Australia, New Zealand, takes the forms of chilling and of freezing. Of the two forms, freezing is much the better. Chilling is effected by means of cold air (see REFRIGERATION). So also is freezing; but an alternative method is that of immersion in cold brine; in both methods the rapidity of the freezing is seemingly the chief determinant in success. The cold brine method is still in the experimental stage; the greater rapidity of the freezing in this method is, however, a great advantage, and the ultimate value of the food treated is much higher than under the cold air process; but the penetration of salt into the food substance is a difficulty, as is also the passing outwards of cell contents into the cooling medium. Freezing in either form would not seem to be destructive of vitamins or of enzymes. In beef, however, there is a loss owing to the drip of meat juice in thawing.

(3) Certain chemical substances have the power to prevent decay or arrest putrefactive changes by destroying the activity of germs or ferments. Thus meat may be preserved (though the food-value is thereby somewhat decreased) by being packed in

common salt, rubbed with salt and dried, immersed in brine, salted and smoked. The method of salting and smoking ham is described at HAM; the chief preservative element in the wood-smoke is creasote. Vegetables are preserved (pickled) by being boiled with vinegar and spices. Creasote, boric acid, salicylic acid, benzoic acid, and sulphur compounds can all be used as food preservatives, but the objection to the use of chemical agents is that they either have a distinct taste themselves or have a toxic influence on the human body, and their use has in certain countries come to be legally restricted. In Britain control is by the Public Health (Preservatives, &c., in Food) Regulations, 1925 (amended 1926). Under these regulations the use of chemical preservatives is forbidden except in the case of certain specified articles. For the purpose of the regulations the term 'preservative' does not include common salt (sodium chloride), saltpetre (sodium or potassium nitrate), sugar, acetic acid or vinegar, glycerine, alcohol or potable spirits, herbs, hop extract, spices and essential oils, or any substance added to food by smoking. Among the articles enumerated in which preservatives may be used are sausages and sausage-meat, fruit, jam, candied peel, sugar, pickles, and in each case is given the proportion, as also the nature, of the preservative to be employed—either sulphur dioxide which includes sulphates, or benzoic acid which includes benzoates. For condensed milk, see MILK.

(4) Exclusion of air is a method of preserving which is used almost exclusively for cooked foods. Various plans of coating meat with air-tight coating have been tried. Meat has been dipped in molten paraffin-wax, gelatine, gutta-percha, &c.—all of which exclude air; but the air, or, more correctly, the germs present in the air, are imprisoned in the tissues of the meat, and these speedily set up putrefactive changes. The only process which has successfully accomplished the desired end is that probably first proposed (though many have claimed the credit of the invention, and the process as now carried on is the outcome of many minds) by one Appert of Paris in 1810. The various tinned meats, soups, &c., now in the market are examples of Appert's method. The meat, &c., is placed in tins, which are immersed in a solution of calcium chloride heated up to a temperature of 270° F., which expels the air and destroys both germs and spores. The tins are previously closed, except a small pin-hole for the escape of steam. They are heated thus for about three hours, when the pin-holes are closed by solder to prevent the ingress of new air, and the tins are allowed to cool. This process is thoroughly successful as far as mere preservation goes. Tins of meat thus treated have been opened after twenty years, and no sign of putrefaction has been noted. Bad tins, in the rare cases where they occur, are the result of carelessness in air exclusion; they can be detected before opening by their bulged-out appearance, the gases of decomposition pressing out the sides or ends. The objection to the process lies in the over-cooking to which the meat must be subjected. This impairs both the appearance and flavour, and no doubt removes some of the nutritive value of the meat, although this latter point is denied by some. Other plans, varying somewhat in detail but similar in principle, have been patented, and are in use in some of the food-preserving factories. Aberdeen and London are centres in Britain for this industry, which is developed most notably in America.

The idea of preserving provisions by the use of artificial atmospheres, with or without control of temperatures, has been put forward, and investigations have been made into the preservative effects produced on living fruit by varying the amounts of oxygen and carbon dioxide in the atmosphere.

The various extracts of meat are in a way preserved foods. They consist of the juice and extractive matter of the meat evaporated down to a thick consistence, and frequently preserved by a large addition of salt. The majority of these extracts are stimulants rather than foods, some of them being practically useless.

See reports issued by the Food Investigation Board of the Department of Scientific and Industrial Research.

President of the United States, the head of the executive of the United States, is also the only executive officer who reaches his position by election; the appointment of the others being either in his hands (subject to their confirmation by the senate) or regulated by law. The president is elected for a term of four years; several presidents have been chosen for a second term of office, but a third term, although there is nothing in the constitution to prevent it, is practically prohibited by the popular prejudice against it. A candidate must be a natural-born citizen of the United States, not under thirty-five years of age. The president has a salary of \$75,000 a year, and must receive no other emolument during office from the United States or any State. He is commander-in-chief of the army and navy of the United States, and of the militia when in the actual service of the Union; he has the power to grant reprieves and pardons for offences against the United States, except in cases of impeachment, and (by and with the advice and consent of two-thirds of the senate) to make treaties and to appoint ambassadors, consuls, and all other officers of the United States whose appointments are not otherwise provided for; from time to time he sends to congress a 'message' (of the 'King's Speech') giving information as to the state of the Union, and recommending measures for consideration; he may convene both houses, or either house, in special session; and, if the two houses disagree as to the time of adjournment, he may adjourn them to such time as he thinks fit. The president, like the vice-president and all other civil officers, may be removed from office on impeachment by the House of Representatives for and conviction by two-thirds of the senate of treason, bribery, or other high crimes and misdemeanours. He may require the opinion, in writing, of the head of any of the executive departments on any subject relating to the duties of his department. Every bill which passes congress must have the president's signature to become law, unless, after he has returned it with his objections, two-thirds of each house support it and pass it over his veto.

The Vice-president of the United States, although elected along with the president, is no part of the executive department. His sole function is to preside over the senate, where he has no vote unless in the case of a tie; and in practice he has little influence on the administration, and is regarded only as an 'under-study,' in readiness to take the presidency in the event of its being vacated by the president's removal, death, resignation, or inability. Six vice-presidents—Tyler, Fillmore, Johnson, Arthur, Roosevelt, Coolidge—have so succeeded to the presidency. In the event of the removal, death, resignation, or inability of both the president and the vice-president, the secretary of state, and after him, in their order, other members of the cabinet, would act as president until the disability of the president was removed, or a new president elected. On the death of a vice-president the duties of his office are fulfilled by the president *pro tempore* of the senate.

The election of president and vice-president is controlled by the electoral system, under which the people do not vote directly for the candidates, but for electors from their separate states who are

pledged to cast their votes for particular candidates. Each state is entitled to a number of electors equal to its number of senators (two in each case) and representatives in congress; these latter range from one to forty-three. At first the electors simply voted for two candidates, and the one who received the second highest number of votes for president became vice-president; but since 1804 provision has been made for a separate election of the vice-president. In the event of no candidate having a majority of the electoral votes the House of Representatives chooses a president, voting by states, each state having one vote; if no vice-president is elected the senate chooses a vice-president, voting as usual. Such cases occurred in 1800-1, when Jefferson and Burr had tied, and the former was made president and the latter vice-president; in 1824-25, when none of the four candidates for the presidency had a majority, and John Q. Adams, who had received eighty-four electoral votes, was chosen by the House over Andrew Jackson, who had ninety-nine; and finally in 1836-37, when Richard M. Johnson, who had obtained a plurality of electoral votes for the vice-presidency, was elected by the senate. The territories have no vote in any case.

For other presidents, see the articles on the several republics that have such officers at the head of the government.

The presidents of the United States have been George Washington (1789-97), John Adams (1797-1801), Thomas Jefferson (1801-9), James Madison (1809-17), James Monroe (1817-25), John Quincy Adams (1825-29), Andrew Jackson (1829-37), Martin Van Buren (1837-41), William Henry Harrison (March-April 1841), John Tyler (1841-45), James Knox Polk (1845-49), Zachary Taylor (1849-50), Millard Fillmore (1850-53), Franklin Pierce (1853-57), James Buchanan (1857-61), Abraham Lincoln (1861-65), Andrew Johnson (1865-69), Ulysses S. Grant (1869-77), Rutherford Birchard Hayes (1877-81), James Abram Garfield (March-September 1881), Chester Alan Arthur (1881-85), Grover Cleveland (1885-89), Benjamin Harrison (1889-93), Cleveland (1893-97), William McKinley (1897-1901), Theodore Roosevelt (1901-9), William Howard Taft (1909-13), Woodrow Wilson (1913-21), Warren Gamaliel Harding (1921-23), Calvin Coolidge.

Presidio, a Spanish word for 'a fort,' applied especially to four Spanish fortified posts on the coast of Morocco—Ceuta, Melilla, Allucemas, and Peñón de Vélez, formerly convict settlements.

Press, **FREEDOM OF THE**, the expression used to denote the absence of any official restraint on the publication of books and other printed matter. In England, at the Reformation, the control of the press came to be centred in the crown, the ecclesiastical in addition to the secular government being vested in Henry VIII. as temporal head of the church. The Company of Stationers, who came to have the regulation of printing and publishing, were servants of the government, subject to the control of the Star Chamber. The censorship of the press was enforced by the Long Parliament, in spite of Milton's eloquent protest (see his *Areopagitica*), and was re-established more rigorously at the Restoration. It was continued at the Revolution, and the statute regulating it was renewed from time to time; but at last in 1695 the Commons by a special vote struck it out of the list of temporary acts to be continued. Since that time the censorship of the press has ceased to exist in Britain. But, though there are no official restrictions on what shall and what shall not be published, the authors and publishers of criminal or injurious matter are amenable to the law of libel; and there are certain statutory requirements in force to enable them to be traced. Every person who prints anything for hire or reward must

under a penalty of £20, keep one copy at least of the matter printed, and write on it the name and place of abode of the person who employed him to print it. Every person who print any paper meant to be published must print on the first or last leaf his name and usual place of business; and on failure to do so he forfeits the sum of £3. and so does any person publishing the same. There are a few printed papers exempted from conforming to the above requirement—as, for instance, papers printed by parliament or in government offices, engravings, auction lists, bank-notes, bills of lading, receipts for money, and a few other similar matters. In the case of a libel legal publication is constituted by sending or showing a copy printed or in manuscript to any person; the sale of a newspaper or other publication in a shop, or its delivery to an officer at the Stamp-office, is also considered an act of publication. The truth of the statements published may be urged as a plea of defence in an action for libel; in criminal proceedings truth is a defence if the publication is for the public benefit. The publisher of a book or newspaper may also defend himself by showing that the matter complained of was published by order of either House of Parliament, that it is a fair criticism on a public person or act, or that it represents the honest belief of the defendant, and is published by him in the course of his official or moral duty. If a bill shall be filed in any court for the discovery of the name of the printer, publisher, or proprietor of a newspaper or other publication, with the view of rendering him liable in damages for slanderous matter, the defendant is bound to make the discovery required, which, however, cannot be made use of against him in any other proceeding than that for which it has been made. The penalties against newspapers can only be sued for in the name of the Attorney-general or Solicitor-general, or Lord Advocate. Certain regulations also exist regarding the exhibition of Plays (q.v.). Subject to these restrictions, the freedom of the press has subsisted in Britain since 1693-95. At least an equal degree of freedom obtains in the United States, where privilege is much more widely extended. See LIBEL.

A more or less rigorous censorship of the press exists in most European states. There is often no direct supervision previous to publication, but the censor has it in his power to stop any publication which he deems objectionable, to confiscate the edition, and to prosecute the author and editor. Newspapers and pamphlets are generally subjected to a stricter censorship than larger works. See INDEX.

Pressburg. See PRESBURG.

Pressensé, EDMOND DE (1824-91), a prominent French Protestant theologian and controversialist, was born in Paris, studied there, and at Lausanne, Halle, and Berlin, and in 1847 became a pastor at Paris. He was deputy to the National Assembly for the Seine department in 1871-76, and was elected a senator for life in 1883. A strong thinker, vigorous writer, and eloquent preacher, Pressensé published many learned books, and contributed to *Chambers's Encyclopædia*.

Pressgang. Impressment was the mode formerly resorted to for manning the British navy. The practice had not only the sanction of custom, but the force of law. It may be traced in English legislation from the days of Edward I.; and many acts of parliament, from the reign of Philip and Mary to that of George III., were passed to regulate the system of impressment. Impressment consisted in seizing by force, for service in the royal navy, seamen, river-watermen, and at times landmen, when state emergencies rendered them necessary. The pressgang, an armed party of reli-

able men commanded by officers, usually proceeded to such houses in the seaport towns as were supposed to be the resort of the seafaring population, laid violent hands on all eligible men, and conveyed them forcibly to the ships of war in the harbour. As it was not in the nature of sailors to yield without a struggle many terrible fights took place between the pressgangs and their intended victims—combats in which lives were often lost. In point of justice there is little, if anything, to be said for impressment, which had not even the merit of an impartial selection from the whole available population. Under the laws all eligible men of seafaring habits were liable between the ages of eighteen and fifty-five; but exemptions were made in favour of apprentices who had not been two years apprenticed, fishermen at sea, a proportion of able seamen in each collier, harpooners in whalers, and a few others. A pressgang could board a merchant-vessel or a privateer of its own nation in any part of the world, and carry off as many of the best men as could be removed without actually endangering the vessel. The exercise of this power made a privateer dread a friendly man-of-war more than an enemy, and often led to as exciting a chase as when enemies were in pursuit of each other; for the privateer's men were the best sailors, for their purpose, that the naval officers could lay hold on. Mitigations of the harsh laws on the subject were frequently introduced. As early as 1563 the naval authorities had to secure the sanction of the local justices of peace; in 1835 the term of an impressed man's service was limited to five years save in urgent national necessity. By that time the system was becoming obsolete. But the laws sanctioning impressment slumber, without being repealed.

Pressing to Death. See PEINE FORTE ET DURE.

Prester John, the name applied by mediæval credulity for two hundred years to the supposed Christian sovereign of a vast but ill-defined empire in central Asia. The idea of a powerful Christian potentate in the far East, at once priest and king, was universal in Europe from about the middle of the 12th to the beginning of the 14th century, when it was transferred to Ethiopia and finally found a fancied historical justification in identification with the Christian king of Abyssinia.

The first mention of a Prester John, sprung from the ancient race of the Magi of the Gospels, occurs in the Chronicle of Otto, bishop of Freisingen. Here, on the authority (1145) of the bishop of Gabala (*Jibal* in Syria), we find a circumstantial account of his power, his Christianity after the Nestorian pattern, his victories over the Medes and Persians, and how his progress to Jerusalem was stayed by the intervening Tigris, which refused to freeze over to give him passage. Again, about 1165, there was widely current in Europe an extravagant epistle supposed to be addressed by Prester John to the Greek emperor Manuel. Herein we read astounding wonders enough: how that he ruled over the three Indies and countless hordes of men, among them those unclean races which Alexander the Great shut up within the northern mountains; that thirteen great crosses of gold and jewels were borne before as many armies, each of 10,000 knights and 100,000 foot; that all his subjects were virtuous and happy; attendant upon him were seven kings, sixty dukes, and 365 counts, twelve archbishops, and twenty bishops, while seventy-two kings with their kingdoms were his tributaries; before his throne stood a wondrous mirror, in which he saw everything that was happening in all his vast dominions; his kingdom contained the Fountain of Youth, the Sea of Sand, the River of Stones, and the river whose sand was precious gems,

ants that dug gold, fish that yielded purple, pebbles that give light and make invisible, and the salamander which lives in fire, from the incombustible covering of which were fashioned robes for the presbyter to wear. There is also extant a letter of date 1177, written by Pope Alexander III. and evidently addressed to the imaginary author of the grandiloquent epistle of 1165.

About the year 1221 the distant rumour of the conquests of Genghis Khan again gave strength to the belief in such a mighty Christian potentate. M. d'Avezac first pointed out the true historical source of the story in the Chinese Yeliu Tashi, founder of the empire of Kará-Khitái, who assumed the title of Gur Khán (supposed by Oppert to have been confounded with *Yukhanan* or *Johannes*), and fixed his capital at Balasaghun, north of the T'ian Shan range. He defeated Sanjar the Seljuk sovereign of Persia, in 1141 at a great battle near Samarkand, but, though hateful to the Moslem historians, of course never made any profession of Christian faith. Professor Bruun of Odessa identifies Prester John with the 12th-century Georgian prince John Orbelian, a redoubtable enemy of the Turks (see Colonel Yule's *Marco Polo*, 2d ed. 1875, app. to vol. ii.). Many writers about the close of the 13th century, as Marco Polo, the Sieur de Joinville, and even Gregory Abulfaraj, identify him with Ung Khán, king of the Nestorian tribe of Kerait. Friar Odoric about 1326 visited the country—the Tenduc of Marco Polo—still ruled over by a prince whom he styles Prester John, but he adds, with the cautious gravity of the true historian, 'as regards him, not one hundredth part is true that is told of him as if it were undeniable.' From this time the Asiatic phantom entirely disappears from view, but from the 14th century onwards Prester John continues a less romantic existence under the guise of the Christian king of Abyssinia.

See D'Avezac in vol. iv. (1839) of the *Recueil de Voyages et de Mémoires* of the Paris Société de Géographie; Dr Gustav Oppert, *Der Presbyter Johannes in Sage und Geschichte* (2d ed. 1870); Friedrich Zarncke, *Der Priester Johannes* (1876-79). See also Colonel Sir Henry Yule's article in *Ency. Brit.* (9th ed.), his *Hakluyt Society Catalogue and the Way Thither* (vol. i. 1866), and *The Book of Ser Marco Polo* (2d ed. 1875).

Preston, an important manufacturing town of Lancashire, a municipal, parliamentary, and county borough, on the north bank, and at the head of the estuary, of the Ribble, 14 miles from the Irish Sea, 28 NNE. of Liverpool, 31 NW. of Manchester, and 209 NNW. of London. Occupying an eminence 120 feet above the river, and built mostly of brick, it is on the whole well laid out, and is surrounded with pleasing scenery. The town-hall, built in 1862-67 from designs by Sir G. G. Scott, is a French Gothic pile, with a clock-tower and spire 195 feet high. In 1882 were laid the foundation-stones of the Lancashire county hall and of the Harris free library and museum, to the latter of which in 1883 Mr R. Newsham bequeathed a collection of pictures and art treasures. The churches are all modern, for even the parish church has been rebuilt. St Walburge's (Roman Catholic), by Hansom of cab celebrity, has a spire 306 feet high, the loftiest built in England since the Reformation, which amply redeems 'proud Preston' from its old 'no-steeple' reproach. Other edifices are the grammar-school (1550; rebuilt 1841, and removed to new buildings in Moor Park erected in 1911), the corn exchange and market-house (1824), public baths (1851), two covered markets (1870 and 1924), militia barracks (1856), the infirmary (1869), &c. Three large public parks were laid out in 1867—the Miller and Avenham parks, and the former unsightly 'Moor' of 100 acres to the north of the town. There have since

been added Haslam and Ribbleton parks to the west and east, and Frenchwood Recreation Grounds on the banks of the Ribble, adjoining Avenham Park. In Miller Park a statue was erected in 1873 of the fourteenth Earl of Derby; in Winckley Square is a monument to Sir Robert Peel. Preston was constituted an independent port in 1843; and great improvements have been effected under the 'Ribble Navigation and Preston Dock Act, 1883,' including the deepening of the channel so as to admit vessels of 1000 tons, construction of a dock of 40 acres (opened 1892), erection of warehouses, &c. Arkwright (q.v.), who was born here in 1732, in 1768 set up here his famous spinning-frame; and Preston now is one of the principal seats of the cotton industry, which gradually superseded the linen manufacture, its staple in the 18th century. There are also iron and brass foundries, iron shipbuilding yards, engineering and machine shops, steam-boiler works, rope-walks, &c. A guild-merchant festival, first clearly heard of in 1397, has been held regularly every twenty years since 1562—the last on 4th September 1922. Preston, the first of whose royal charters was granted by Henry II. in 1179, returns two members to parliament. Pop. (1811) 17,115; (1841) 50,073; (1881) 100,262; (1921) 119,900.

Preston arose whilst ancient *Coccum* or Ribchester, higher up the Ribble, decayed. In Athelstan's reign Amounderness, the hundred in which it is situated, was granted to the cathedral church of York; hence its chief town came to be known as Preston or 'priests' town.' Near Preston, on 17th August 1648, Cromwell totally routed the royalists under Sir Marmaduke Langdale; and Preston figures in both the Jacobite rebellions of 1715 and 1745. For Foister's little army surrendered here to General Willes; and Prince Charles Edward occupied the town on both his march to and his retreat from Derby. Lady Hamilton has been claimed, but falsely it seems, as a native. On 1st September 1832 Joseph Livesey of Preston and six others here signed a pledge of total abstinence. See TEMPERANCE.

Prestonpans, a coast-town of Haddingtonshire, 8 miles E. of Edinburgh. Its salt-pans flourished from the 12th century till 1825; now brewing and mining are the principal industries. Pop. 2000. To the south-east, on 21st September 1745, was fought the battle of Prestonpans, Preston, or Gladsmuir, when in a five minutes' rush Prince Charles Edward's 2500 Highlanders completely routed 2300 disciplined soldiers under Sir John Cope and Colonel Gardiner (q.v.).

Prestwich, a cotton manufacturing town of Lancashire, 4 miles NNW. of Manchester, with a 13th c. Gothic church. Pop. 19,000.

Prestwich, SIR JOSEPH (1812-96), was a London wine-merchant till he was sixty, in 1874 became professor of Geology at Oxford, and in 1896 was knighted. See the *Life* by his wife (1899).

Prestwick, the headquarters of golf on the Ayrshire coast, a parliamentary burgh of Ayr group since 1918, 2½ miles N. of Ayr; pop. 8500.

Presumption, an inference drawn by the law in certain circumstances, and used to start an argument. A person who has possession of goods is presumed to be the owner till the contrary is proved. A man is presumed to be innocent till the contrary is proved. The law of England presumes that any one who has not been heard of for seven years is dead. Under the Presumption of Life Limitation Act, 1891, applicable to Scotland only, the court, on application being made to it, may find that a person who has disappeared for seven years has died on any date within the seven years which is established by the

facts, or, failing the establishment of such a date, may find that the person is to be presumed to have died at the expiry of the seven years' disappearance.

Pretender. See JACOBITES, STEWART.

Pretoria, administrative capital of the Union of South Africa and of the Transvaal, stands on a plain sheltered by mountains, 980 miles from Capetown and 285 by rail (1893) W. of Lourenço Marques, on Delagoa Bay. It is named from the Boer leader Andries Pretorius (died 1853), who saved the Trekkers by repeatedly defeating the Zulus, till then triumphant (see TRANSVAAL). New public buildings were erected in 1891. Pretoria has a university college, a Transvaal museum, national zoological garden, and a branch mint (1922). During the Transvaal war it was formally occupied by Lord Roberts on 5th June 1900. Pop. 74,000 (45,000 white).

Preussen. See PRUSSIA.

Preveza, a town won in 1912 by Greece from Turkey, on the Gulf of Arta, trades in cheese, olives, and cattle; pop. 7000.

Prévost, ABBÉ. Antoine François Prévost d'Exiles, commonly called the Abbé Prévost, and immortal as the author of *Manon Lescaut*, was born of good family at Hesdin in Artois, 1st April 1697. He was educated by the Jesuits at Hesdin, and at the Collège d'Harcourt in Paris, at sixteen volunteered for service as the last war of Louis XIV. was drawing to its close, but soon returned to the Jesuits, and indeed had almost joined the order when a fresh temptation drew his impulsive and restless nature once more to the soldier's life. Of this second period of soldiering little is known, but it is certain that at twenty-four he joined the Benedictines of St Maur, and spent the next six years in a round of religious duties, in study, and in writing a volume of *Gallia Christiana*. About the year 1727, being anxious to be transferred to Cluny, where the rule was less austere, he discounted his permission, and so found himself unexpectedly guilty of the sin of disobedience. He fled to Holland, and spent six years of exile in that country and in England, where he got into trouble, it would seem, for forging a signature to a promissory note. In 1728 he published the first and best of his long novels, the *Mémoires d'un Homme de Qualité*, to which indeed *Manon Lescaut* (apparently first published at Amsterdam in 1733) forms a kind of supplement. His fluent pen employed itself in further novels, in translations, and in *Le Pour et Contre* (1733-40), a periodical review of life and letters, modelled on the *Spectator*, and showing an excellent appreciation of English books. By 1735 he was back in France by royal permission, and allowed to wear the dress of the secular priesthood. He was befriended by Cardinal de Bissy, and the Prince de Conti, whose chaplain he became, and for thirty years he wrote assiduously over a hundred volumes of compilations, including a voluminous *Histoire générale des Voyages* (of which vol. i., 1746, contains a fine portrait by Schmidt), histories, moral essays, translations of *Pamela* and *Clarissa Harlowe*, and at least one novel—*Histoire d'une Grecque Moderne*. In 1741 a literary service thoughtlessly rendered to a satirical novelist drove him from France to Brussels, thence to Frankfurt; but he was soon forgiven by M. de Maurepas, and allowed to return. He lived in a cottage at Saint-Firmin near Chantilly, walked much in the woods there, and died of the rupture of an aneurism, 23d November 1763. The story was long current that after he was thought to have died of apoplexy, a stupid surgeon, in haste to begin a post-mortem examination, both brought him to life and killed him with a single thrust of his knife; but this hideous romance first appeared

about 1782, and was completely disproved by Harisse (see his *L'Abbé Prévost*, 1896). Many other legends have clustered round Prévost's romantic life. Of these the most remarkable is a perfectly baseless calumny that he killed his own father, who had caught him in an intrigue, by throwing him downstairs.

Prévost's is one of the names lifted securely above the flood of time by one book written in a moment of happy inspiration. *Manon Lescaut* remains fresh, charming, and perennial, from its perfect and unaffected simplicity, the stamp of reality and truth throughout, and a style so flowing, easy, and natural, that the reader forgets it altogether in the overpowering pathetic interest of the story. The half-dozen figures portrayed have the likeness of life itself: the young Chevalier des Grieux, the hero, is a lover of the noblest pattern, absolutely forgetful of self, and idealising even the unworthiness of his mistress; Tiberge is an admirable type of the sensible and faithful friend, Lescaut, Manon's brother, of the ruffian and bully; but the triumph of the book is Manon herself, charming, light-hearted, shallow, incapable of a love that she will not sacrifice for luxury, yet ever moved with a real affection for her lover, constant even in her inconstancy and her degradation, the goodness ever shining through the guilt, and at last purified by love and suffering. One feels in this unique book that it is impossible to say where reality ends and fiction begins, and indeed it remains to this day unequalled as a truthful realisation of one over-mastering passion. From beginning to end a careful reader detects the traces of a sad experience, for its author had himself a sensitive heart and warm imagination, joined to a weak and vacillating character. At Tiberge and a Des Grieux met in himself, for his character and ideals were pure and elevated, despite the weaknesses that grew out of his passionate and impulsive soul.

There is no complete edition of Prévost's works. His *Œuvres Choies* were collected at Amsterdam (39 vols. 1788-85). Of his one masterpiece the editions are numberless, and there are translations by Charlotte Smith (1785), Moylan (1841), G. D. Gribble (1925), and others. See the biography prefixed to Prévost's *Pensées* (1764); Sainte-Beuve in *Portraits Littéraires*, vols. i. and iii., and *Causeries du Lundi*, vol. ix.; books by Harisse (Paris, 1896) and Schroeder (1899), and Miss M. Robertson's notes to her edition of the *Homme de Qualité*, Pt. v. (1927).

Prey, BIRDS OF. See BIRDS OF PREY.

Priam, king of Troy at the time of the Trojan war, was the son of Laomedon and Strymo or Placia. The name means 'the ransomed,' and was given him on account of his having been ransomed by his sister Hesione from Heracles, into whose hands he had fallen. His first wife was Arisba, daughter of Merops, whom he gave away to a friend in order to marry Hekabe (Hecuba), by whom, according to Homer, he had nineteen sons. He had altogether fifty sons; later writers add as many daughters. The best known of these are Hector, Paris, Deiphobus, Helenus, Troilus, and Cassandra. Priam is represented as too old to take any active part in the Trojan war, and in Homer only once appears on the field of battle. After Hector's death he went to the tent of Achilles to beg the body for burial. The oldest Greek legends are silent respecting his fate; but later poets like Euripides and Virgil say that he was slain by Pyrrhus when the Greeks stormed the city.

Priapus, son of Dionysus and Aphrodite, born at Lampsacus on the Hellespont, considered as a divinity of fruitfulness, especially of flocks of sheep and goats, of bees, the vine, and of all kinds of garden produce. His statues usually stood in gardens, in the form of rude wooden images,

painted vermilion, with a club, sickle, and phallic symbol of exaggerated dimensions.

Přibram, a mining town of Bohemia, 48 miles by rail SSW. of Prague, has important lead and silver mines, and various manufactures, a mining academy, technical schools, and a church much frequented by pilgrims. Pop. 15,000.

Pribylof Islands. See ALASKA, SEAL.

Price, the exchangeable value of commodities. See CURRENCY, EXCHANGE, MONEY, VALUE, and works cited at POLITICAL ECONOMY.

Price, RICHARD, philosopher, was born at Tyn-ton, in Glamorganshire, on 22d February 1723. His father was a dissenting minister, morose, bigoted, and intolerant, in complete antithesis to the disposition of the son. As a boy he read Clarke and Butler, went at eighteen to a dissenting academy in London, and at the close of his studies became chaplain to a Mr Streatfield at Stoke-Newington, with whom he lived for thirteen years. Legacies from his patron and an uncle in 1756 enabled him to marry. He laboured as a preacher at Newington Green and at Hackney, and established a reputation by his somewhat heavy but able *Review of the Principal Questions in Morals* (1758). His apologetic work, *On the Importance of Christianity*, appeared in 1766. In 1769 he received from Glasgow the degree of D.D., and published his *Treatise on Reversionary Payments*; which was followed by the compilation of the celebrated *Northampton Mortality Tables*, and various other works of value relating to life assurance and annuities. In 1771 appeared his famous *Appeal to the Public on the Subject of the National Debt*; in 1776 his *Observations on Civil Liberty and the Justice and Policy of the War with America*. The latter brought him the freedom of the city of London and an invitation from congress to assist in regulating its finances. Price lived long enough to herald the promise of the French Revolution, and to be denounced in Burke's *Reflections*. He died April 19, 1791. Price was a believer in the immateriality of the soul, holding that it remained in a dormant state between death and resurrection. Their difference of opinion on this subject led to a controversy of some celebrity between him and his friend Dr Priestley. His views respecting the divinity of Christ were what is called Low or semi-Arian. As a moralist he has a close affinity with Cudworth, and in some points strangely foreshadows Kant. Of his great treatise on morals the chief positions are these: actions are *in themselves* right or wrong; right and wrong are simple ideas incapable of analysis; these ideas are received immediately by the intuitive power of the reason or understanding. See the *Lives* by his nephew, William Morgan (1815), and by Roland Thomas (1924).

Prichard, JAMES COWLES, ethnologist, was born at Ross in Herefordshire, 11th February 1786. The son of a Quaker merchant, he received a careful home education at Ross and in Bristol. There, at St Thomas's, London, and in Edinburgh he studied medicine; and in 1810, after a residence both at Cambridge and at Oxford, he commenced practice in Bristol as a physician. He was appointed physician to Clifton dispensary and St Peter's Hospital, and afterwards to the Bristol Infirmary. In 1813 appeared his *Researches into the Physical History of Mankind*, which at once secured him a high standing as an ethnologist. The different editions of this work (4th, 5 vols. 1841-51) gave further proofs of the zeal with which he pursued his ethnological inquiries; and at the same time he devoted himself much to philology, which he judged indispensable for an enlarged study of ethnology. He made himself

master not only of the Romance, Teutonic, and Celtic languages, but also of Sanskrit, Hebrew, Arabic; and in *The Eastern Origin of the Celtic Nations* (1831; 2d ed. by Latham, 1857) he compared the different dialects of Celtic with the Sanskrit, Greek, Latin, and Teutonic languages, and argued for the common origin for all the peoples speaking those languages. Besides several medical works, he also published an *Analysis of Egyptian Mythology* (1819; Ger. trans. by A. W. von Schlegel, 1837) and *The Natural History of Man* (2 vols. 1843). Appointed in 1845 a commissioner in lunacy he removed to London, where on 22d December 1848 he died of rheumatic fever. The first to raise ethnology to the rank of a science, he was himself a monogenist, maintaining that man is one in species, and that the negro is the primitive type of the human race.

Prickle. See HAIRS OF PLANTS.

Prickly Heat is the popular name in India and other tropical countries for a form of skin disease sometimes known as *Lichen tropicus* (see LICHEN). It more frequently attacks strangers from temperate climates than the natives, although the latter are not altogether exempt from it. It consists in a copious eruption of small red papules. The sensations of itching and stinging which attend it are intense, and give rise to an almost irresistible propensity to scratching, which only aggravates the irritation. Avoidance of perspiration as far as possible, baths of plain cold water, and the use of dusting powders and spirit lotion are helpful.

Prickly Pear, or INDIAN FIG (*Opuntia*), a genus of Cactaceæ (q.v.), having a fleshy stem generally formed of compressed articulations; leafless, except that the youngest shoots produce small cylindrical leaves which soon fall off; generally covered with clusters of strong hairs or of prickles; the flowers springing from among the clusters of prickles, or from the margin or summit of the articulations, solitary, or corymboso-paniculate, generally yellow, rarely white or red; the fruit resembling a fig or pear, with clusters of prickles on the skin, mucilaginous, generally eatable—that of some species pleasant, that of others insipid. The prickles of some species are so strong, and their stems grow up in such number and strength, that they are used for hedge-plants in warm countries. They are natives of America from 50° N. to 40° S. lat., especially Mexico and Chile. The Common Prickly Pear or Indian Fig (*O. vulgaris*), a native of Virginia and more southern parts of North America, is now naturalised in many parts of the south of Europe and north of Africa, and in other warm countries. It grows well on the barest rocks, and spreads over expanses of volcanic sand and ashes too arid for almost any other plant. It is of humble growth; its fruit oval, rather larger than a hen's egg, yellow, and tinged with purple, the pulp red or purple, juicy, and pleasantly combining sweetness with acidity. It is extensively used in many countries as an article of food. In the south of England the prickly pear lives in the open air, and occasionally ripens its fruit. In America it is cultivated considerably to the north of its native region. The Prickly Pear is naturalised in Europe as far north as the sunny slopes of Tyrol, where it is smaller and has prostrate stems. In Australia and South Africa prickly pears of various species have become a pest. The Australian governments have striven in vain to cope with *O. inermis*, *O. stricta*, and others by means of insects, fungi, and other methods. Utilization as a source of industrial alcohol has been attempted in South Africa. The Tuna (*O. Tuna*), a hedge-plant in the West Indies, affords food to the cochineal insect, and yields a pleasant fruit.

Pride, THOMAS, one of the most resolute of Cromwell's soldiers, was a native of London. At first a drayman and brewer, he enlisted at the outbreak of the Civil War, and by his merit quickly rose to be colonel. He commanded a brigade under Cromwell in Scotland, and, when the House of Commons betrayed a disposition to effect a settlement with the king, was appointed by the army to purge it of its Presbyterian royalist members. By 'Pride's Purge' about a hundred were excluded, whereupon the House, now reduced to about eighty members, proceeded to bring the king to justice. Colonel Pride sat among his judges, and signed the death-warrant. He died 23d October 1658, and so felt not the rage of his enemies, but his body was dug up and hanged beside Cromwell's at Tyburn.

Prideaux, HUMPHREY (1648-1724), scholar and divine, born at Padstow, was educated at Westminster School under Dr Busby, and at Christ Church, Oxford, where he graduated B.A. in 1672. His *Marmora Ozoniensia* (1676), an account of the Arundel Marbles, procured for him the friendship of Lord Chancellor Finch (afterwards Earl of Nottingham), who in 1679 appointed him rector of St Clement's, Oxford, and in 1681 a prebendary of Norwich. After several minor preferments he was collated in 1688 to the archdeaconry of Suffolk, and in 1702 was made Dean of Norwich. His nine works include a *Life of Mahomet* (1697), long very popular; *Directions to Churchwardens* (1701); and *The Connection of the History of the Old and New Testament* (1715-17). The last treats with much learning, but less discernment, the affairs of ancient Egypt, Assyria, Persia, Judæa, Greece, and Rome, in their bearing on prophecy. See Prideaux's *Letters to John Ellis*, edited by E. M. Thompson, (Camden Soc. 1875).

Pride of China (also called Pride of India, and Bead-tree), a handsome tree of the family Meliaceæ (*Melia Azedarach*), a native of India, Persia, and China, naturalised in the southern states of the American Union. It grows rapidly, has large bunches of flowers, and enormous quantities of small fruit. A decoction of the bark of its root is used as a vermifuge.

Priego de Córdoba, a town of Spain, 46 miles S.E. of Córdoba, grows wine and weaves silk; pop. 20,000.

Priene, anciently one of the 'twelve' cities of Ionia, stood a little N.W. of the mouth of the Mæander in Caria. From the remains of an elegant Ionic temple to Athene Polias an agent of the British Society of Dilettanti carried off and gave to the British Museum the stone bearing the record of its dedication by Alexander the Great. See *Antiquities of Ionia*, part iv. (1882), Wiegand and Schrader, *Priene* (1904).

Priessnitz. See HYDROTHERAPY.

Priest (Gr. *presbyteros*, Lat. *presbyter*, lit. 'elder'), the title in its most general signification, of a minister of public worship, but specially applied to the minister of sacrifice or other mediatorial offices. In Egypt priests and laymen were not in the Old Kingdom separate classes, but laymen (and women) took their turn in performing priestly offices. As time went on, endowments to maintain offerings to the dead at tombs developed a class of tomb chaplains, who have been compared with the mediæval chantry-priests. In the Middle Kingdom professional chief priests took the place of the nobles in the temples, with laymen serving under them; and under the XVIIIth dynasty the great college of priests of Amon-Re at Thebes set an example that was followed elsewhere, so that at last the priesthood

became almost a caste. The priesthood of India belongs to the first caste, or that of the Brahmins, exclusively (see CASTE, INDIA). But, as the proper performance of such functions requires, even in a Brahman, the knowledge of the sacred texts to be recited at a sacrifice, and of the complicated ceremonial of which the sacrificial acts consist, none but a Brahman learned in one or more Vedas, and versed in the works treating of the ritual, possesses, according to the ancient law, the qualification of a priest. See also BUDDHISM, LAMAISM, SUN-CULT.

In Jewish history the patriarchal period furnishes an example of the family priesthood; while in Melchizedec, king of Salem, we find the union of the royal with the priestly character. In the Mosaic law the whole theory of the priesthood, as a sacrificial and mediatorial office, is fully developed. The priest of the Mosaic law stands in the position of a mediator between God and the people. The Mosaic priesthood was the inheritance of the family of Aaron, of the tribe of Levi (q.v.). It consisted of a High-priest (q.v.), and of inferior ministers, distributed into twenty-four classes. In the service of the temple each class was subject to a chief priest, and served for a week in rotation. The duties in the temple consisted in preparing, slaying, and offering victims, in preparing the show-bread, burning the incense, and tending the lights of the sanctuary. Outside they were employed in instructing the people, attending to the daily offerings, enforcing the laws regarding legal uncleanness, &c. For their maintenance were set aside certain offerings (see FIRST-FRUIT) and other gifts. They wore a distinguishing dress, the chief characteristics of which were a white tunic, an embroidered cincture, and a turban-shaped head-dress. The Jewish priesthood may be said to have practically ceased with the destruction of the temple.

In the Christian dispensation the name primitively given to the public ministers of religion was *presbyteros*. The name given in classical Greek to the sacrificing priests of the pagan religion, *hierēus*, Lat. *sacerdos*, is not found in the New Testament explicitly applied to ministers of the Christian ministry; but very early in ecclesiastical use it appears as an ordinary designation; and with all those bodies of Christians—Roman Catholics, Greeks, Syrians, and other Orientals—who regard the eucharist as a sacrifice (see LITURGY) the two names were applied indiscriminately. The priesthood of the Christian church is one of the grades of the hierarchy, second in order only to that of bishop, with which order the priesthood has many functions in common. The priest is regarded as the ordinary minister of the eucharist, whether as a sacrament or as a sacrifice; of baptism, penance, and extreme unction; and although the contracting parties are held in the modern schools to be themselves the ministers of marriage, the priest is regarded by all schools of Roman divines as at least the normal and official witness of its celebration. The priest is also officially charged with the instruction of the people and the direction of their spiritual concerns, and by long-established use special districts, called parishes, are assigned to priests, within which they are entrusted with the care and supervision of the spiritual wants of all the inhabitants. The holy order of priesthood can only be conferred by a bishop, and he is ordinarily assisted by two or more priests, who, in common with the bishop, impose hands on the candidate. The rest of the ceremonial of ordination consists in investing the candidate with the sacred instruments and ornaments of his order, anointing his hands, and reciting certain prayers significative of the gifts

and the duties of the office. The distinguishing vestment of the celebrant priest in the mass is the *Chasuble* (q.v.). In Catholic countries priests wear even in public a distinctive dress, in most respects common to them with the other orders of Clergy (q.v.). In the Latin Church priests are bound to a life of celibacy. In the Greek and oriental churches married men may be advanced to the priesthood; but no one is permitted to marry after ordination, nor is a married priest permitted to marry a second time, should his wife die.

In the Church of England, and other Reformed Episcopal Churches, the term priest is retained as the designation of the second order of clergy, whose special office it is (1) to celebrate the Sacrament of the Lord's Supper; (2) to pronounce the forms of Absolution in the Morning and Evening Prayer, in the Communion Service, and in the Office for the Visitation of the Sick; and (3) to preach, though this last office is, by special license, sometimes extended to deacons. See DEACON, ORDERS (HOLY).

Priestley, JOSEPH, son of a cloth-dresser, was born at Fieldhead, near Leeds, 13th March 1733. For some time he was obliged to abandon school studies, owing to weak health, and betook himself to mercantile pursuits, but with returning strength his literary studies were resumed at a dissenting academy at Daventry (founded by Dr Doddridge). Though his father and family were strong Calvinists, young Priestley, during his residence at the academy, felt called on to renounce nearly all the theological and metaphysical opinions of his youth. 'I came,' he says, 'to embrace what is called the heterodox side of every question.' In 1755 he became minister to a small congregation at Needham Market, in Suffolk. While here he composed his work against the doctrine of Christ's death being a sacrifice or satisfaction for sin, entitled *The Scripture Doctrine of Remission*. In this he taught that the Bible is indeed a divine revelation, made from God to man through Christ, himself a man and no more, nor claiming to be more, and rejected the doctrines of the Trinity and the Atonement. In 1758 he quitted Needham for Nantwich; and in 1761 he removed, as teacher of languages and belles-lettres, to an academy at Warrington; and here his literary career may be said first fairly to have begun. A visit to London led to his making the acquaintance of Franklin, who supplied him with books which enabled him to write his *History and Present State of Electricity*, published in 1767. It was followed by a work on *Vision, Light, and Colours*. In 1762 he published his *Theory of Language and Universal Grammar*. In 1764 he was made LL.D. of Edinburgh, and F.R.S. in 1766. In the following year he removed to Leeds, having been appointed minister of the Mill Hill dissenting chapel there. The fact of a brewery being beside his dwelling gave a new direction to his energetic and versatile mind; he began to study chemistry. In 1773 he was appointed literary companion to Lord Shelburne, and accompanied the earl on a continental tour in 1774. Having been told by certain Parisian savants that he was the only man of understanding they had ever known who believed in Christianity, he wrote, in reply, the *Letters to a Philosophical Unbeliever*, and various other works, containing criticisms on the doctrines of Hume and others. But, while laughed at in Paris as a believer, at home he was branded as an atheist. To escape the odium arising from the latter imputation, he published, in 1777, his *Disquisition relating to Matter and Spirit*, in which, partly materialising spirit and partly spiritualising matter, he holds that our hopes of resurrection must rest solely on the truth of the Christian revelation, and that on science they have no foundation whatever. On leaving Lord Shel-

burne, he became minister of a dissenting chapel at Birmingham. The publication, in 1786, of his *History of Early Opinions concerning Jesus Christ* occasioned the renewal of a controversy, which had begun in 1778, between him and Dr Horsley, concerning the doctrines of Free-will, Materialism, and Unitarianism. His reply to Burke's *Reflections on the French Revolution* led to his being made a citizen of the French Republic; and this led to a mob on one occasion breaking into his house and destroying all its contents, books, manuscripts, scientific instruments, &c. A brother-in-law, however, about this time left him £10,000, with an annuity of £200. In 1791 he was elected to a charge at Hackney; but his honestly-avowed opinions had made him unpopular, and he (1794) removed to America, where he was heartily received. He died at Northumberland, Pennsylvania, 6th February 1804, expressing (though he agreed that he should be called a materialist) his confidence in immortality. He was a man of irreproachable character, serene of temper, fearless in searching after and confessing the truth. His services to chemistry are summed up under that head (and see OXYGEN).

See Rutt's edition of Priestley's *Works* (25 vols. 1832), including Autobiographical Memoir; Martineau's *Essays* (vol. i. 1891); Thorpe's *Priestley* ('Men of Science' series, 1906); E. F. Smith's *Priestley in America* (1920).

Priestly Code. See PENTATEUCH, BIBLE.

Priluki, a town of Ukraine, 87 miles E. by N. of Kiev, with trade in corn and cattle; pop. 24,000, mostly engaged in the cultivation of tobacco.

Prim, JUAN, Spanish general, was born at Reus, 6th December 1814, and rapidly rose to be a colonel, and so distinguished himself in war and statesmanship as to be made general, marshal, and marquis. As progressist he opposed Espartero. Failing in an insurrectionary attempt in 1866, he had to flee to England and Brussels, but here he guided the movement that in 1868 overthrew Isabella. He was war minister under Serrano, but soon became virtually dictator. He secured the election of an Italian prince, Amadeo, as king (in order, as was thought, that the king might be under the minister's control), and was thereupon shot by an assassin as he left the Cortes, 28th December 1870. He died on the 30th.

Prima Donna (Ital.), the first female singer in an opera.

Primage, a charge (over and above the freight) paid by the shipper or consignor of goods for loading the same, to the master and sailors of a ship, or to the owner or freighter.

Primary Colours. See COLOUR.

Primary Rocks. See PALÆOZOIC.

Primate (Lat. *primas*), anciently a bishop holding a position of pre-eminence. Thus the bishop of Rome was called primate of the whole church. In modern times the title belongs only to such sees as had formerly the dignity of vicar of the holy see annexed—Armagh, Arles and Lyons, Mainz, Toledo, Pisa and Salerno, &c. But none of these possess any special primatial jurisdiction. For the primates in the Church of England, see the article ARCHBISHOP. The name *primus* is applied in the Scottish Episcopal Church to the presiding bishop. He is chosen by the bishops out of their own number, without their being bound to give effect to seniority of consecration or precedency of diocese.

Primates, the order of Mammals (q.v.) which Linnaeus placed first (whence the name, Lat. *primus*, 'first') because it includes Man (q.v.). See also ANTHROPOLOGY, APE, ANTHROPOID APES, MONKEYS, LEMUR.

Prime, the first of the 'lesser hours' of the Roman Breviary (q.v.).

Prime-minister. See TREASURY, CABINET.

Primero, or PRIME, a game at cards popular in England in the 16th century, but now obsolete. The same or a very similar game was played in Italy under the name *primiera*, and in France under the names *prime*, *ambigu*, &c. Primero belonged to the family of games of which the old post and pair and the more modern brag and poker are members.

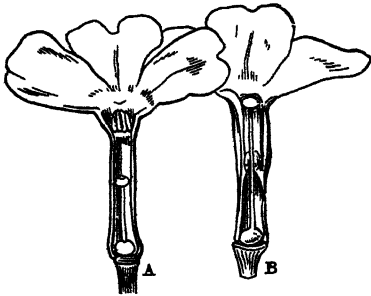
Primitive Methodists. See METHODISTS.

Primo de Rivera, MIGUEL, MARQUES DE ESTELLA, Spanish dictator, born in 1870, was a general placed over the military district of Catalonia when in 1923 he effected a *coup d'état* whereby a military directory took over the government of Spain. In 1925 the directory was nominally changed to a cabinet, without restoration of parliamentary government.

Primogeniture is the rule of law under which the eldest child or ('male primogeniture') eldest son of the family succeeds to the father's real estate in preference to, and in absolute exclusion of, the younger sons (and all the sisters). See BOROUGH ENGLISH, ENTAIL, FAMILY, FEUDALISM, FIRST-BORN, GAVELKIND, KIN (NEXT OF), LAND LAWS, SUCCESSION; and the valuable monograph on *Primogeniture* (1895) by Evelyn Cecil.

Primordial Zone, a name applied by Barande to the group of strata which in Bohemia underlies the Silurian rocks, and is therefore on the horizon of the Cambrian system.

Primrose (*Primula*), a genus of Primulaceæ, having a bell-shaped or tubular five-toothed calyx, a salver-shaped corolla with five segments, five stamens, a globose ovary containing many ovules, and a many-sided capsule opening by five valves, generally with ten teeth at the apex. The dimorphism of the stamens and pistil of primrose, illustrated in the accompanying figure, is not uncommon in other species of the genus, and has given rise to the terms *thrum-eyed* (A) and *pin-eyed* (B) in the language of florists in describing



Primroses; short (A) and long styled (B).

varieties of the Auricula and Polyanthus. The distinction is of some practical importance in so far as fertilisation of the individual flowers is affected by the relative positions of the respective organs. The species are all herbaceous perennials, generally having only radical leaves; and the flowers in a simple umbel, more rarely with scapes bearing solitary flowers. Almost all of them are natives of Europe and Asia. Some of them are among the finest ornaments of our groves and meadows; some are found in mountainous regions. Their fine colours and soft delicate beauty have led to the cultivation of some of them as garden flowers, probably from the very

beginning of floriculture. The name refers to the early appearance of the flowers of some of the most common species in spring. The Common Primrose (*P. vulgaris*), abundant in woods, hedgerbanks, and



Common Primrose (*Primula vulgaris*).

pastures in Britain and in most parts of Europe, has obovate-oblong, wrinkled leaves, and single-flowered scapes; the flowers about an inch broad, pale yellow. This is the plant to which the English name primrose specially belongs. Akin to it is the Cowslip (q.v.) or Paigle (*P. veris*). The Oxlip (*P. elatior*), apparently wild in some parts of England, particularly in the eastern counties, may be a hybrid between the common primrose and the cowslip. The Polyanthus (q.v.) is a cultivated oxlip. The Auricula (q.v.; *P. Auricula*), an Alpine species, is a favourite garden flower. The Bird's-eye Primrose (*P. farinosa*) and the Scottish Primrose (*P. scotica*) are both flowers of exquisite beauty, found in the northern parts of Britain, the latter chiefly on the coasts of Sutherland, Caithness, and Orkney. The Alps and the Himalaya produce many species. The Chinese Primrose (*P. sinensis*) is very common in Britain, not only as a greenhouse but a window plant. It produces compound umbels of very numerous lilac, red, or white flowers, which are displayed in autumn, winter, and spring. In the western states of America the most conspicuous species is *P. Parryi*, with large purple flowers, which grows on the Rocky Mountains. *P. farinosa*, in the eastern states, is rare.

Primrose League. This political organisation was founded 17th November 1883 by Lord Randolph Churchill, Sir John Gorst, Sir Alfred Slade, and Sir H. Drummond Wolff. The name was chosen in reference to the fact that the primrose was Lord Beaconsfield's favourite flower (a fact by some unkindly disputed; cf. *Notes and Queries* for 1888, pp. 146, 416). It was originally intended to admit men only, banded in companies of about 100 to act as missionaries of the league. The effect of admitting women may be gathered from the fact that the number of members rose from 957 in 1884 to 237,283 in 1886.

Primula. See PRIMROSE, COWSLIP, AURICULA, POLYANTHUS.

Primulaceæ, a family of dicotyledons mostly natives of temperate and cold regions. They are all herbaceous, or scarcely half-shrubby, with leaves generally all radical, and no stipules. The calyx is generally five-cleft, inferior or half-superior, regular, persistent; the corolla, with the limb divided into as many segments as the calyx, rarely wanting; the stamens inserted on the corolla, one opposite to each of its lobes; the ovary one-celled, the style solitary, the stigma capitate; the capsule with a central placenta and many seeds. Large

genera are *Primula*, *Lysimachia*, and *Androsace*. Besides the two first mentioned, Britain has representatives of *Hottonia*, *Centunculus*, *Glaux*, *Anagallis*, *Cyclamen*, *Trientalis*, and *Samolus*. Many



Flowers of a few of the *Primulaceae*.

a, *Primula sikkimensis*; b, *P. obovata*; c, *P. Sieboldii*; d, common primrose (*P. vulgaris*); e, cowslip (*P. veris*).

of the *Primulaceae* have flowers of much beauty, as the Primrose, Cowslip, Auricula, Pimpernel, &c., and some are very fragrant.

Primum Mobile. See PTOLEMY.

Prince (Lat. *princeps*), an epithet which was originally applied to the *princeps senatus* of the Roman state, and afterwards became a title of dignity. It was adopted by Augustus and his successors; hence the word was afterwards applied to persons enjoying kingly power, more especially the rulers of small states, either sovereign or dependent. The title is now very generally applied to the sons of kings and emperors and persons of the blood-royal. The word prince translates two German titles: *Fürst* (ranking below Herzog or duke), and *Prinz*, the latter given (1) to all members of sovereign houses, and (2) to such members of noble families as already held the title *Fürst* in the time of the Holy Roman Empire (i.e. up to 1806). In various parts of continental Europe the title prince is borne by families of eminent rank but not possessed of sovereignty. Practically in Britain the term prince is restricted to members of the royal family. In France, under the old regime, dukes took precedence of princes; and many dukes had principedoms as minor titles. Napoleon put his new-created princes above dukes. In Italy princes rank after dukes, sons of dukes being called princes.

Prince Edward Island is a province of the Dominion of Canada, having entered the confederation in 1873. It is situated in the Gulf of St Lawrence, and is separated from New Brunswick and Nova Scotia by Northumberland Strait. The greatest length of the island is 140 miles; its breadth varies from 2 to 34 miles, and it has an area of 2184 sq. m., nearly all of which is occupied. The population in 1921 numbered 88,615. Although discovered by the Cabots, no claim was made to it by the British on that account. Possession was assumed by the French, but little was done towards its settlement until 1715, when its fertility attracted some Acadians from Cape Breton. It was finally ceded to Great Britain in 1763. In the first

instance it formed part of Nova Scotia, but in 1768 was made a separate province. The pop. in 1763 was 4000; but about that time an emigration set in to the mainland, and the Acadians were expelled, so that in 1768 it had been reduced to about 1300 (see ACADIA). Until 1799 it was called St John's Island, but its name was then changed to Prince Edward Island, in compliment to the Duke of Kent, who paid it a visit in that year. Prior to 1875 most of the land was the property of absentee proprietors, and for many years the land question was a source of difficulty. The local government, however, passed a measure in 1875 giving itself powers to buy out the landlords, and to sell the land to the tenants or others on easy terms of repayment. By this legislation a fruitful source of irritation was removed, and the agricultural industry—the principal one in the province—placed on a more satisfactory footing.

Seen from the water, the appearance of the island is exceedingly prepossessing. The surface is undulating, but never exceeds 500 feet; the soil is very fertile, consisting generally of a light-reddish loam, and occasionally of a stiffer clay, resting in some places on red sandstone, although in other localities it seems to be entirely alluvial. All kinds of cereals, roots, and vegetables are raised. Oats and potatoes from the island enjoy a special reputation, and the same thing may be said of its sheep and horses. A natural manure, called mussel mud, made of decayed oyster, clam, and mussel shells, is found on the coasts. It is largely used by the farmers, and is said to be a most valuable fertiliser. Although coal is known to exist, it is not worked, owing to the depth at which it is found and the cheapness at which it can be purchased from Nova Scotia. There are apparently no other minerals on the island. The climate is healthy, being milder than that of the mainland, and freer from fogs. The spring is often backward, but the summer months are enjoyable. Prince Edward Island is without doubt the best fishing station in the Gulf of St Lawrence, but the habits and feelings of the people are so decidedly agricultural that the fisheries have not received from them the attention they deserve. They are chiefly for mackerel, lobsters, herring, cod, hake, and oysters; while salmon, bass, shad, halibut, and trout are caught in limited quantities. The oyster fishery is capable of vast development. The oysters are considered the finest in the world. Lobsters are exported. The conditions are also favourable for the breeding and rearing of live stock, of which large numbers are annually exported to other parts of Canada and the eastern states of the American Union. Silver foxes are bred for their fur.

The coast-line is a succession of bays and projecting headlands; the largest bays are Egmont, Hillsborough, and Cardigan, which by penetrating into the land from opposite directions form narrow isthmuses, dividing the island into three distinct peninsulas. Charlottetown is the capital, and has a pop. of 12,000. Other principal towns are Summerside (3000), Georgetown, and Souris. The rivers are naturally short, but the province is well watered. Shipbuilding is long since extinct; manufactures are not carried on to any large extent, and chiefly for local purposes. The making of butter and cheese on co-operative principles, a new development, has greatly increased. There is a railway, built and worked by the Dominion government, running from one end of the island to the other. The island is connected by telegraph with the mainland, and there is daily steam communication between the two, although it is occasionally interrupted during the winter. A tunnel (9 miles) under the Northumberland Strait, has been talked of. The settlers are predominantly of English,

Irish, and Scottish descent, with many of French, German, and Scandinavian origin. Roman Catholics number some 39,000; Presbyterians, 26,000; Methodists, 11,400; Baptists and Anglicans each about 5000. Free education has prevailed since 1853. There are two colleges—the Prince of Wales (Protestant) and St Dunstan's (Roman Catholic). The government of the island is administered by a lieutenant-governor, appointed by the governor-in-council, and paid out of federal funds. The legislative assembly consists of thirty members—fifteen councillors elected by property-holders, and fifteen assemblymen elected by universal suffrage. These sit side by side and have exactly the same powers. The province has four representatives in the Dominion House of Commons. Its revenue is supplemented by a subsidy from the Dominion government arranged for at the time the island entered the confederation. See D. C. Harvey, *The French Régime in Prince Edward Island* (1926).

Prince of Wales Island. See PENANG.

Prince Rupert, a city of British Columbia, Pacific terminus of the Canadian National Railway, about 450 miles NW. of Vancouver, has facilities for a great port, and has been nobly planned, with provision for public buildings, squares, and parks, but development has been slow. Prince Rupert has sawmills, salmon and halibut fisheries, trade in grain, timber, and minerals. Pop. (1921) 6393. For Rupert's connection with Canada, see HUDSON BAY.

Prince Rupert's Drops. See ANNEALING.

Princes Islands, a beautiful group of nine islets near the eastern end of the Sea of Marmora, about 10 miles SE. of Constantinople, the largest being called Prinkipo. A favourite summer-resort of the Constantinople Greeks, they were in old times frequently a place of exile.

Prince's Metal, named from Prince Rupert, an alloy of copper and zinc, with more zinc than in brass.

Princeton, a borough of New Jersey, 50 miles SW. of New York. Pop. 6000. In 1777 it was the scene of a battle between the British under Colonel Mawhood and the Americans under Washington, in which the former were defeated; here the Continental Congress sat in 1783; and from Princeton Washington dated his farewell address to the army. Princeton, however, is chiefly celebrated as the seat of Princeton University, formerly the College of New Jersey, which, founded by charter in 1746, under the auspices of the Presbyterian Synod of New York, held its first commencement under its second charter at Newark in 1748. Liberal subscriptions were obtained both in America and in Britain, the Bishop of Durham being among the contributors, and the General Assembly of the Church of Scotland ordering a national collection. In 1756 the college was transferred to Princeton, on the erection of a hall named Nassau Hall in honour of William III. Within it hangs a portrait of Washington. It has had several distinguished Presbyterian divines for its presidents, as Jonathan Edwards and Dr James M'Cosh. Since the civil war benefactions have poured in upon it. Among its graduates have been James Madison, fourth president of the United States, and many very eminent men. The theological seminary, founded in 1812, is the oldest of the Presbyterian Church in America. In 1896 the college became Princeton University. It has faculties of Arts and of Science, many laboratories and museums (especially for natural science), and a large library.

Principal. See AGENT, GUARANTY.

Principe, or PRINCE'S ISLAND, a Portuguese island in the Gulf of Guinea, forms a province with São Thome. It produces cocoa, coffee, sugar, palm kernels, &c. Area of island, 45 sq. m.; pop. 5000.

Pringle, THOMAS, minor poet, was born at Blairlaw (near Kelso), Roxburghshire, 5th January 1789. Lame from childhood, dyspeptic, devout, he went at seventeen to Edinburgh University, and found bread if not contentment of mind as clerk in the Scottish Public Records Office. He took to writing at an early age, and, besides other literary schemes and ventures, started the *Edinburgh Monthly Magazine*, the parent of *Blackwood*, in which his own most important article was on the Gypsies, from notes supplied by Scott. In 1820 he set sail with a party of twenty-four emigrants of his father's family for Cape Colony. He travelled into the interior with the party, and had his heart stirred within him to see the inhumanity practised towards the natives by English and Dutch residents alike. For three years he lived at Capetown as librarian of the government library at a salary of £75 a year. He started the *South African Journal*, and fought a brave fight for the freedom of the press. But he was bullied by the tyrannical and petty-minded governor of the day, Lord Charles Somerset, his schemes crushed, and himself reduced to poverty. He returned to London in 1826, and became secretary of the Anti-Slavery Society. He died in London, 5th December 1834. His *Ephemerides* (1828) was a collection of graceful verse. Those poems that related to South Africa—the best 'Afur in the Desert'—were reprinted in the volume of *African Sketches* (1834), a series of glowing sketches of South African scenery. Pringle's *Poetical Works* were edited, with a florid eulogium, rather than a life, by Leitch Ritchie (1839), and by W. Hay (1912).

Printing. Letterpress printing, or more strictly Typography, is the method of impressing any surface standing in relief on to paper, or any other suitable material, with the aid of some pigment such as a specially made ink, usually black, but sometimes in colour. This pigment is of a somewhat glutinous nature, and not liquid as writing-ink. The term printing covers many processes, and for our immediate purpose generally applies to impressions taken from type and all blocks standing in relief, such as wood-engravings and all illustrations made by photographic methods, either line or half-tone blocks, including stereotype and electrotypes duplicate plates, whether of type or illustrations. Again, the expression printing may also be applied to lithography, offset-printing, collotype, copperplate, and even the various methods of producing printed cotton and other fabrics. In this particular article it is not necessary to give any details of these other methods, except to explain that we are dealing with the results obtained from surfaces that stand in actual relief, and not those employed for planographic processes, such as lithography, or the intaglio system, which consists of incised plates either engraved by hand or photogravure plates, mechanically produced, as their name implies. Intaglio is the reverse to the relief method, and the ink in this case is forced into the furrows resulting from the incisions made. When the plate is inked the surplus pigment is wiped off the surface of the plate, leaving only that remaining in the furrows. The paper under great pressure is then forced into the plate, which leaves the inked print slightly raised on the surface of the paper. This may be felt by passing the finger lightly over the printed object. On the other hand, all letterpress printing, being in relief, is indented, and the impression will be seen on the back of the paper, even if only faintly.

Among the Chinese it is said, during the 10th century, a first idea of printing took shape, and in China, indeed, the plan adopted a thousand years ago for certain kinds of work, i.e. pictorial designs, in some respects still prevails. It was not until some three or four centuries later that the Chinese employed some system of lettering for the printing of what may be termed descriptive matter, as distinct from mere pictures. For what we would call 'block-books,' which may or may not include some small amount of lettering such as titles or short descriptive matter, the Chinese usually employ pear-tree wood, which is cut up into boards of about half an inch thick, and these into blocks large enough for two pages of the book to be printed. The blocks are planed, squared, and sized or varnished. The design to be engraved is drawn or written on thin transparent paper, and transferred to the surface of the block by rubbing. The engraver next cuts away everything except the transferred pictures or letters. Labour being cheap, a block of this kind can be cut at about the same expense as it could be set up in movable metal types. For printing no press is used, the block being adjusted on a table, before which the printer stands, having a bowl of ink on one side and a pile of paper on the other. In his right hand he has two flat-faced brushes, fixed on the opposite ends of the same handle. One brush is dipped into the ink and applied to the face of the block, on which a sheet of paper is placed; the back of the paper is then swept lightly but firmly with the dry brush at the other end of the handle. This is all that is needed to fasten the ink on the paper—which is soft, thin, pliable, and quickly absorbent. Printing from movable types, it is said, was probably practised in China as early as the 12th or 13th century, and there are Korean books printed from movable clay or wooden types in 1317. The Chinese still prefer block-printing, but printing from metal types is becoming more general.

In the 15th century printing was first invented and practised in Europe. Before movable types were employed, which was in the latter part of the first half of that century, block-books after the Chinese fashion had been produced, and the first dated record we have is the picture of St Christopher, which is said to have been cut on wood in 1423. This was followed by several other block-books, and between 1430 and 1450 some of the most celebrated are the following: *Apocalypsis*, *Canticum Canticorum*, and *Biblia Pauperum*. All these were knife-cut plank-wise, usually on pear-tree or similar wood, whereas nearly all modern blocks are engraved on the end grain of box-wood with a graver which is a small V-shaped tool of steel. This explains the difference between a wood-cut and a wood-engraving, so often confused.

The first introduction of movable types overlapped the later period in which these block-books were produced, and it is not clear whether the first separate types were cut on wood or cast in metal, and, if cast, what kind of metal was employed. Prior to the printing of the Gutenberg Bible at Mainz, about 1455, there were several very crude examples of printing turned out, particularly from Holland, but it is to Gutenberg (? 1400–1468) that is attributed the credit of being the inventor or at least responsible for the great improvement in the production of movable types and for the splendid craftsmanship displayed in printing his celebrated Bible, really the first big volume to be printed with movable types. With regard to the Dutch claim to the invention by Coster or Koster (? 1370–1440) of Haarlem, probably in the light of more recent researches he may have been the first to make some experiments, but these early examples of his work are rather poor, and will not bear comparison

with that of Gutenberg. For the last half-century or more many claims have, in turn, been separately advanced in favour of these two printers, but bibliographers of the present day are mostly inclined to give Gutenberg priority for the reasons stated above. Certain it is that the spread of printing throughout Europe was more due to Gutenberg than to Coster.

It has been said that Fust (or Faust), who had financed Gutenberg from the start, obtained by a law action possession of his premises and plant, and with the aid of Schoeffer, formerly an assistant to Gutenberg, carried on the original business, whilst Gutenberg obtained other monetary help and set up a second office. With two rival establishments in existence, it was not possible to keep secret the method of printing. In 1462 the city of Mainz was sacked, and this dissolving engagements between masters and workmen, many of the latter migrated to other countries, taking with them their knowledge of the art. Printing spread with marvellous rapidity, considering the many difficulties of transport and communication then prevailing. For instance, by 1500 there were nearly 80 different master-printers at work, and by the end of that same century approximately 200 in Europe generally. From Mainz the art of printing spread to Italy in 1465, to France in 1470, to Spain in 1474, to Portugal in 1487, to South America in 1536, and in the British Isles—to England 1477, Scotland 1507, Ireland 1551, Wales c. 1588.

It was William Caxton (q.v.) who first introduced printing into England. Having learned the art, it is said at Cologne and at Bruges, he came back to England and set up his press at Westminster within the precincts of, but not in, the abbey itself. Whilst at Bruges he had printed five books, but the first book he issued from Westminster was the *Dictes and Sayings of the Philosophers*, dated November 1477, which was followed by many other books too numerous to mention here. On his death he was succeeded by Wynken de Worde, his assistant, said to be a native of Alsace, whom he had brought over from Bruges (see WORDE).

The first hundred years of printing in England was a period of great activity. In 1478 printing was first practised at Oxford by Theo. Rood; in 1480 at St Albans by an unidentified printer, now called 'the Schoolmaster'; in 1521 at Cambridge by Siberch. When the art had spread throughout the country, and education became more general, it was realised by the authorities that a power for good or evil had arisen. Then it was deemed necessary to regulate the press, and in 1530 censorship was established in England. This was followed by a period of decadence in the quality and quantity of printing. Printers were punished, especially during the existence of the so-called Star Chamber (q.v.); oppressed, abused, and often imprisoned, they lost all enterprise. Censorship was abolished in 1694, and then began a period of revival, aided by some improvement in typefounding in the middle of the 18th century. The 19th century saw some further development, following the invention in 1814 of the steam printing-press.

It was during the first half of this century that William Pickering (1796–1854), the eminent bookseller and publisher, was responsible for a marked improvement in book-production, in which for some twenty-five years of his life he was assisted by the second Charles Whittingham (1795–1876) of the Chiswick Press. This association—Pickering with his unrivalled knowledge of early printing, and Whittingham as an acknowledged printer of good taste—resulted in an ideal collaboration which did much to create a higher standard in printing. The

are nicked on the front side of the letter as explained in the article on TYPES. He picks up the desired letter from its box, and in conveying it to the composing-stick turns it to the proper position with the nick or nicks uppermost (fig. 3). In

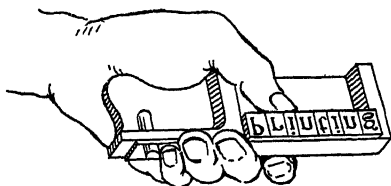


Fig. 3.—Setting-up Type.

setting up poetry a uniform space is placed between each word. This also applies to prose matter, but in order to fill out a line of prose to its full width, without breaking the last word, it is nearly always necessary either to increase or decrease the spacing between the words of the whole line. Occasionally the last word, if it happens that it is a long one, is divided by placing a hyphen and carrying forward the remaining portion to the next line. Before justifying the line out to its full extent a careful compositor will read his line and amend any errors made. When the composing-stick is filled the whole is lifted out and placed on to a galley usually made of metal, of various lengths, with a flange round three sides, which allows the type matter to rest safely against the lower side, and permits of it being locked or fastened up in order to have a proof struck off. This proof is then compared by the corrector of the press with the copy from which it was first set up, and all technical errors eliminated. This is termed the first or house proof.

Proofs are generally submitted to the authors or customers in slip or galley-form, and not so often in definite page length, except in the case of a reprint order. For a new work it is generally the custom to send out in this long slip form, because corrections, deletions, or insertions can be effected with greater facility than if proofs are submitted in page form.

The reader, or corrector of the press, as he is sometimes called, is usually one with a practical experience as a compositor, and noted for careful workmanship and clean proofs, possibly due to his general education being above the average, and a knowledge of languages is a valuable recommendation for the post. His position is one of responsibility, and the reputation of his firm depends greatly on him for the careful reading or revision of all work issued from that particular press.

When the technical errors have been cleared out in the house proof, clean proofs with the MS. are sent to the author or editor, who probably makes certain alterations or deviations from the first copy supplied. These are returned to the printer, the corrections made in the type, and further proofs are usually sent out again in page form of the desired length, with the headlines and page-folios inserted and arranged in sheets or signatures of a given number of pages, either in sections of 8, 16, or 32 pages, according to the precise size of the proposed printed book. Then if the book is, say, a crown 8vo ($7\frac{1}{2}$ by 5 inches), such as a novel, the pages are usually arranged in sections of 16 pages, and then laid down as two signatures of 16 pages each, thus constituting a 'forme' of 32 pages of type. In some cases, when the number printed is a large one, the forme may consist of four sections of 16 pages, making a total of 64 pages, this needing a sheet of paper of double quadruple crown, measuring 60 by 40 inches.

When the requisite number of pages have been made up they are laid down on the imposing surface—which stands on a strong wooden frame, rather above ordinary table height, and made with a planed iron surface—in a certain order so that when the pages are printed on both sides of the sheet they will cut up into sections and fold in complete sequence by the bookbinder. This is attained by adopting some recognised scheme of lay-out for the many and varied sizes of books. One small and simple instance is a sheet of 8vo = 16 pages in all, which shows (fig. 4) the actual type

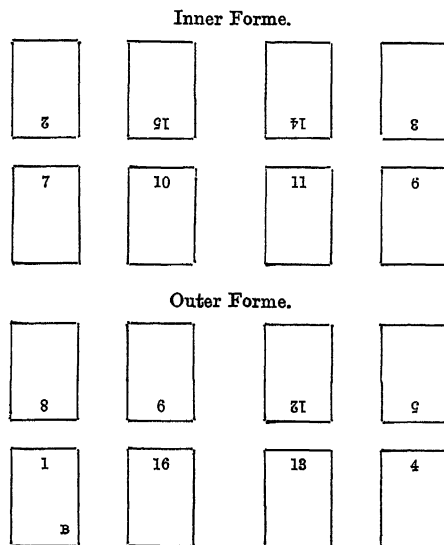


Fig. 4.—A Scheme for Imposition.

pages as the compositor would place them on the imposing surface; these when printed would appear in a reversed order. Similar schemes are adopted for sheets printed in larger sizes, and according to the number of pages contained therein. When the type pages have been arranged in correct order they are surrounded with either wood or metal 'furniture,' which gives the desired margin to the different pages, and then enclosed in an iron frame called a 'chase,' the whole constituting a 'forme' (fig. 5), which represents 4 pages of a quarto size.

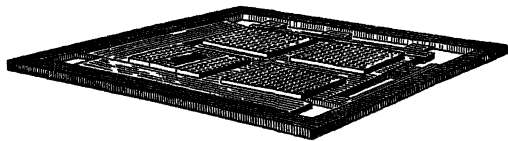


Fig. 5.—Complete Forme with Chase.

After being securely fastened by the aid of wedges or 'quoins' it is rendered portable. After fresh proofs have been struck off, these formes may be stored in racks, and eventually, when any final corrections or alterations have been made, carried and placed on the particular press or machine told off for printing.

Frequently stereotype or electrotype plates are first made of type pages. This is advisable for long runs in printing numbers, because it saves wear and tear to ordinary loose type, which is an expensive item in the first cost of installing a printing plant—in fact, it is a continuous expense for renewals, unless mechanical type-setting is employed. In that case machine-set types are usually printed from direct, and only when reprints are

likely to be called for are the pages stereotyped or electrotyped for future use. The type thus being liberated is then thrown into the melting-pot in readiness for other work.

But as regard hand-set types, when finally disengaged, these have to be returned or distributed into their respective cases as required for further work. This is called 'distribution,' and a compositor does not usually attempt this until he has gained a complete mastery of the different boxes and can handle type carefully. By practice he will soon obtain speed and proficiency in dropping the letters into their proper receptacles; in fact it is possible to disperse 'dead matter,' as it is called, three or even four times more quickly than it originally took to set up.

The choice of the size of type depends largely on the size of the book to be printed, and also by the length of the MS. or copy supplied. For instance, an appropriate size for a quarto book would be, say, 12 point (pica), and for an octavo, 10 point (long primer), or even 11 point (small pica). Sometimes it is necessary to drive or spin out a work, which is done by 'leading' out the lines by thin strips of metal made of various thicknesses, and these are called 'leads.' If the lines are set quite close without leads, this is known as set 'solid.' Excessive leading is not advisable, for it gives a weak appearance to the page. On the other hand, if the printed line is a fairly long one, a little leading is less fatiguing in reading, and assists the eye in taking up the next line more readily.

So far we have been dealing with type-setting by hand, which still prevails to some extent for work of a commercial character, and also for some proportion of book-work. Machine-setting in the past was confined generally to newspaper work and to magazines. Owing to the improved designs now to be obtained in type faces and the greater facilities offered for mechanical type-setting, much more book-work is now being done each year. This can be carried out more expeditiously, and an unlimited quantity may be put into type whilst metal is available. With hand-set types, which were usually limited, it was sometimes difficult to put any great quantity into type at one time.

Many experiments were made during the whole of the last century with various mechanical contrivances for expediting the composing of ordinary type, but none of these attempts were satisfactory; and although some of the systems lingered for some time, they have practically all dropped out of use. These machines employed existing loose types, but for some machines these types had to be specially nicked to facilitate distribution.

Of machines now in use for mechanical type-setting, it is only necessary to take two as examples, namely, the linotype and the monotype, which represent two quite different methods, both of which may be considered as almost perfect in their respective working. We say this without disparagement of other machines on the present market, to which we can give but a passing reference, but these follow on general lines one or other of the two systems now named.

The LINOTYPE, so named from the fact that it composes and casts as a solid slug a complete 'line of type' to any given width in any size or style of face selected; and a page or column is built up of lines, and not single or separate letters. The dual operations of setting and casting are confined to one machine and one operator only, with a keyboard similar to that of a typewriter. On compressing one of the keys, a brass matrix is released from the magazine, and slides down a groove or channel, and is assembled in the correct order by a travelling belt until the line is complete. The filling out of the line to the desired width is re-

gulated by the use of certain space-bands or wedges which are pushed up sufficiently to justify or fill out the line. The assembled line of matrices and space-bands are then carried to the face of a vertical mould and filled with molten metal, and so the complete line is cast and ready for the cutting knives for trimming the foot and sides in order to allow of the lines standing square and true in all respects. The finished lines are then conveyed to a receptacle called a galley. As soon as the matrices are disengaged they are automatically returned to the magazine, but the space-bands are retained in the stationary box, situated near the assembly block. Whilst distribution is in progress, the composition of further lines is taking place. From this brief account it will be seen that the whole number of operations is under the sole control of one man. Given good 'copy,' it is said that it is possible for an expert to produce finished lines of plain straightforward matter which would be equivalent to about 10,000 ens or more per hour, which means that number of separate letters, but for all-round work of the ordinary operators the average may be taken at least as 5000 per hour from fair copy. This machine also sets 'display' work.

Unlike ordinary hand-set type, which becomes worn in course of time, the linotype produces each time a new and clean face for printing purposes, and, being cast in lines, is easier and quicker to handle in bulk, with less liability to 'accidents of the press' by not being in separate or loose single types. If there is no call for reprints the slugs are thrown into the metal-pot for fresh work.

One of the advantages claimed for this machine is that it composes in almost any known language or character, and is employed in all civilised countries. Sundry improvements and various accessories are being continually announced, all of which add to the general utility and greater expedition of this machine.

The method adopted by the MONOTYPE is that of composing and casting in separate types. This allows of greater facility for making alterations or corrections in the matter. This system, although more or less automatic, requires two operators, one for the keyboard and one for the caster. There are certain advantages to be claimed for it over the slug method—one, which we have just referred to, concerns alterations or corrections. As the caster is quicker in its action than the keyboard, it is possible, where the installation is a large one, for a smaller number of casters to keep pace with the keyboards, and one attendant can run two machines, or even three, with the aid of a subordinate assistant.

The keyboard of the monotype, which is also similar to that of a typewriter, is used for the perforation of a paper ribbon, which controls the caster. As the keys are pressed, certain perforations are made in this paper strip. When finished, the perforated ribbon is transferred to the caster, and this machine is automatically controlled by the perforations made on this ribbon. By the agency of compressed air passing through these perforations two stops are elevated, one at right angles to the other. The object of these stops is to define the position to which a case containing 225 matrices shall be brought over a mould. Immediately the correct matrix has been brought into position, it is clamped to the mould, which has been meanwhile adjusted to the required width of the type to be cast, and molten metal is injected into the mould, resulting in a type being cast, correct to size, and bearing on its upper end the character required. A fine stream of water is passed through the mould to prevent it being overheated, and the metal in the mould instantly becomes solidified. The matrix is then

lifted from the mould, and, whilst the next matrix is being brought into position, the type previously cast is ejected and carried to a position where type after type is stored until the words and lines are complete. Each line is then carried to the galley, where they are accumulated until the galley is filled. When the type is finally disengaged it is melted down for new work.

As the monotype needs, in addition to the keyboard, a separate caster it is said that a competent keyboard man can operate about 12,000 ens or separate letters per hour, but the actual average may be taken as from 5000 to 7000 per hour; much, however, depends on the copy supplied. In this case, too, the machine is constantly being improved and added to. One other advantage is that the type produced by the caster can be used as hand-set types, and any particular letter running short can be separately cast to any requirement.

Two other classes of composing machines may be mentioned here whilst dealing with this section. Both are on the slug principle. The first is the **TYPOGRAPH**, which was introduced from the Continent some years ago, but, owing to the difficulty of obtaining renewals during the Great War, its general employment lapsed for a time. Except for some details, the main principles are those of other slug machines, but in this case the matrices are attached to steel runners, and are in view of the operators, and not enclosed in a magazine like that of the linotype. The matrices are set in motion by depressing a key on the board as in other composing-machines, and the spacing is effected by a series of space-bands, plain on one side, with a helical face on the other, and a cylindrical boss, which expands by rotation, and thus justifies the line to its full limit.

The **INTERTYPE** is another and later development of this class of slug-casting machine, and in many respects is similar to the linotype. It professes to have certain advantages over others of the same kind. In designing this machine a policy of standardisation has been adopted, so that it is built up from a uniform base, and the difference between one magazine and a two, three, four, or even a six magazine is only a question of equipment. Thus a user is enabled to purchase a machine of limited equipment sufficient to meet his immediate needs, and build this up as his business grows. It is claimed that its capacities are greater than those of any other machine on the market; that it is lighter to operate, as the keyboard has been simplified; and it has also a greater range for the setting and casting of the slugs, besides many other improvements of the various parts in connection with assembling, spacing, casting, finishing, and distribution of the matrices into the magazine.

The **LUDLOW TYPOGRAPH** is a small and efficient slug-casting machine of American origin, and is a useful adjunct to composing-machines of a larger kind, and also for those printing-houses still employing the old method of hand-setting. It has been generally adopted by the newspaper press, and also by firms dealing with commercial work, chiefly for the setting and production of slugs necessary for the display-lines or headings of advertisements. The outfit of matrices offered by the makers includes a large variety of type faces in all sizes. Hand-set types of a jobbing or fancy character are usually limited and expensive to purchase, but by this particular machine an unlimited supply is to be obtained by the aid of comparatively few matrices, which are set up in a special composing-stick and cast in single lines.

Experiments are now being made with certain photo-composing apparatus, which, if successful, it is claimed will largely supersede the prevailing methods of hand and machine composition by

metal types. One difficulty we foresee is that of making corrections effectively.

Notable as have been the improvements effected in type-setting, it is in the press department of printing that greatest advance has been made. Particularly is this so in newspaper production, to which is applied the rotary system of printing.

There are three modes of impression in printing, and these are the platen (or flat), the cylindrical, and the rotary. The first presses were of the foremost kind, and the first known illustration of an old wooden hand-press dated very early in the 16th century, but the earlier presses were in the form of a wine or linen press. The illustration (fig. 6) shows a fixed bed, on which

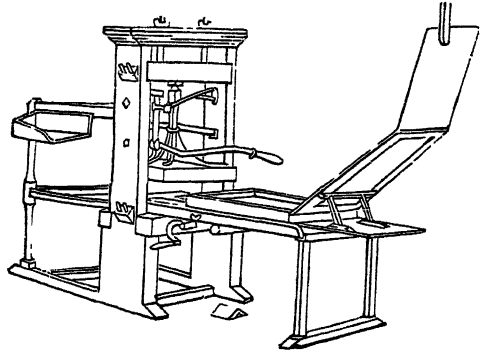


Fig. 6.—Old Wooden or Common Press.

the type pages were laid, whilst the upper part, termed the platen, which was placed over it, was raised or lowered by means of a screw. When the surface of the type was inked, and the sheet of paper to be printed was laid over it, the top portion, made of solid wood, was screwed down until the two planes came into contact with the type and sheet intervening. The platen was then raised and the printed sheet released.

This press was modified from time to time, and Moxon, our first authority on printing, said in his work, *Mechanick Exercises*, 1683, that it was Blaeuw of Amsterdam who made about that date several valuable improvements in this wooden hand-press, which remained in general use until the latter part of the 18th century, when Earl Stanhope began making his experiments with the press which bore his name. This was made entirely of iron, and was actuated by a system of links and levers which allowed two men to print two hundred impressions per hour, an advance on that produced by the old wooden press, which was then termed the 'common press.' Later on, other improvements were made on Earl Stanhope's design. This was followed by the Columbian press of American design, which was also of iron, and of more solid and powerful build. This was followed also, about 1823, by the Albion press, made by Cope of London, which for hand work still retains its popularity. It was this particular kind that was adopted by William Morris when setting up his Kelmscott Press. Some of these hand-presses were made specially strong in order to deal with the heavy work demanded by his famous edition of Chaucer, which contained many large woodcuts designed by Burne-Jones. Except for the printing of very short runs, or for the pulling of proofs, or for the production of fine limited editions (or editions de luxe), these presses are now rarely used, and are chiefly employed by the few private presses that came into vogue with the death of Morris in 1896 and the closing down of the Kelmscott Press in 1898.

These hand-presses required quite a different method of working and also a different system of 'making ready,' which is a necessary preparation before beginning to print. Moreover, these presses involved much manual labour and were slow in production, which is not to be tolerated in these days. The modern power-presses, whether for sheet or web printing, have now been improved so very much that with the requisite skill they will produce work equal to, and in some classes even better than, that given by the old hand-press.

To trace the evolution of the hand-press into the power-driven machine of to-day it is necessary to go back to the end of the 18th century. It has been claimed that William Nicholson of London must have derived some of his ideas for the construction of a printing-machine—this was about 1790—from one patented in 1772 by Adkin and Walker for printing on calico and other textile fabrics. The principle adopted by these two men was that of the rotary system, which Nicholson to some extent adopted. He was not a printer, but simply an editor, and he never reached any stage beyond the designing of the machine. Curiously enough, many of the points he suggested in his patent of 1790 foreshadowed those embodied in some modern printing machinery.

It is to Friedrich König that credit is due for the actual making of a printing-machine. He came from Germany in 1806, and his first experiment was with the platen method. His idea was to accelerate the speed and make more automatic the production of the hand-press. The result was not at first encouraging and never put into general use. About this time it is assumed that he must have been impressed with Nicholson's suggestions, and, abandoning his former and somewhat crude ideas of the flat impression, he in 1811 took out a patent for a machine, consisting of a single cylinder, on which the paper was impressed as the bed on which the type was placed travelled to and fro—the sheet being printed as the bed went forward, and the cylinder remaining stationary on the return, very much on the same principle as the modern stop-cylinder, which is distinct from the two-revolution machine.

This second attempt of König's was more successful, and John Walter of the London *Times* gave him a commission to build for him a double-cylinder machine. This was completed in 1814, and steam power was first adopted in that same year by the *Times* for driving that machine, which produced about 1000 impressions per hour on one side only. König was still busy with new ideas, and shortly afterwards he patented another machine consisting of two large cylinders which faced each other. This has been termed a 'perfecting machine,' from the fact that the sheet after being printed on the first side was carried by tapes and reversed in its progress so that it was presented to the second cylinder for the printing of the second side. It was in 1818 that Edward Cowper made several improvements on this machine, which included a flat ink-distributing table, a distinct advantage, still employed for single or double cylinder machines. This machine, later on, was still further improved, and produced about 750 perfected (i.e. backed) copies per hour. Many of the original features are still retained in the more modern examples of this class of machine, and also rendered more speedy. One recently put on the market by the Linotype and Machinery Ltd. is said to produce 1600 perfected copies per hour.

For many years most book-work, and chiefly that of a commercial character, has been executed on what is generally known as the WHARFEDALE or single cylinder on the stop principle. This followed the 'Ulverstonian' machine, built about 1853 by

Soulsby, with a revolving and travelling cylinder which passed over a fixed type-bed, but the Wharfedale reversed that action by adopting a fixed cylinder revolving on stationary journals with a reciprocating type-bed. This was first introduced about 1860 by William Dawson and David Payne of Otley in Yorkshire, and its name was derived from the local dale through which the river Wharfe runs. These machines, of which there were several variations, had a great vogue for many years, and are still much in use in different parts of the world. Both English and American makers have added many improvements to the original specifications. These include better inking facilities and various automatic arrangements for delivery of the printed sheets.

The cylinder, a hollow drum, has an opening in its under side, and is placed approximately in the centre of the machine. The table or carriage on which the type-forme is placed has racks underneath, geared into traverse-wheels and driven by a crank motion from the driving-wheels, and from those traverse-wheels the reciprocating table motion is derived. Racks on top of the table cause the cylinder to rotate, thus giving the impression to the forme. The inking system is placed at the extremity of the machine, and across it a duct or ink-reservoir, with an adjustable knife, which regulates the outflow of ink. A roller in motion, called a vibrator, takes a film of ink periodically and transfers it to the ink-table, which forms part of the carriage, and travels backward and forward. The ink is evenly spread over the ink-table by distributing-rollers. The table then passes under the inking-rollers, which give the forme the proper coating of ink. The various rollers are coated with 'composition,' which is of a resilient nature, and is referred to on page 391. The feeding apparatus is situated at the other end. A pile of paper is placed on the laying-on board, and the feeder stands at the side of it and lays the sheet down until the edge of it comes in contact with the front and side marks, when a series of metal fingers, called grippers, open, and take a sheet by its front edge, and hold it secure while the cylinder is revolving and the printing taking place. At a certain point the grippers release the sheet, which then passes into the taking-off apparatus, from which, by various devices, it is deposited on the delivery-table with the printed side uppermost. The cylinder, on the return of the forme-carriage, is stopped, the necessary locking being performed by a push-rod worked off an eccentric cam placed on the lower part of the frame, which pushes the cylinder back to a dead stop. The inking and distributing powers are a great feature of these machines, likewise the accessibility of all parts and the convenience in laying on and taking off. They are simple in construction, and occupy little space. The 'Standard' Wharfedale of Messrs Dawson, Payne, and Elliott, Ltd., is made in many different sizes, and the smallest is guaranteed to run at 2600 and the largest at 1500 copies per hour by hand-feeding, but those fitted with an automatic feeding apparatus will produce greater numbers.

Soon after the introduction of the stop-cylinder machine a small PLATEN machine was invented by an American named Gordon. This was made exclusively for small jobbing work, and it was first actuated by a foot-pedal, but afterwards, when made in larger sizes, provision was made for driving by power. An endless variety of these small and useful machines are now to be obtained. They occupy little floor-space, and, according to size, will print anything from a card up to a sheet measuring 22½ by 17 inches—larger sheets are not usual. The operator both lays on and takes off the printed

sheet or card, and the output is at least 1000 an hour. Some machines are speeded up to produce more, but the number given, unless some automatic arrangement for feeding or taking off is used, is safe if these operations are performed by hand. This machine needs only a small, square floor-space. It usually consists of two parts—the bed and the platen; and the main principles are that the bed which holds the type-forme is placed in a fixed vertical position, and the inking arrangements are placed at the back and near the top of this half of the machine. The other portion which forms the platen, on which the sheet to be printed is laid, is, when at rest, almost horizontal, and when set in motion this platen rises and meets the fixed bed containing the type-forme, and the impression is given to the intervening sheet. The platen then falls back into its original position, and the printed sheet is removed and another laid to certain marks, ready for the next impact. In the interval the overhead inking arrangements pass over the type-forme, the ink being first distributed by either a revolving disc or a cylindrical drum. These handy machines relieved the old hand-presses of much of the smaller work, being much more expeditious and much less expensive in working. They are also exceedingly useful as a supplement to the cylinder-machine department in dealing with oddments of printing and miscellaneous work of a jobbing character.

The so-called colour machine, first made in this country on the stop-cylinder principle, consists of one cylinder and two separate inking arrangements, and is adapted for long runs in red and black, for example. The two ink-ducts and the necessary rolling, with the two separate formes for printing, are arranged at each end of the machine, and the carriage or bed of the machine is sufficiently long to carry the two formes to be printed, both the feeding and delivery being made in the same way as the ordinary one-colour stop-cylinder. The cylinder makes two revolutions forward in order to receive in turn the two colours, and on the return of the carriage, or bed containing the two type-formes, the cylinder remains stationary. One other system of printing is based on the two-feeder plan, which increases the output.

The Wharfedale 'stop' machine has, to some extent, been superseded by those built on the two-revolution system, which is of American origin. Of this class the MIEHLE is a good example, and the principle is now being applied more generally by other makers in this country. The chief character of the two-revolution machine is that it has a non-stop-cylinder, which is continually rotating whilst the machine is in motion. The cylinder rotates in the same direction twice for each copy given—once for the actual impression, and, secondly, for the return of the forme-carriage, which is arranged for by special gearing, thus avoiding the stationary pause of the cylinder. This method, combined with sundry improvements and certain accessories, renders it a faster and more accurate machine than the ordinary stop-machine. The feeding board is placed overhead, and not on a level with the bottom of the cylinder. Its solid construction gives it a more rigid frame, and it is claimed that this point, together with greater accessibility to the different parts of the machine, reduces the time usually spent in making ready for the running, particularly for work containing illustrations in one or more colours.

As stated previously, the newer varieties of machines do not require so much preliminary preparation or 'making-ready' for printing as formerly, because the frame, or bed-plate, and other parts are now so much more rigid and more truly finished in all respects. But even now a

certain amount of time must be given to this necessary work, in order to obtain uniformity of impression and evenness of inking—this is specially desirable for books or magazines that include process-blocks as textual or separate illustrations. These may be either line or half-tone blocks, and the latter usually require greater care. To arrive at the uniformity required it is necessary to bring the type up to an absolute level by patching up a trial uninked sheet pulled for impression only, and to turn that sheet upside down in a good light to see the result of that impression. Where the letters appear low, very thin paper is pasted on the impression sheet, and where they stand high, pieces are cut out. Usually if blocks are included in the type pages they are found to be low. In that case it is customary first to underlay them so as to bring them up to the height of the surrounding type—this is done before the inequalities of the type are dealt with. When this is done, and the sheet pasted up into its proper place on the impression cylinder, another trial sheet is pulled, and sometimes a third one is necessary, all of which are fastened up on the cylinder, or the pages may be cut out singly from the sheet and pasted up separately, which is the more usual plan. If the type is new and the machine in fairly good order, making-ready will, of course, not involve so much trouble as if type and machine are both somewhat worn. Illustrations in the text demand special attention in bringing out light and shade in each separate block, and to do this properly will test the artistic appreciation of the workman. This is carried out by a more elaborate overlay to each illustration, and is greatly assisted by correct underlaying in the first instance, as already explained. All this being carried out as detailed, and the requisite amount of ink regulated to the requirement of the work in hand, evenness of both impression and inking should result. In the rotary system of printing now to be considered, as distinct from the platen and cylindrical methods, little or no making-ready is required.

ROTARY printing is used mostly for newspaper production, but occasionally for magazines and the more ordinary kinds of book-work of large issues. It is here that the greatest improvements in printing practice have been made since the middle of the last century. Messrs Hoe of New York constructed for the *Times* newspaper in London a ten-feeder machine, which was considered an improvement on previous experiments of the rotary character, but the feeding arrangements involved much manual labour, and the rate of production was slow. Out of this, in 1866, evolved the Walter press, which was the first to adopt stereotyped curved plates to fit the type cylinder, and printed direct from the web or reel of paper. This dispensed with the large number of hand-feeders and expedited the printing enormously. It is said that this new machine produced 10,000 perfect sheets per hour, the equivalent of 20,000 impressions. To the Walter family all credit must be given for this and some subsequent improvements made. This Walter press was adopted as a basis by other manufacturers, not only here, but also in other countries. Many subsidiary arrangements were added from time to time, one of the first being automatic folding.

As a result, other machines on the rotary principle have been put on the market, equally good but differing from each other in details. In striving to attain further improvements, it has generally happened that some other good feature had to be sacrificed in the process.

The more technical descriptions usually applied to the various rotary machines are generally confusing to the ordinary reader. The difference between a single and a double width of machine

should first be noted. The former prints from the reel or web of paper two news pages wide, the latter four pages wide, and this double width is slit with a revolving circular knife before it reaches the folding apparatus. Again, the larger machines are arranged in decks, and duplicate presses, according to the designation of the particular machine, are collectively employed. For instance, a single octuple is made up of two presses on each deck situated at both ends of the machine, which constitutes four units in all. Each separate press prints both sides as the web of paper passes through, and when it is slit, cut, collated, and folded it is carried to the delivery fly situated in the centre of the machine. Quadruple and sextuple machines are limited to the number of presses indicated by their names.

As an example of a rotary machine, a double octuple (consisting of eight single presses) similar to that employed at the *Times* office, and made by the firm of Messrs R. Hoe and Co. Ltd., occupies a floor-space 56 feet long by 9 feet wide, which measurement does not include either the outside staircases or the reels situated at either end, but merely the bed-plate of the machine; the height of the decks is about 18 feet. The paper is fed in from both ends, and the four folders are situated in the centre on both sides where delivery is made, thus forming, as it were, a double machine of double width. As the machine is speeded to run 15,000 revolutions per hour, its full capacity at that rate will produce 60,000 complete copies of a newspaper, consisting of 32 pages printed from four duplicate sets of stereotype plates, and the copies are slit, cut, and collated before reaching the folders, each separate and complete copy being delivered folded in half and counted off in quires. A pasting accessory may also be employed if required. If the issue consists of 24 pages only, the upper deck at each end is thrown out of use. Each reel contains about five miles of paper, and as exhausted may be easily and quickly replaced by fresh reels by means of an overhead electric hoist. Each single press may be said to be arranged in a vertical pile, with the inking appliances at the bottom; in the centre are placed, side by side, the two plate (printing) cylinders, and immediately on the top the two blanket (impression) cylinders, through which the paper passes for the printing of the first and backing sides. As the web is unwound from the extreme end of the machine it passes under the press, and is carried up the centre of the pile until it reaches the first plate cylinder, with its corresponding blanket cylinder above it, for the first impression. It is then conveyed to the next pair of facing cylinders for the reverse to be printed. From there it is cut and folded as already mentioned, and placed on the delivery fly. By the aid of certain smoothing rollers the web of paper is kept flat and taut in its progress. All this is repeated with the other seven separate presses forming the octuple. Save for a limited amount of skilled and certain other manual labour, the running of this complex machine is entirely controlled by the simple pressing of an electric button.

A useful adjunct for expediting newspaper work is stereotyping by the AUTOPLATE (see STEREOTYPING), which is an automatic machine for producing curved stereotype plates for rotary machines. After the type pages have been moulded and dried, these moulds are placed in the casting apparatus, and in a few minutes perfect plates are turned out ready for fixing on the printing cylinders, with as many duplicates as required.

Machine-made paper is now manufactured in much larger sizes than formerly, and, as a result, printing-machines are laid down to cope with the

larger sheets. The old hand-presses, especially the wooden ones, could only deal with quite small sheets; the first iron presses practically doubled the size of the sheet. Later developments of these hand-presses slightly increased the size, and the earlier power machines, whether platen or cylinder, handled paper of even larger dimensions. In addition to rotary printing from the web or reel, flat printing-machines have been adopted to take not only papers in quadruple, but in double quadruple, sizes up to 50 by 80 inches, which means expedition and the cheapening of production.

The old method of inking employed balls. The workman held one in each hand and dabbed the surface of the type, whilst his companion at the hand-press laid on the sheet to be printed. These balls were made of pelts, and the stuffing inside usually of wool. Rollers came into use soon after the Stanhope press was invented in 1800, and were absolutely necessary for the first printing-machines of cylindrical design. The present constituents of the roller for all printing-presses are mainly treacle, glue, and glycerine, the proportions varying with the different makers and according to the particular class of press or machine for which they are needed. These rollers are cast in iron moulds to standard sizes.

Ink consists of a varnish made of boiled linseed-oil with the addition sometimes of a little resin and occasionally soap. For colouring matter lamp-black is used, which may be intensified with the addition of a little blue. This is a compound for the best kind of work, such as that used for good book-work. For cheaper inks many other substitutes of a chemical nature are used, but they are not permanent.

It has been mentioned already that an automatic system of delivering the printed sheets was applied to some of the early cylinder machines. This is still in use for certain machines, the operation usually being performed by the aid of a small wooden drum or cylinder placed near the larger printing cylinder. As printed, the sheet is seized by other grippers attached to this secondary drum from which it passes to the endless travelling-tapes, and is then conveyed to the delivery board and the printed sheets placed face upwards on the pile. The later kinds of cylinder machines have different systems of delivery.

Automatic feeding has been in the past a greater problem, owing to the many differences in the size, substance, and the surface of the sheets particularly. There are now several methods in use which answer fairly well and can deal with most varieties of paper supplied to the printer. The method generally adopted is that of suction. In connection with these automatic appliances a recent addition is the 'pile' system of feeding and delivery, useful for works of long runs. This allows of the unprinted paper and printed sheets being handled in bulk by special trucks being wheeled into position. The working is automatically regulated by overhead gearing. One great advantage is that any premature handling of freshly printed sheets is avoided.

Steam power was applied to printing in 1814, and much of the present development of the craft has been due to that system of driving. But it was a cumbersome method, involving much valuable space for engine and boiler, and expensive to run. It created dirt or dust, and needed much attention. The introduction of the gas-engine for small or medium requirements was a great boon. It was economical to drive, could be started and stopped readily, and required little space and less attention. We may now consider electricity as the ideal power in all respects. It is clean, not expensive, occupies wall-space only, and is extremely handy.

It can be used to drive groups of machinery, but the better way is to adopt independent driving. This means a separate motor for each machine, the power being regulated to the size of the machine. This in itself is a great advantage, because the machine is only consuming power whilst running. In addition, this method entirely dispenses with all overhead shafting and belting, which, when in motion, raises some amount of dust detrimental to both workers and work, and at the same time increases the risk of accidents. Again, to have a variety of machines of different sizes deriving power from the same shaft has an unsteady effect on some.

At ILLUSTRATION OF BOOKS and PHOTOGRAPHY will be found an account of the several processes of reproduction, which include collotype, photogravure, and other methods. But much colour-work is still done by the letterpress system by the use of the three primary colours, which has created a demand for printers proficient in this class of work. Good blocks are necessary, and also suitable inks. Making ready is carried out in much the same way as for ordinary half-tone blocks printed in a monotone. Absolute dead register is essential, and this depends largely on a perfectly rigid machine being selected for dealing with this class of work. Yellow is the colour first used, followed by red, and lastly by blue. Occasionally a fourth colour, usually a neutral gray, is employed to give greater effect to the whole picture. Offset-printing is another method sometimes used for colour-work, but that process usually falls under the head of Lithography (q.v.). Some very good and soft effects are to be obtained by this new method.

Some very curious customs still prevail in the printing trade, some of which have been handed down since the time of Caxton, and these are mentioned in Moxon's *Mechanick Exercises* of 1683, to which work we have already referred. One important custom is that of the so-called 'Chapel.' In the larger offices every department has its own chapel (and these combined are termed an 'imperial' chapel), and the men employed in each form themselves into what may be described as a committee, which meets occasionally to discuss matters generally under the guidance of the 'father,' who is assisted in his work by a 'clerk.' Many of the technical terms still employed by printers have been handed down from the incunabula period, and derived from various classics and also from ecclesiastical sources. For instance, certain sizes of types were named after the works they were first put to, such as Pica, Primer, Brevier, &c., the meanings of which are obvious. To mention two terms only—'friar' and 'monk' are still used. The first denotes a white patch in a printed page, and the latter is one applied to a black (or dirty) patch.

BIBLIOGRAPHY.—WORKS (English): J. Southward, *Practical Printing* (2 vols.), *Modern Printing* (2 vols.); C. T. Jacobi, *Printing, a Practical Treatise on the Art of Typography*; H. A. Maddox, *Printing, its History, Practice, and Progress*; Legros and Grant, *Typographical Type Surfaces*; F. Howard Collins, *Author and Printer*; Stanley Morison, *Four Centuries of Printing, Modern Fine Printing*. (American): T. L. De Vinne, *Practice of Typography, Correct Composition*; *Practice of Typography, Modern Book Composition*; *Practice of Typography, Title Pages*; E. G. Gress, *American Manual of Presswork, Art and Practice of Typography*; D. B. Updike, *Printing Types, their History, Forms, and Use* (2 vols.).

PERIODICALS (English): *Printer's Register*; *British and Colonial Printer and Stationer*; *British Printer*; *Caxton Magazine*; *Linotype Record*; *Monotype Recorder*; *The Fleuron*. (American): *Inland Printer*; *American Printer*; *Printing Art*.

Prinzenraub. See ALTENBURG.

Prior, Priory. See MONACHISM, MONASTERY, ABBOT.

Prior, MATTHEW, was born 21st July 1664 at Wimborne Minster in East Dorset. His father was a joiner, who, coming to London, took up his abode in Stephen's Alley, Westminster. Young Prior went to Westminster School, then under the redoubtable Dr Busby. His father died, and, his mother being unable to pay his school-fees, he fell into the care of his uncle, a vintner in Channel (now Cannon) Row, who took him into the bar to keep accounts. Here his familiarity with Horace and Ovid attracted the attention of Charles, Earl of Dorset, and other visitors to the Rhenish Wine House, with the result that he returned to Westminster, his uncle finding him in clothes, and Dorset in books. At Westminster he formed a life-long friendship with the two sons of the Honourable George Montagu, the elder of whom afterwards became Earl of Halifax. In order to follow his friends to Cambridge, Prior, against Lord Dorset's wish, accepted a scholarship from the Duchess of Somerset at St John's College. He was admitted Bachelor in 1686, and in the following year wrote with Charles Montagu the clever parody of Dryden, entitled *The Hind and the Panther transversed to the Story of the Country-mouse and the City-mouse*, which, according to tradition, greatly annoyed Dryden. In April 1688 Prior obtained a fellowship; and his composition of the yearly college tribute to the Exeter family, a rhymed excursus upon Exodus, iii. 14, led to his going to Burleigh as tutor to Lord Exeter's sons. Lord Exeter shortly afterwards removed to Italy, and Prior applied (through Fleetwood Shephard) to his former patron Dorset for advancement. He was, being then twenty-six, made secretary to Lord Dursley, afterwards Earl of Berkeley, then going as ambassador to the Hague. In Holland Prior remained some years, finding especial favour with King William. In 1697 he brought over the Articles of Peace at the treaty of Ryswick; and, after being nominated Secretary of State for Ireland, he was made secretary in 1698 to the Earl of Portland's embassy to France, continuing this office under the Earl of Jersey. In this capacity he found favour with Louis XIV. In 1699 he became an under-secretary of state; in the following year Cambridge made him an M.A., and he succeeded Locke as commissioner of trade and plantations. In 1701 he entered parliament as member for East Grinstead. Under Anne he joined the Tories, and in 1711 was employed in the preliminaries of the peace of Utrecht, going to Paris as ambassador in the following year. With the queen's death in 1714 came the triumph of the Whigs, and in 1715 Prior, returning to England, was impeached and imprisoned. In 1717 he was excepted from the Act of Grace, but was, none the less, subsequently discharged. The remainder of his life was passed partly at Down-Hall in Essex, a country-house purchased for him by his friend Lord Harley, to whom he entrusted the profits of a subscription edition of his poems, and partly with Lord Harley, at whose seat of Wimpole he died, 18th September 1721, being then in his fifty-eighth year. He was buried in Westminster Abbey, under a monument decorated with his bust by Antoine Coysevox, given to him by Louis XIV. His portrait was painted by Richardson (National Portrait Gallery), by Belle (St John's College), Kneller, Dahl, and others.

Of Prior's abilities as a diplomatist there are diverse opinions. Pope sneered at them. But Bolingbroke and Swift extolled them; and it is stated that the archives at Paris show him to have been far abler and more resourceful than is generally

supposed. As a poet, in which capacity he is now remembered, he holds a unique position. Without much real sentiment or humanity, his verses have a wit, a grace, a neatness and a finish, which link him to the lighter Latin poets on the one hand, and to the best French writers of familiar verse on the other. Cowper praised his 'easy jingle,' Thackeray 'his good sense, his happy easy turns and melody.' He collected his poems, described by himself as consisting of 'Publick Panegyrics, Amorous Odes, Serious Reflexions, or Idle Tales' (many of which had been contributed to Dryden's and other miscellanies), in 1709, and again, in extended form, in 1718. By this latter issue he made £4000. His more ambitious pieces, *Solomon on the Vanity of the World* and a paraphrase of the old ballad of the *Nut Brown Maid*, are not now thought to be his best, although they had considerable popularity with the readers of the 18th century. But a third long poem, *Alma; or, the Progress of the Mind*, an imitation of Butler, is full of wit and waywardness. His *Tales* resemble the French *contes* too much in their objectionable qualities to be palatable to the English taste. He survives mainly by his purely playful efforts, his lyrics and his epigrams, not a few of which are unsurpassable. In the kind of piece known to the French as *vers d'occasion* he is unrivalled, and his beautiful stanzas to *A Child of Quality* have been as fortunate as Gray's *Long Story* in setting the tune to a host of versifiers. In 1740, long after his death, two volumes were published, one containing alleged *Memoirs*, in which there is little of his, and the other a number of posthumous verses, among which are some of his best. See his *Selected Poems*, edited by Austin Dobson (Parchment Library, 1889), *The Shorter Poems*, ed. F. Bickley (1923); an article by Mr G. A. Aitken in the *Contemporary Review* for May 1890; the editions of Prior's works by R. Brimley Johnson (2 vols. 1892), and Waller (1905-7); his *Life* by Francis Bickley (1913); L. G. Wickham Legg's study (1921); and the *Prior Papers* published by the Historical Manuscripts Commission in vol. iii. of the Marquess of Bath's Collection (1904-8).

Priscian (Lat. *Priscianus*), surnamed CÆSARIENSIS, born or educated in Cæsarea, is in point of reputation the first of Latin grammarians; his treatise was in universal use as a text-book during the middle ages. Paulus Diaconus calls him a contemporary of Cassiodorus (468-562 A.D.). He taught Latin at Constantinople, and enjoyed a government salary. The work which has preserved his name is his *Commentariorum Grammaticorum Libri XVIII*. The first sixteen books treat of the different parts of speech; the remaining two of syntax. The work shows great learning and good sense, and contains quotations from many Greek and Latin authors no longer extant. Priscian also wrote six smaller grammatical treatises, and two hexameter poems of the didactic sort, *De Laude Imperatoris Anastasii* and a free translation of the *Periegesis* of Dionysius.

Priscillian, the chief propagator of the doctrines professed by the sect known from his name as Priscillianists. They spread widely in Spain during the last third of the 4th century, and lingered there till the middle of the 5th century. The first seed of their doctrines is said to have been carried into Spain by a Memphian named Marcus, whose earliest disciples were Agape, a Spanish lady, and Heliadius, a rhetorician. Priscillian was a man of noble birth, pious and well educated; and his eloquence and nobility of character soon gathered round him a group of devoted followers, including two bishops, Instantinus and Salvianus. From their hands he received episcopal ordination,

and he established his see at Avila. Hyginus, bishop of Córdoba, was the first to take alarm, but his measures were so gentle that he himself was covered with reproaches by the ultra-orthodox and fanatical. Priscillian's most determined enemies were Idacius, bishop of Emerita (Mérida), and Ithacius, bishop of Sossoba. He was condemned and excommunicated at the synod of Saragossa (381), with three others of the leaders of the party. They next went to Rome to clear themselves before the pope, but were denied audience, and at Milan on the return journey they met as little sympathy from Ambrose. Under the vacillating rule of Gratian, however, they prospered, but their hopes were dashed to the ground by the usurpation of Clemens Maximus. From the judgment of the synod of Bordeaux (384) Priscillian appealed like Paul to Cæsar, and was at length summoned to appear at Trier. Martin of Tours was in favour of tolerant measures, but after his departure the fanatical party prevailed, and Priscillian, with others of the party, was condemned and put to death—the first who suffered death for heresy (385). Many Priscillianists recanted after the synod of Toledo (400), and soon after that of 447 they disappeared altogether. Their doctrines contained Manichæan and Gnostic elements, strange cosmical speculations based on primitive dualism, the doctrine of emanations and astrological fatalism. They practised rigid asceticism, and eschewed marriage and the use of animal food. One damning blot on their morals was that absolute veracity was only obligatory between themselves. Graver charges still were made against their morality; but it should be remembered that the only accounts we have are those of bitter enemies, and their principles, originally obscure enough, have been made darker by a cloud of calumny. 'If the Priscillianists violated the laws of nature,' says Gibbon, 'it was not by the licentiousness but by the severity of their lives.'

See Mansel's *Gnostic Heresies* and Neander's *Church History*; books on Priscillian and Priscillianism by Mandernach (1851), Schepss (1886), Paret (1891), Babut (1909); and Morin, *Études, textes, découvertes* (1913). Schepss claimed to have discovered some of his writings; these he edited in vol. xviii. of the *Corpus Scriptorum Ecclesiasticorum Latinorum* (Vienna, 1889).

Prism, in Geometry, a solid figure which can be most easily conceived of if we imagine a number of plane figures (triangles, quadrilaterals, &c.) exactly similar in form and size to be cut out of paper or any thin plate, and piled one above the other, and then the whole pile to become one body. It will thus be seen that the top and bottom of the prism are similar, equal, and parallel to each other, and that the sides are plane figures, rectangular if the prism be 'right' (i.e. if in the above illustration the pile of plane figures be built up perpendicularly), and rhomboidal if the prism be 'oblique' (i.e. if the pile slope to one side); but under all circumstances the sides of a prism must be parallelograms. The top and bottom faces may be either triangles, squares, parallelograms, or quadrilaterals of any sort, or figures of five, six, seven, &c. sides, provided only both are alike; and the number of sides in the plane figure which forms the top or bottom of course determines the number of faces of the prism; thus, in a triangular prism, there are five faces in all (three sides and two ends); in a quadrangular prism, six faces (four sides and two ends), &c. If two prisms, one being 'right,' and the other 'oblique,' have their bases of equal area, and be of the same vertical height, their solid content is the same, and is found by multiplying the area of the base by the vertical height. The parallelopiped is a quadrangular prism, and the *cube* is a particular case of the parallelopiped.

PRISM, in Optics, is a triangular prism of glass

or other transparent substance, its two ends being isosceles triangles, or it may be a prism-shaped glass container filled with a liquid or with a gas. The prism is a most important instrument in experiments on the refraction of light, and, in the hands of the most eminent optical philosophers, has been the means of largely adding to the science of optics. See OPTICS, REFRACTION, SPECTRUM.

Prisoners of War are those who are captured from the enemy during naval or military operations. By the laws or recognised principles of war, the entire people of a vanquished town, state, or nation become the absolute property of the victors. In ancient times the treatment of prisoners of war was very severe. In the Greek wars it was no uncommon thing to put the whole adult male population of a conquered state to the sword, while the women and children were enslaved. Although the putting to death of prisoners became less frequent, they and their families were commonly reduced to slavery to as recent a period as the 13th century. The act of Napoleon in putting to death the Turkish prisoners of war at Jaffa in 1799 was universally condemned, and is probably the last instance of such barbarity. Notwithstanding frequent exchanges, large numbers of prisoners accumulate during war.

Prisons are places of confinement normally for criminals or malefactors, in some cases and places also for debtors and political prisoners; and imprisonment as a procedure by means of which high objects are to be attained ought to be conducted according to a defined system founded on recognised principles. It used to be believed that nothing more was required than to ensure the security of the victim or culprit, by chains and fetters if necessary, unless it were to inflict on him some further bodily pains and penalties, the smallest of which was to feed him with 'the bread of affliction and the water of affliction' ordered by Ahab for the prophet Micaiah. Imprisonment was not mentioned in the Anglo-Saxon laws as a punishment, but was enforced when an offender could not find a surety. In course of time, however, it was authorised by the common law as a punishment, as well as specified by statute for particular offences; nevertheless gaols were actually used more for securing the persons of those committed to them than as places of punishment. Under the common law all gaols belonged to the king, and by 5 Hen. IV. chap. 10 it was enacted that none but the common gaol should be the place of committal for offenders brought before a justice of the peace. But there were many 'franchise' gaols owned by great persons, or by towns and liberties under their charters, which were lawful places for carrying out imprisonment ordered by the persons or bodies to whom these privileges were granted as a part of the criminal jurisdiction placed in their hands. In many cases these bodies had the power of life and death.

In the reigns of Edward VI. and Queen Elizabeth a new description of place of confinement was introduced—viz. the 'bridewells' and 'houses of correction' for vagabonds, &c. By 7 James I. chap. 4, every county was required to provide such an establishment with suitable instruments and appliances in it for setting idle people to work.

To-day prisons are of two kinds—(1) Convict prisons, where persons sentenced to penal servitude are confined. (2) Local prisons, where persons sentenced to ordinary or simple imprisonment are retained.

The punishment of penal servitude had its origin in the system of transportation, and transportation itself had its origin in banishment or exile. This was expressly forbidden by Magna Carta, but

existed nevertheless as a practice, because a criminal who had incurred the sentence of hanging and had taken sanctuary to avoid his fate was permitted in some cases to escape his punishment if he exiled himself. In course of time the privilege of sanctuary was abolished by law (though its practice existed notwithstanding for some time afterwards), and consequently the system of self-banishment which grew out of it; but before then—viz. in the thirty-ninth year of Queen Elizabeth's reign—banishment had been legally established by the Vagrancy Act, which gave quarter sessions the power of transportation.

Transportation was sanctioned by law in the reign of Charles II. as a mode of dealing with incorrigible rogues, vagabonds, and sturdy beggars, as a punishment for attending an illegal prayer-meeting after a previous conviction of that offence, and to put down the moss-troopers of Northumberland and Cumberland. The transportation was not at first enforced by any direct action of the government, but those sentenced to it were left to carry out their sentences by removing themselves to the West Indies or elsewhere under penalty of hanging if they failed to do so; but in course of time the process became more systematised, and in 1718 it was found necessary to deliver them over to a contractor who engaged to take them to His Majesty's colonies and plantations in America on condition of his having property and interest in their services for a specified term of years. They were given over to slavery in fact, and the contractor at the termination of the voyage put them up to auction and sold their services to the highest bidder. In 1776 it became no longer possible to send these outcasts to America. Some of the colonies had for years past continually protested against the system; but the war of independence left no alternative but to put an end to it, and the government had to find some other mode of disposing of these criminals, estimated in 1778 at 1000 annually. This difficulty originated the practice of confining prisoners in hulks in the Thames or in the harbours of Portsmouth, Chatham, &c.

This was intended only as a temporary expedient pending the execution of an act devised by Blackstone, Eden (Lord Auckland), and Howard, for the building of penitentiaries in England, which were intended to provide a separate cell for each of the inmates, who were during their imprisonment to be employed on useful labour. Chap. 74 of the 19th Geo. III., after reciting that 'the punishment of felons and other offenders by transportation to His Majesty's Colonies and Plantations in America is attended with many Difficulties,' and enacting that such offenders might be transported elsewhere, and that offenders who might be sentenced to be burned in the hand might instead be fined or whipped, proceeds to say that 'whereas, if many offenders convicted of crimes for which Transportation hath usually been inflicted were ordered to solitary imprisonment accompanied by well-regulated labour and religious instruction, it might be the means under Providence not only of debarring others from the commission of the like crimes, but also of reforming the individuals and inviting them to habits of industry, it shall be lawful to appoint supervisors who shall erect penitentiaries where such persons may be ordered to imprisonment and hard labour.' The first hulks were established in 1778; and this fatal temporary expedient serves to illustrate the sarcasm as to the superior permanency of temporary expedients, for the last hulk was not closed until a fire destroyed it in 1857; and in fact they had a perfect representative in Gibraltar prison, which was constructed on the model of a hulk and developed all the evils of these establishments, and which was only closed in 1875 after strenuous

opposition to its abolition by the local naval and military authorities. Many years were destined to pass before the permanent penitentiary system became a fact. Great efforts were made to revive the transportation system, and in 1787 a new penal colony was founded in Australia. This with the hulks continued to form the punishment next in gravity to capital execution until the last hulk was closed in 1857 and the last batch of convicts was sent to Western Australia in 1867. It is not necessary to describe the hulk system, if system that can be called in which the inmates were herded together in unchecked association, where 'vice, profaneness, and demoralisation' flourished. The prisoners in the hulks were described by a committee of the House of Commons in 1832 as 'well fed, well clothed, indulging in riotous enjoyment by night, with moderate labour by day, so that life in them is considered "a pretty jolly life."' But no attempt was then made to abolish them.

The hulks were at first, like all other prisons, placed under the management of the local justices, who appointed the overseer, and the overseer appointed the officers; the justices also made the overseer contractor for the maintenance of the prisoners, and as it was obviously his interest as contractor to cut short the supplies of food and clothing for the prisoners, they therefore by this measure contrived that his interest should be diametrically opposed to his duty and to the welfare of the prisoners in his charge. The supervision of the hulks resided in the Court of King's Bench, who steadily neglected their duty, and the inspector provided for by parliament was not appointed. In course of time and by degrees the Home Secretary usurped power over these establishments, and his action was endorsed by parliament in 1815; and their connection with the King's Bench was severed in 1825. An inspector was appointed, after that a superintendent; and after some other changes the control and administration of the hulks was in 1850 vested in the Board of Directors of Convict Prisons.

Transportation to Australia, which began in 1787, for many years provided for only a small part of the persons sentenced to transportation or respited from execution. Until 1816 an average of only 474 prisoners was transported annually to Australia, after that the average rose to 3000, and in 1834 amounted to 4920. Transportation in its most flourishing days was characterised by evils which rivalled if they did not sometimes surpass those of the hulks.

Whilst, however, it was in full vigour a step was taken, feebly and slowly indeed, towards the creation of the penitentiaries intended in 1776 to form a permanent substitute for transportation to America. Millbank Prison (q.v.) provided means for the confinement of every prisoner in absolute separation, according to the modern doctrine, and it was intended that his treatment should be on the most advanced reformatory system; but this experiment went no further at this time. In 1838 the existence of the terrible evils which attended the transportation system were formally established by the report of a commission, who said that the system was unequal, without terrors to the criminal class, corrupting to both convict and colonist, and very expensive, and they recommended punishment in penitentiaries instead.

Various improvements in the Millbank system were introduced after this, and finally in 1842 it took the form of passing the convicts through two stages of discipline in certain prisons at home before sending them to complete their sentences in one of the colonies. The first of these stages was passed in a prison in which each inmate was kept

in complete separation; the second in a prison in which he was employed in useful public works in regulated association, but confined in a cell by himself by night and at all times when not at work or in chapel. The complete efficiency of this stage was at first marred by a certain number of convicts being placed in association at night, but in time the separation came to be thoroughly carried out, the only exception being in the cases of prisoners who on medical grounds could not properly be left alone. The first stage was regulated according to the system adopted, first experimentally, at the model prison at Pentonville which had been erected in 1842. When the experiment had been proved to be successful, convicts were sent to undergo it at Millbank Prison and at other prisons of which the construction was suitable. The second or public works stage was carried out in prisons like Portland, which was constructed for the purpose in 1847. Dartmoor Convict Prison was opened in 1850 for the same purpose, Portsmouth Prison in 1852, Chatham in 1856, &c. In these the convicts were employed in large public works, in farming, in land reclamation, in quarrying, &c. The breakwater at Portland, the fortifications of that island, the large extension of the dockyards at Chatham and Portsmouth, the forts which protect Chatham, and various other military and naval works, besides the construction of large prison establishments, attest the advantages of the system, which also enabled the prisoners to gain a useful knowledge of trades by which they could obtain employment on their release.

From 1844, and more rapidly after 1852, the number of prisoners actually transported gradually diminished, most of those who received that sentence being discharged on free pardon in England after serving from half to two-thirds of their sentences. In the course of time the opposition of the Australian colonies to the continuance of transportation led to the abandonment of the system altogether, and since 1867 no convict have been sent thither. The punishment of penal servitude was by various acts passed between 1853 and 1864 substituted for transportation. These acts introduced certain notable modifications in regard to sentences of the next degree of gravity to capital punishment. When transportation was in force a prisoner on whom such a sentence was passed might be treated in any of three different ways. Commencing his sentence in the local prison, where he remained until it was thought proper to remove him, he might be transferred either (1) to Australia, from which in all probability he never returned, whatever the length of his sentence; (2) to Gibraltar or Bermuda, from which he was brought back to England when he had served a certain portion of his sentence, and there discharged; or (3) to the hulks, or to the 'public works' prisons substituted for them. If he went to Australia he was in the early days assigned as a servant to some free settler, and so at once ceased to be actually a prisoner; but in later years a system was established under which all prisoners first passed a certain time in a convict establishment and then were discharged conditionally to find employers for themselves. It also became the practice ultimately to retain all prisoners sentenced to transportation for a certain time in a prison in England, conducted on the separate system, from which they might be sent either to the hulks or to the 'public works' convict prisons which replaced them, or to one of the convict establishments abroad. If sent to the hulks or 'public works' prisons they might either remain there till discharged, or be drafted off to one of the convict establishments in the colonies. Whichever of these modes of disposing of the

convicts was followed, in none of them did they pass the whole of their sentences in the condition of prisoners, a most important consideration to bear in mind. Those who were sent to Gibraltar or Bermuda, as well as those who did not leave the country at all, but were confined in the hulks, were released on free pardon after they had passed about half their sentences or a little more. Those who went to Australia were released even sooner, but in their case only on certain conditions, by which a hold over them was maintained.

When the objections of the Australian colonies to the continuance of transportation thither made it necessary to adopt some other plan for disposing of these prisoners, the Penal Servitude Act, 1853, was passed in order to carry out a system founded on that which had been followed with regard to prisoners sentenced to transportation, but providing for the large majority being retained at home. Under this act a sentence of transportation could not be passed for less than fourteen years, and a sentence of penal servitude was substituted for all lower terms. But the sentences of penal servitude permitted by this act were shorter than the sentences of transportation assigned to various crimes under the old acts, because it was intended that the whole of the sentences of penal servitude should be passed in confinement; the terms were therefore fixed so as to correspond with the periods which had actually been passed in prison by convicts who had been sentenced to transportation but not actually sent out of the country. For seven years' transportation or less was substituted four years' penal servitude; for over seven but not over ten years' transportation was substituted not under four years and not over six years; for over ten but not over fifteen years' transportation was substituted not under six years and not over eight years; for over fifteen years' transportation was substituted not under six years and not over ten years. No difference was made in life sentences. Power was taken in this act to release convicts in the United Kingdom conditionally or on ticket-of-leave, instead of releasing them as formerly on free pardon. It was not intended that this power should be exercised in the case of sentences of penal servitude, as they had already been shortened to the terms actually served in prison under the sentence of transportation, but only in the case of prisoners sentenced to transportation who were not actually sent out of the country. The convict prisons therefore contained inmates serving under different conditions: those under sentence of transportation might have a remission of part of their sentences if well conducted, those under sentences of penal servitude could get none.

Before long it was found that great disadvantage in training and reforming the convicts, and in managing them by appealing to better feelings than those of mere fear, arose from the absence in the case of prisoners sentenced to penal servitude of the hope of gaining a remission of sentence; and the comparison in this respect between these prisoners and others in the prisons who were under sentence of transportation gave rise to great discontent among the prisoners. The consequence was that in 1857 another act was passed which made the length of sentences of penal servitude the same as former sentences of transportation, and thus facilitated the application of the system of remission to sentences of less than fourteen years as well as to those above that term. The House of Commons Committee (1856), on whose report this course was adopted, also recommended the introduction of a shorter term of penal servitude intermediate between the highest term of imprisonment then in ordinary use and the lowest term of transportation or, as it had become, penal servitude.

Accordingly the Act of 1857 authorised a sentence of not less than three years' penal servitude for any offence which might be punished by seven years' transportation. In carrying out this act prisoners were allowed to gain remission of a portion of these short sentences as well as all the others.

About this time very warm discussions were being carried on on the subject of penal systems, originating partly no doubt in the great change necessitated by the gradual abolition of transportation; and about 1861-62-63 those who attacked the system which had actually been introduced were able to point to a recent increase of crime as a justification of their attacks on it, more particularly on the ticket-of-leave system. Great point was given to this feeling, and it was much intensified, by an outbreak of crimes of violence in the metropolis (garroting). The result was that a Royal Commission was appointed to report on the Penal Servitude Acts and the system adopted to carry them out. In consequence of the report of this commission in 1864 another Penal Servitude Act was passed, in which the government did not fully adopt the recommendations of the Royal Commission, but they raised the minimum term of penal servitude from three years to five years, except in the case of those who incurred a second sentence of penal servitude, in whose cases seven years was the minimum term permitted. This latter provision was repealed by the Prevention of Crimes Act, 1879. A review by the light of later experience of the grounds on which the recommendation of the Royal Commission was made cannot but lead to the opinion that erroneous deductions were made from imperfect data.

The Directors of Convict Prisons in their annual reports had more than once referred to the anomaly peculiar to the United Kingdom by which no sentence was possible between two years—which was practically the limit of a sentence of imprisonment—and five years, which was the shortest legal sentence of penal servitude, and had expressed their opinion that it was desirable to re-introduce the power of sentencing to penal servitude for terms as low as three years, which existed from 1857 until the Act of 1864, and was abolished by that act in consequence, as has been seen, of the report of a Royal Commission. In 1891 an act was passed to allow of the sentence of three years being imposed in future. By the Act of 1857 power was given to the Secretary of State to release convicts conditionally before the expiration of their sentences. This system, known as the ticket-of-leave system, was at the time strenuously attacked, under the erroneous supposition that it first introduced a system of releasing prisoners before they had served their full sentences; but this, as has been already stated, they never actually had done. On the contrary, under the ticket-of-leave system they were in point of fact detained to serve in prison a larger part of their sentences than had been customary before. Moreover, under the new system, instead of being absolutely pardoned when released, they were subject to revocation of their licences if they did not conduct themselves well, by which their abstention from crime was materially guaranteed.

The Prison Act of 1898 was an important measure in that, among other things, it served to place convict prisons and local prisons (see below) under one board of commissioners, and gave power also to the Secretary of State to make rules for the government of both types of prison, subject to parliamentary approval, so that henceforth the whole prison code had parliamentary sanction, and could be altered at any time by parliamentary rule without the necessity for fresh legislation. In 1899, as an outcome of the act, there was drawn up a complete new code of rules which has since been but slightly

amended, and which, if allowance be made for the establishment of the Borstal and preventive detention systems (see below), remains the basis of all prison treatment to-day. The rules of the Secretary of State are interpreted and expanded by a body of standing orders, unpublished except for the use of the prison service, and in this way secrecy obtains as to the final details of prison regime.

The principle on which, in the first days of convict prisons, the system of punishment was founded was that those who were subject to it should suffer discipline of such degree of severity as might act as a deterrent to them and to others who might be tempted to become criminals, but that they should at the same time be brought under the reformatory influences of religious teaching, good example, and such training in self-control as could be given by offering certain advantages to industry and good conduct, as well as inflicting suitable punishment for the reverse. That principle may be said still to be the basis of the system. In order to guard against that contamination which was such an evil in older forms of confinement, in the new convict system prisoners were divided into two classes, and this idea was later more fully developed, convicts to-day being very carefully classified by the Directors of Convict Prisons according to their previous history and character. Questions are sent to the police, old employers, and persons who knew the convict in his youth, and on the replies, the man is relegated to the Star, the Intermediate, or the Recidivist Class. To the Star Class are sent men of previous good character; to the Intermediate, those who either from their youth or their character may be said not to have formed habits of crime; to the Recidivist, those guilty of grave and persistent crime.

In the two stages of the original penitentiary system important changes have been made. Thus the tendency has been to shorten the period of separate confinement, and in 1910 it was reduced to one month for the Star and Intermediate Classes, and three months for the Recidivist Class. Again the opportunity for that employment in public works which was typical, in the early days, of the second stage of labour in regulated association has largely disappeared, and under present conditions a very large proportion of convicts are engaged, not in heavy open-air labour, but in workshops, as carpenters, tailors, moulders, smiths and fitters, printers, shoemakers, and as makers of baskets, mail-bags, twine, and rope. The rewards to industry and good conduct are granted under what is known as the progressive-stage system, and now the convict may earn a remission of one-fourth of his sentence, besides gaining certain privileges in regard to letter-writing, visits from his friends, and such like indulgences. The practice which existed until 1864 of encouraging industry and good conduct by certain increases in the diet was discontinued from that date, on the principle that rewards to prisoners should not be destructive of the necessary penal or restrictive conditions of prison life.

At the head of every convict prison is the governor, whose duty it is to administer and supervise all branches of the prison. He is assisted by a staff who have to control and regulate the discipline and employment of the prisoners, and a staff of clerks, who keep a record of all matters relating to the prisoners and their sentences, their conduct, &c.; and also by a storekeeper, with a staff of clerks, who has the charge of stores and accounts. The chaplain conducts divine service, visits and advises the prisoners. He has under him schoolmasters, who conduct their education. The medical officer has charge of matters relating to the health of the prisoners. The

hospital is constructed on the most modern principles, and provides accommodation for some patients in separation and for the association of those for whom the medical officer thinks it necessary. To control and supervise these convict prisons a body called the Directors of Convict Prisons was created for England and Wales by statute in 1850, whose powers unite those of visiting justices of ordinary prisons with those of various bodies which had been created by parliament from time to time to govern the various convict prisons placed under their management. A similar body was created for Ireland in 1854, and there a system founded on and closely resembling that which had been developed in England was created; but until 1888 (when a convict prison was established at Peterhead in connection with the convict labour at the harbour-works) all male convicts sentenced in Scotland served the greater part of their sentences in convict prisons in England. The convict prisons are visited frequently by one or more of the directors, whose duty is to see that the governor and the other officers of the prison are doing their duty, and to hear and determine any reports against the prison officers. To directors also the prisoners can complain or appeal if they consider they are not fairly treated, or bring forward any requests they have to make, but which the governor has no power to comply with. A Board of Visitors appointed by the Secretary of State visits the prison monthly to hear and determine serious reports against convicts, and to hear any complaints they may have to make.

Each day marks are awarded to every prisoner according to his industry, and these marks measure daily his progress towards attaining that remission of a quarter of his sentence which he is allowed to earn, as well as towards his promotion to a higher class, in which he may enjoy certain privileges before referred to. The punishments inflicted on those prisoners who misconduct themselves consist of close confinement, reduction of diet, forfeiture of the privileges already earned, and forfeiture of remission. Flogging with a 'cat' or a birch can only be awarded in the gravest cases, such as assaults on warders, &c., after being reported to the Board of Visitors and determined by them, and subject to confirmation by the Secretary of State.

As regards the health of the prisoners in convict prisons, statistics show that their favourable position in respect of sanitary requirements, the regularity of their lives, and the constant medical care taken of them result in a low mortality; and this result is brought about in spite of a large proportion of the inmates of prisons being persons of low type, who have led dissipated and irregular lives. The conduct of the prisoners is, as a rule, very good, the result of a steady system of control under which exact discipline is enforced, and, while good conduct and industry are encouraged, misconduct is surely punished. The great bulk of prison offences are committed by a few habitual offenders against the rules.

The prisons in which sentences of imprisonment are carried out have a separate history from that of those which have been described. There were so far back as two centuries ago occasional protests against the abuses and cruelties practised in prisons, and a notable parliamentary inquiry into the misconduct of a gaoler named Bembridge was held in 1730; but until the last quarter of the 19th century the idea that prisoners had any claim for humane treatment had hardly made any way beyond the circle of a few philanthropic reformers; any attempt to use the period of imprisonment to improve the nature of the criminal was almost unknown. The way to better things was undoubtedly opened by Howard's visits of

prison inspection about 1776, and in following years, and by his reports on the condition of the prisons he visited, followed as they were by proposals for reform and improvements which were enjoined and encouraged by acts of parliament. Solitary confinement with labour and instruction was approved by statute in 1774, and in 1784 general regulations were formed for the treatment of prisoners, among which a proper classification of prisoners according to the gravity of their offences was enjoined. In 1791 justices were enjoined to visit and inspect these prisons three times in each quarter, and to report on them to quarter sessions. In 1814 the appointment of chaplains was made compulsory. But compliance with these statutory reforms did not immediately follow, for indeed it was a long time before they passed into the stage of practical fact. In 1818 there still remained 518 prisons in the United Kingdom, to which more than 100,000 prisoners were committed in the year, and only twenty-three of these had been subdivided so as to enable the above classification to be carried out. In fifty-nine of them the males were not divided from the females (and in fact there was no statutory injunction to this effect until 5 Geo. IV. chaps. 65 and 85). In 445 prisons there was no employment of any kind for the prisoners; in 100 of the gaols overcrowding was excessive; no less than 13,057 prisoners were crowded into the space which, according even to the moderate demands of those days, was fit for only 8545. The prisons were in many cases so ill-regulated that they became scenes of abandoned wickedness. In 1835 and 1839 most important legislative steps were taken. Further rules of administration were laid down in the acts passed in these years, and inspectors of prisons were appointed to see that they were carried out. By the latter act also the vital importance of a suitable design and construction for gaols as an aid to good prison management was recognised by the creation of the office of Surveyor-general of Prisons to advise in these matters.

Howard had advocated the complete separation of prisoners by placing each of them in a cell alone, and this was provided for in the Penitentiary Act, 1778. The practice was adopted in a few county prisons, and it was again enjoined together with daily divine service and the absolute separation of males from females in 5 Geo. IV. chaps. 65 and 85, but the expense of building these cells fortified a prejudice against the 'solitary' system, which was largely increased by the too thorough mode in which it had been carried out in America. A commission which was sent in 1834 to America to inquire into the matter, however, reported entirely in favour of the principle of separation if judiciously carried out. Their recommendation was followed in the construction of Pentonville Model Prison in 1842, and the success of the system led to an extensive reconstruction of county prisons on the same plan, finally resulting in that system being adopted to the exclusion of any other.

Although some progress in other respects followed the Acts of 1835 and 1839, there was still so much imperfection and such want of uniformity in rules, diet, labour, &c. that further reforms and stronger pressure on the local authorities in whom the management of the prisons was vested was urgently called for. These were provided by the Prison Act, 1865, which enacted a code of rules for all prisons, and required that each male prisoner should be provided with a separate cell.

In 1878 a further and most important step was taken by the transfer of the control and pecuniary charge of all the local prisons to the government, represented in each member of the United Kingdom by a body of commissioners appointed by royal warrant. This measure was justified by the im-

possibility of ensuring due uniformity in the treatment of prisoners in all gaols so long as they remained in the hands of so many independent local authorities, by the great difficulties, amounting to impossibility, in getting some of the local authorities to provide proper prison buildings, and by the unnecessary costliness which resulted from the existence of so many small and independent prisons. In ways which have been shown above the Prison Act of 1898 applied equally to local and to convict prisons, and of necessity the powers given by the act to the Secretary of State, and turned to account in the code of 1899, further ensured uniformity of control.

Prisoners before trial form a separate class in the prisons, and are now subjected to no more inconvenience than is necessary to ensure security and due order and discipline in the prison. They may wear their own clothes and supply their own diet if they choose, have full opportunities of receiving visits from their friends and corresponding with them, and are not obliged to perform any unaccustomed or menial labour for themselves if they will pay for assistance.

It was, however, evident that a man who was unable to find bail was at a disadvantage as compared with one who was at liberty until his trial. He was kept in enforced idleness, and could not be allowed to associate with convicted prisoners. He was, moreover, unable to earn the small amount of money required for the purposes of his defence. This has been corrected, however, by allowing prisoners to work at their trades or at the manufacturing work of the prison and to receive their earnings, less a small reduction for their maintenance and the use of tools. The money thus earned can be sent to the prisoner's relations, expended on his defence, or given to him when he leaves the prison either on acquittal or after serving his sentence.

The evils of enforced idleness were self-evident in the case of debtors. Up to the year 1898 they were kept apart from other prisoners and were allowed to lounge about in association, providing their own clothing, bedding, and food, which might include an allowance of wine or beer. This was not so objectionable at a time when persons could be imprisoned for debt, but when the law was altered in 1869 to limit imprisonment to those debtors only who refused to pay when they had the means, debtors were virtually a class guilty of fraud. In 1898 this was recognised by compelling debtors to work, and allowing them to earn money by their industry at the rate of not exceeding 2s. 6d. a week.

To pass from these special classes to the ordinary prisoners, the general rule is that after sentence every prisoner is permitted to raise himself progressively by industry, combined with good conduct, through four stages, in each of which he gains some amelioration of his treatment. If he is sentenced to imprisonment with hard labour, the first month is spent in hard bodily or manual labour for not more than ten hours in strict separation, and for the first fourteen days he sleeps on a plank bed without a mattress. Female prisoners are exempted from these deterrent features. A prisoner sentenced to imprisonment without hard labour is associated at labour from the beginning of his sentence. He may be subjected to punishment by deprivation of diet, confinement in a cell, and in case of violence corporal punishment (limited by the act of 1898 to mutiny and gross personal violence to officers) with a birch or a cat-of-nine-tails. The necessity for these punishments has, however, very largely diminished—a result of the system of progressive stages; for if he is ill-conducted or idle his progress into the higher stages

is delayed, or he may be degraded into a lower stage after attaining to a higher. Certain powers for the infliction of punishment reside with the governor, but corporal punishment or heavier sentences than he is empowered to award can only be inflicted by order of the magistrates who form the visiting committee of each prison, and subject to the approval of the Secretary of State.

The visiting committee are appointed every year by quarter-sessions, about twelve to each prison. Their duty is to visit the prison periodically, to hear any complaints of the prisoners, to deal with reports made of the misconduct of any prisoners, and to fulfil certain other functions more particularly laid down in the rules made by the Secretary of State; but they have no authority over the officers. In fact, whereas up till 1878 the local authorities managed the prison, and the government inspected it, the position is now reversed—the government manages and the local justices inspect. The Prison Act of 1893 provided for the classification of prisoners by the court into three divisions, according to the nature of the offence and the antecedents of the offender. A cardinal principle is that every prisoner under sentence should be fully employed. Hard labour consists of stone-breaking, oakum-picking, and the like. Labour other than hard is varied in character, and the list of trades followed or articles made in the prisons enumerated in the annual reports reaches to about 150. A large proportion of the prisoners supply the wants of the prison population by weaving, tailoring, &c., but, as may be imagined, there is a large number of prisoners who know of no industry which can be followed in prison, and great difficulty is found in providing them with work, for they do not generally stop long enough to learn a trade to any good purpose. Mat-making was from early times one of the principal prison industries, but later had to be almost abandoned in consequence of an agitation begun about 1872 by outside workers in charitable institutions—here, as in prisons, its ease of acquisition was its specially desirable feature—and elsewhere, who complained of the unfair competition of prison labour. A great deal of manufacturing work is now carried out for public departments, such as mailbags and string for the Post Office, seamen's bags, coal sacks and ships' fenders for the Admiralty, bags and mattresses for the War Office.

Every prison has its medical officer, and a well-regulated and well-constructed infirmary. The death-rate from natural causes in prisons in England and Wales is generally less than 50 per 1000 prisoners received. The absence of all diseases due to insanitary conditions is the main reason of the healthy condition of the prisoners; and no doubt the strict temperance—for no alcoholic liquors form part of the dietary—and the regular life contribute to this result.

In order that the standard of efficiency may be maintained in all the prisons, and that opportunities may be given to both officers and prisoners to communicate any complaints they may have to make, inspectors are appointed to visit each prison, and to report to the commissioners on any point which may require their intervention.

The design and construction of a prison is, as may be supposed, a feature of the very first importance. Security is of course one of the essentials, but there are others almost as important. In looking over old prisons, as that built at York under the inspiration of Sydney Smith, one cannot but be struck with the massiveness of construction of many of them—the huge bars and bolts, the large clumsy locks, the ponderous grated doors, and sometimes chained to the wall the heavy fetters with which the prisoners were loaded. By such means as this it was intended to ensure the safe custody of the

prisoners without constant personal watchfulness and supervision by the prison staff. All this is changed in the prisons of more recent date, but the security is even greater than before, because in a prison of modern construction the supervision can be more thorough. In a prison of modern construction the site is surrounded by a wall about 18 feet high, outside of which, unless a road or street runs along the boundary, a margin of about 20 feet is left unbuilt on as a precaution against the facilities which buildings against a wall may give for scaling or breaking through it.

The prison is entered through two pairs of double gates, having a space between them sufficient for a wagon to stand in, so that the solid outer gate may be shut before the grated inner gate formed of iron bars is opened. At the side of the gate is the porter's lodge, and perhaps certain waiting accommodation and rooms in which the prisoners may, under supervision, receive visits from their friends. These gates give admission to the outer court of the prison. Opposite the gate is probably the entrance of the main building; the offices of the governor, chaplain, &c. are placed here. After passing these the buildings occupied by prisoners are arrived at.

Every prisoner occupies a cell measuring 13 feet by 7 feet, and containing 800 cubic feet of air, with a grated window, part of which is made to open; in the wall are inlets from a channel for fresh air, warmed when necessary by hot water pipes, and outlets for foul air drawn out through flues which communicate with a furnace and tall chimney in the roof. On shelves in the wall are the books and the small utensils provided for the prisoner's use. The furniture consists of a stool to sit on, a fixed table, a wooden bed board and a coir pillow, sheets, blankets, and rugs, and a mattress for the prisoners who have passed the first stage. A bell-pull, by means of which a warder's attention can be called when necessary, and an eye-hole in the door through which the warder can inspect the prisoner, are provided in each cell.

Rows of cells such as this are arranged alongside each other, and on opposite sides of a corridor about 16 feet wide, which is open to the roof; and there may be above the ground-floor two or three tiers of cells, access to which is given by iron stairs and a gallery off which the cells open. There are possibly some cells on a lower level, where usually the heating apparatus and sometimes the cook-house, bakehouse, workshops, and stores are situated; but in the most recent constructions it is thought better to place these latter in separate buildings outside the block of cells. A hospital for sick patients is provided, and a separate block of cells in which prisoners are placed on first reception, and where they are cleansed and examined by the doctor, and their private property and clothes taken from them, the latter being replaced by a prison suit if the prisoner is convicted, or if before conviction he prefers not to wear his own clothes. The department for females is put distant from that for males, and no male officer is allowed into the female division unless he is accompanied by a female warder or matron. The chapel is a prominent feature in the prison, for prayers are read before all the prisoners who can attend every morning, and on Sunday there are morning and evening services. In prisons built on this model towards the middle of the 19th century the chapel was divided into little boxes, so as to isolate prisoners completely from each other. This construction has for some time been abandoned as having failed in its object, and as being destructive of the value of the service.

In connection with the offices is a library of selected books for issue to the prisoners, which is

under the control of the chaplain. In some part of the cell block is a bath-house, where prisoners are required to wash themselves periodically; and in connection with the female side of the prison is a laundry for the washing of the prisoners' clothing, sheets, &c., and in which also sometimes washing is done for people outside on payment. There are also workshops in which carpenters, smiths, &c., can carry on their trades for the benefit of the prison. Large airy yards surround the blocks in which the prisoners live. In these they take their daily exercise under supervision of warders, and separated by such an interval from each other as may prevent oral communication—indeed, at all times and in all prisons, both convict and local, a virtual law of silence is enforced, all intercourse or communication between prisoners being forbidden except, with slight relaxations after a certain period of sentence as a reward for good conduct, where necessary for the conduct of the prison or in connection with the labour of the prisoners, the claims of discipline and the prevention of corruption being held to render the restriction necessary. Part of the space inside the walls is often cultivated for vegetables for consumption by the prisoners.

Since 1869 a new feature has been developed in controlling the criminal class. By an act passed in that year and revised in 1871, the latter being called the Prevention of Crimes Act, any person convicted on indictment a second time may be subjected to 'supervision' by the police for seven years after the expiration of his sentence. During this period he is required to report himself to the police once a month, and to keep them informed of his residence; he is also required to prove his innocence if certain suspicious circumstances are brought against him. If he fails to comply with the obligation to report himself he may be imprisoned for a year with hard labour. The convict released conditionally before the termination of his sentence is subject to similar obligations, and if there are reasonable grounds for believing that he is leading a criminal life, or showing himself unworthy of the freedom conditionally granted him, or if he should be actually convicted of crime, he may be returned to prison to undergo the whole of that part of his sentence which was remitted. Persons who are found by the court to be habitual criminals may, in addition to a sentence of penal servitude, be awarded a term of preventive detention for not exceeding ten years and are detained in a special convict prison, or part of a prison, under rules that are intended to foster industry, thrift, and self-respect, and which mitigate the necessary severity of penal discipline in convict prisons. The duration of the term of preventive detention may be shortened if the prison committee reports that a convict may be liberated without danger to society. Following liberation supervision takes place, but not of the kind in practice under the ordinary ticket-of-leave system. Licence is positive rather than negative in character; and the supervision is not of the police authorities but of the Central Association for the Aid of Discharged Convicts, a voluntary association subsidised by government. This association compels a person to proceed to an approved place where work has been found, not to move from that place without permission, to be punctual and regular in attendance at work, and to lead a sober and industrious life. The extension to other than habitual criminals of the principle of a positive in place of a negative licence has gained increasing advocacy, as has also an extended application in the treatment of crime of the whole idea of preventive detention; any such extended application would almost necessarily involve the adoption in some form or other of the indeterminate sentence.

To aid in the work of detecting criminals a Habitual Criminal Register has been established, in which the names, descriptions, photographs, and criminal career of all persons who are proved to have been twice convicted on indictment are recorded. This register is printed and circulated to all police forces and prisons, and supplies means of establishing the identification of any prisoner who comes into their custody, who is suspected to be an habitual criminal; it also indicates what prison should be applied to for further evidence. To show, in cases where no special identity is suggested, whether any person in custody is on the register of habitual criminals, a Distinctive Marks Register has been established, in which all the peculiar marks of those who have been registered are classified and recorded.

The Inebriates Act of 1898 provides that special provision should be made for 'criminal' inebriates, persons who committed their crimes in consequence of drunken habits. Accommodation for females is provided at Aylesbury and for males at Warwick.

In 1901 a special treatment was established both in local and in convict prisons for mentally defective prisoners, and under the Mental Deficiency Act of 1913 provision is made for the supervision of criminal defectives in state and certain certified institutions. Defectives may be sent to these institutions either from prison or direct from the courts. The act of 1913 is limited in scope and is important less in its results than in its being a pioneer piece of legislation in the direction of removing from prison surroundings those who, through mental affliction, drift into criminal courses. To the view that mental disability may largely contribute to the commission of crime, increasing recognition is accorded, as is practically to be seen in the 'Birmingham experiment' of 1919 and after, and extensions of that experiment, under which no person in whose case there is any suspected mental element is sentenced to imprisonment until after full investigation of his mental state.

The taint resulting from imprisonment is a circumstance which, it must be supposed, cannot in the nature of things be removed. At the same time, in the Criminal Justice Administration Act of 1914, recognition is given to the principle that it should not be needlessly increased. Thus where desired, and unless there be good reason to the contrary, courts are obliged to allow time (not less than seven clear days) for the payment of fines, the old practice of almost automatic commitment for trivial offences in default of payment of fines being in this way removed; in all cases also where the offender is not less than 16 nor more than 21 years of age, the court may allow him to be placed under supervision until the fine is paid, recognition here being given to the Borstal principle (see below). The act also, as a provision against the admitted evil of short sentences, enacted that no imprisonment should be for a period of less than five days, detention for lesser periods in certified police cells, &c. being, however, allowed. Among other things the act also regulated the imposition of hard labour along with imprisonment, and aimed at the more effective classification of prisoners into divisions.

The separate treatment of young persons of both sexes under what is known as the 'Borstal System,' which had been in force for several years at selected prisons in England, was embodied in the criminal law of the country on the 1st of August 1909, under the Prevention of Crime Act, 1908 (Part 1), which empowers the court to pass a sentence of detention under penal discipline in a Borstal institution for a term of not less than one year (now two years), and not more than three years, and the persons liable to such detention are those between the

ages of 16 and 21, whom, by reason of criminal habit or tendency, it is expedient to detain for lengthened periods under such instruction and discipline as appear most conducive to reformation and repression of crime. The act is the formal embodiment in the penal law of England of all those conclusions which experience of the working of the 'Borstal System' during a number of years had suggested, and has for its object the conversion into honest and law-abiding citizens of young criminals who in many cases, from want of opportunity and knowledge of better things, come into conflict with the law during that period of life when their manhood is not fully developed, and their unformed habits of body and mind admit of the application of reformatory treatment with a good prospect of ultimate success. The act provides that after the expiration of six months, if there is a reasonable probability that the offender will abstain from crime and lead a useful and industrious life, he may be released on licence from the institution on condition that he is placed under the supervision or authority of any society or person willing to take charge of the case; and with this object an association, called the 'Borstal Association,' partly supported by public funds, has undertaken to take charge of the lads on their discharge. By the Criminal Justice Administration Act of 1914 the Borstal principle received an important extension; by this act also the minimum period of detention was raised from one to two years, and the period of supervision beyond the expiration of the original sentence, from six months to one year. The training in the Borstal institutions consists mainly in trade instruction, physical drill, and hard work, with a fair proportion of exercise, games, &c.

The penal law in its bearings on the imprisonment of young persons under 16 years of age was virtually revolutionised by the Children Act of 1903. Under this act penal servitude or imprisonment for persons under 16 years of age is practically forbidden, except in very exceptional circumstances where an alternative form of punishment is considered by the court undesirable. Confinement when it takes place is for a period not exceeding one month, and is not in ordinary prisons but in 'places of detention' specially created by the act. Under the probation system, which may be considered of special service in the case of young persons, but is not confined in its application to them, an offender, in place of being sentenced to imprisonment or other punishment, may be discharged, perhaps under supervision, provided he undertake to be of good behaviour, and to appear for conviction and sentence when called on at any time during some specified period not exceeding three years. The whole system was improved and extended by the Probation Act of 1907, provision being made for the appointment of probation officers, and power being given to courts altogether to dismiss proved charges.

The first statutory recognition that it was expedient to make some provision for prisoners on discharge was in 32 Geo. III. chap. 45, by which justices might convey any such person by pass back to his parish; and, at the opening of the chapel of the New House of Correction for Middlesex, the chaplain, the Rev. Samuel Glaspe, pointed out that, the discipline and training of the prison having it might be hoped supplanted the prisoners' habits of idleness and profligacy by habits of industry, the magistrates might be able to speak of them according to their merit or demerit to the parish officers. He observed, however, that this would not provide for the cases of Irish delinquents who had no settlement in the United Kingdom, but who were not few in number. He thus showed

the necessity for doing what in more recent times has been undertaken by societies for the aid of discharged prisoners. In 1823 the Gaol Act enabled a moderate sum of money to be paid for the benefit of discharged prisoners out of the rates, or from public benefactions belonging to the gaol, in order that they might resort to any place of employment or honest occupation. In 1862 societies for the aid of discharged prisoners received statutory recognition, and the money awarded by the justices for the assistance of any prisoner, to an amount not exceeding £2 per head, might be handed over to these societies for their benefit. This act was obviously a recognition of societies which already existed, but it afforded a great stimulus to the formation of others. The earliest of the existing societies was the Hampshire Society, which dates from 1802; Dalston Female Refuge dates from 1805; the Sheriffs' Fund, which deals with City cases, from 1807.

The transfer of all prisons to the government in 1878 had a most important effect in adding to the number of those societies. The Prisons Act had been passed partly to ensure uniformity of treatment of prisoners in all localities, and those who advocated the claims of the discharged prisoner were not slow to perceive that the same principle might be made to apply to the system of helping them to obtain honest employment on completion of their sentence; and, further, that the difficulty they had met with in inducing many of the local authorities to provide funds, or in raising private subscriptions, might be overcome, now that the government was responsible, because they were virtually bound to continue the grants which had been made by many local authorities, and could not refuse to make similar grants in places where the local authorities had hitherto failed to do so. In connection with this the Commissioners of Prisons took action with a view to securing the proper appropriation to this purpose of many charities and benefactions which were devoted in former times to the assistance of prisoners, but the exact objects of which were no longer applicable to existing circumstances. These funds were more or less within the cognisance of the Charity Commissioners, and some of the largest of them had already been diverted to objects quite disconnected from prisons or prisoners; but by means of an act passed in 1882 steps were taken by which most of these funds were appropriated for the benefit of discharged prisoners through the agency of various societies. Since 1887 every prison in England and Wales has had a discharged prisoners' aid society working in harmony with it.

The work carried on by these societies was found to be crippled by lack of funds, and in 1898 a scheme was approved for giving grants in aid at the rate of 6d. for every prisoner discharged, provided that the income derived from any charity should be deducted from the grant. The grant was conditional only on the efficient working of the society and upon a balance-sheet being published annually. The state did not claim in any way to interfere with the voluntary working of the societies. Besides societies working in connection with the local prisons in the provinces, there were five or six societies in London that undertook the care of convicts discharged into the Metropolis. It was inevitable that convicts should regard these societies as being in competition, and they were clever enough to try to set one against the other to their own advantage. In 1911, however, the after-care of convicts was systematised by the establishment of a Central Association subsidised from public funds to which all the existing aid societies were affiliated. At the same time the old system whereby a convict was paid a gratuity

on discharge was discontinued, the association undertaking to provide assistance in the case of every discharged convict. About one-fifth of the convicts discharged annually are, on the recommendation of the association, excused from reporting themselves to the police. By proposals approved in 1913 important changes were made in the after-care of prisoners discharged from local prisons. The former government grant of 6d. per head was raised to 1s., and here also all gratuities were abolished, the amount formerly so spent being handed over to the various discharged prisoners' aid societies throughout the country, to whom the disposition of all funds was entrusted, the general aim being that with the increased monies provided each aid society could give personal attention to every case irrespective of that length of sentence which formerly alone made possible the earning of gratuities. The work of the societies has now been extended to the wives and families of men undergoing imprisonment. The central organisation of aid societies was for long in the hands of a committee of the Reformatory and Refuge Union, a pioneer society in the work of aid-in-discharge and in its organisation, but since 1918 has been vested in the Central Discharged Prisoners' Aid Society, a body consisting of members of the several aid societies.

Under present ideas of prison administration notable improvements have been effected in prison régime. Prisoners sentenced to more than a month may, by industry and good conduct, obtain a remission of one-sixth of their term. Training-schools have been organised for warders, and all officers, both male and female, now undergo a course of four months' instruction in their duties. In the large female prisons there are crèches for infants, and the prison hospitals are staffed with trained nurses. Special cells are provided for prisoners suffering from tuberculosis. The female prisons are inspected by a lady inspector, and the prisoners are visited regularly by lady visitors. All prisoners of defective education who are under 40 are taught regularly in class. The prison libraries have been enlarged. The world's news is given to all prisoners by means of weekly addresses. Secular lectures have been organised, and missions are conducted in all prisons. The bulk of the prisoners are sentenced to too short a term to admit of technical training, but for those who have more than a month to serve there are now workshops and skilled trade instructors. The dangers of contamination are provided against by keeping first-offenders of previous good character in a class by themselves.

Improvements have also been made in convict prisons. The rules have been modified for convicts of feeble mind and for old men. Convicts who have served 7½ years are admitted to a class to which are attached many coveted privileges. The monotony of a long imprisonment is broken by lectures and concerts at fixed intervals.

The prison population of Britain shows signs of steady decline. For England in 1876-77 the total average daily number of prisoners of all kinds was approximately 30,000; in 1920-21 it was 9800. For Scotland the corresponding figures are 2920 in 1876, 1870 in 1920, and 1890 in 1924.

Scotland.—Prisons and the prison system in Scotland of to-day are very similar to those of England, although the prisons in each country are administered by different government departments, English prisons being under the Home Office, whilst Scottish prisons are under the Scottish Office. The acts relating to Penal Servitude, Prevention of Crime—including Preventive Detention and Borstal System—apply to both England and Scotland. There are thirteen prisons in Scot-

land, legal places of detention for all descriptions of criminal and civil prisoners. Convicts can be detained in any prison. Male convicts, however, are confined in Peterhead prison, and are employed in making a harbour of refuge there. During recent years the system at the latter prison has been considerably modified, not with a view of making it more comfortable, but of making the system less severe and more humane. The men are allowed to take their meals in association, and to play games, such as football, with each other. Educational, gymnastic, and physical drill classes, concerts and debates conducted by the convicts themselves, are permitted under the supervision of prison officers. Convicts earn remission of sentence and are liberated on licence as in England; and persons undergoing sentences of more than a month's imprisonment earn remission of one-sixth of their term by industry and good conduct. For serious offences, such as mutiny, personal violence to a prison officer or to a fellow-prisoner, &c., a convict renders himself liable to corporal punishment by order of a Prison Commissioner, a power which is now vested in Boards of Visitors in England. All prisoners requiring help on discharge from prison are assisted by a Discharged Prisoners' Aid Society, one of which is connected with every prison. Convicts, i.e. those undergoing penal servitude, are taken care of by a Central Association, which is subsidised from public funds. In Scotland there is no First and Second Division for prisoners as in England.

United States.—In the early part of the 19th century the most advanced examples of prison discipline and construction were to be found in the United States, and improvements of great importance were initiated. Following closely on Howard's report, the 'Philadelphia Society for Assisting Distressed Prisoners' was founded in 1776—the first of the kind in the world; and, though dissolved during the War of Independence, it was reorganised in 1787, and is still at work. Large measures of reform were quickly secured. By 1790 the principle of separation was recognised, and in 1794 all convicts were separated and secluded. In the latter year, also, capital punishment was abolished in Pennsylvania for all crimes but murder in the first degree. It thus became necessary to devise some substitute for capital punishment. At the Eastern Penitentiary at Philadelphia, opened in 1829, the so-called 'Pennsylvania System' of permanent seclusion of convicts was carried out; the evil effects arising from the rigorous application of this principle have been already referred to, and in all other American prisons what is known as the 'Auburn System'—silent labour in association by day, and separation by night—came to be adopted. In the southern states survivals of the system whereby prisoners were leased out to the highest bidders for the term of their sentences are still to be found, and in certain parts of the country chain-gangs continue to be employed on road work. Ideas of criminal treatment along remedial and reparative lines early assumed importance in the United States. The first place of detention for juvenile delinquents was opened at New York in 1825; the first reformatories on the cottage or family system were established in Ohio—for boys at Lancaster in 1858, for girls at Delaware in 1878. In 1877 the Elmira (New York) Reformatory was opened, at which a now famous system has been adopted for the treatment of first-offenders under thirty years of age; the principal features are indeterminate sentences, the classification of prisoners into three classes under the marks system, and discharge upon probationary parole, under supervision. The prisoners enjoy a luxurious dietary, and many indulgences are granted to induce them

to work, so that the penal element of a sentence of imprisonment is entirely absent.

Later contributions of the United States to an improved prison system have shown themselves in the institution of convict road-camps and convict farms, where, outwith prison precincts, labour takes place under approximately free conditions; in the development of the 'honor system,' where at official discretion temporary liberty is granted to a prisoner on his honour; in a measure of recognition to the idea of corporate responsibility ('self-government'), under which prisoners as a body seek amelioration of the prison régime, undertaking in the common interest not to abuse any privileges granted; in the increasing application of scientific methods to the analysis of the mental elements in crime. In certain respects, however, some of which have been indicated, prison practice in the United States is behind that of countries of corresponding development.

Europe.—In Europe imprisonment as a general rule is cellular, sometimes severely so, though on occasion cellular confinement is combined with methods of associated labour. In France the method of transportation is still to some extent in use.

Prison Reform.—The problems of prison reform receive ever-growing attention. A prison congress held in London in 1872 led some years later to the institution of the International Prison Commission, a confederation of most of the civilised states of the world, having for its purpose the comparative study of the different methods, both of law and of administration, adopted in different countries for the treatment of crime and of criminal propensity. Conferences are held quinquennially in the countries of the various adhering states. Questions discussed, the discussions revealing the direction of prison reform, have been 'the individualisation of punishment,' the recognition of 'limited responsibility,' the institution of psychical laboratories in prisons, the indeterminate sentence, substitutes for, or alternatives to, imprisonment in the case of trivial offences, the classification and employment of prisoners, the supervision of persons under conditional conviction or liberation, preventive methods in the treatment of children and of all young persons. Reporting in 1921 on the English prison system, an unofficial inquiry, originally established in 1919 under the Labour Research Department, but subsequently disconnected from it, stressing the extent to which crime is due to poverty, to feeble-mindedness, and to other causes not curable by punishment, favoured the substitution for the existing punitive system of methods based on principles of curative and educational treatment.

See the articles BECCARIA, BENTHAM, CAPITAL PUNISHMENT, CRIMINAL LAW, EXECUTION, FLOGGING, FRY, HOWARD, IMPRISONMENT, LOMBROSO, POLICE, REFORMATORY AND INDUSTRIAL SCHOOLS, ROMILLY, TREADWHEEL, &c.: those on crimes such as ARSON, ASSAULT, BURGLARY, FORGERY, MURDER, RAPE, THEFT, &c.: and in prison bibliography various official publications, including prison acts, statutory rules and orders of the Secretary of State, reports of parliamentary committees, annual reports of the Prison Commissions, and reports on the quinquennial conferences of the International Prison Commission; the reports of various societies, as the Howard Association (1875-1920), the Penal Reform League (1907-20), the Howard League for Penal Reform (1921, &c.) formed from the union of the two first-named societies, the Central Association (1921, &c.), the Borstal Association, La Société Générale des Prisons, &c.; also Du Cane, *Punishment and the Prevention of Crime* (1885); F. H. Wines, *Punishment and Reformation* (1895, revised ed. 1910); Tallack, *Preventive and Penological Principles* (1896); Quinton, *Crime and Criminals 1876-1910* (1910); Devon, *The Criminal and the Community* (1911); Tarde, *Penal Philosophy* (1912); Ives,

History of Penal Methods (for England, 1914); T. M. Osborne, *Society and Prisons* (1916); Ruggles-Brise, *The English Prison System* (1921), and *Prison Reform at Home and Abroad* (1924); Sidney and Beatrice Webb, *English Prisons under Local Government* (1922); Hobhouse and Brookway, *English Prisons To-day* (the report of the Prisons System Enquiry Committee, 1919-21, 1922); and works on the prisons of the world by E. C. Wines (Cambridge, Mass., 1880), C. Cook (1891), A. Griffiths (2 vols. 1894), C. R. Henderson (1903).

Prisrend. See PRIZREN.

Pristina, a town of Yugoslavia (Turkish till 1912-13), 48 miles N. of Skopje; pop. 14,000.

Pristis. See SAWFISH.

Privateer, a ship owned by a private individual, which, under government permission, expressed by a Letter of Marque (q.v.), makes war upon the shipping of a hostile power. To make war upon an enemy without this commission, or upon the shipping of a nation not specified in it, is piracy. Privateering was abolished by mutual agreement among European nations, except Spain, by the Declaration of Paris in 1856; but the United States of America refused to sign the treaty, for reasons which are given in the article Paris (q.v.). It is doubtful, however, how far that abolition would stand in a general war, for privateering is the natural resource of a nation whose regular navy is too weak to make head against the maritime power of the enemy, especially when the latter offers the temptation of a wealthy commerce. It was usual for the country on whose behalf the privateers carried on war to take security for their duty respecting the rights of neutrals and allies, and their observing generally the law of nations. While not considered Pirates (q.v.) by the law of nations, they were looked upon as little better during the great wars at the end of the 18th and the beginning of the 19th century, and as a rule received but scant mercy at the hands of the regular services. In the wars of 1793-1814 many English privateers were afloat. But in the same period no less than 10,871 English ships, with over £100,000,000, were taken by French 'corsairs'; the Breton privateer *Surcouf* took, in two months of 1807, prizes worth £291,250. At the American Revolution the new republic fully realised the advantage of its position in preying on the mercantile marine of Great Britain; and in the war of 1812 British commerce suffered severely at the hands of American privateers, of which it was computed that some 250 were afloat. During the American civil war the Confederate cruisers were at first regarded in the north as mere pirates; and the Alabama Claims originated in the charge against Britain of allowing the departure of privateers from British ports. In 1870 Prussia made a decree in favour of creating a 'volunteer navy.' There were no privateers in the Great War, 1914-18, but many mercantile vessels were fitted out and regularly commissioned for various services, such as cruisers for blockade duties, and also for anti-submarine work. The Germans used some to prey upon commerce, and destroyed about 400,000 tons of shipping on the principal trade routes; one of these vessels, the *Zee Adler*, was square-rigged, with auxiliary engine. See ENEMY, NEUTRALITY, ALABAMA, BUCCANEER, CORSAIR, PIRACY, PRIZE; Norman, *The Corsairs of France* (1887); Gomer Williams, *The Liverpool Privateers* (1897).

Privet (*Ligustrum*), a genus of Oleaceæ, shrubs and small trees with opposite leaves which are simple and entire at the margin; the flowers small, white, and in terminal panicles; the calyx slightly 4-toothed; the corolla funnel-shaped and 4-cleft; the stamens two, projecting beyond the tube of the corolla; the berries 2-celled. Common Privet

(*L. vulgare*) is a shrub growing in bushy places and about the borders of woods in the middle and south of Europe, and in some parts of Britain, now also naturalised in some parts of North America. It has half-evergreen, smooth, lanceolate leaves; and berries about the size of peas, black, rarely white, yellow, or green. The flowers have a strong and sweetish smell; the leaves are mildly astringent, and were formerly used in medicine. The berries, which hang on the shrub during winter, have a disagreeable taste, but serve as food for many kinds of birds; they have been used for dyeing red, and, with various additions, green, blue, and black. A rose-coloured pigment obtained from them has been used for colouring maps. The wood is hard. Privet, although not spiny, is much used for hedges, often mixed with some spiny shrub, or with beech. It bears clipping well, and grows well in the smoke of towns, also under the shade of trees. The other species of privet are natives of India and eastern Asia. Some of them are now to be seen in shrubberies in Britain. Most kinds grow readily from cuttings, but some of the more ornamental are grafted upon more vigorous species. The white Wax Insect of China (see WAX) deposits wax on *L. lucidum* and on *L. Iboia*.

Privilege. For the privileges of counsel, see **BARISTER**; for the privileges of parliament, see **PARLIAMENT**; for those of peers and ambassadors, see **NOBILITY**, **AMBASSADOR**; for privileged communications, see **CONFIDENTIALITY**, **LIBEL**; for the sacredness of the confessional, see **CONFIDENTIALITY**; see also **ARREST**, **DEBT**, **SANCTUARY**, **SOVEREIGN**.

Privy-council. Wherever a feudal system of government has prevailed it has been customary for the sovereign to summon, from time to time, a council of his barons or nobles to advise him in matters of state. This practice was adopted by feudal monarchs rather as a privilege than as a duty, since it gave them the means of enforcing from powerful feudatories an acknowledgment of their sovereign rights. The attendance of a baron at the court of his lord was a tacit admission of the suzerainty of the latter.

Under the early English kings the royal council was styled the *Aula* or *Curia Regis*. It consisted of the Chancellor, the Justiciary, the Lord Treasurer, the Lord Steward, the Chamberlain, the Earl Marshal, the Constable, and any other persons whom the king chose to appoint; the two archbishops belonged to it as of right; and the Comptroller of the Household, the Chancellor of the Exchequer, the Judges, and the King's Serjeants were occasionally present at its meetings. The authority of the curia was originally co-extensive with that of the king, in whom all the powers of government, judicial and administrative, were united; but its constitution gradually underwent a complete change. In the first place, a distinction came to be drawn between the body of the curia—the *magnum* or *commune concilium*, which was the germ of the modern parliament—and the *concilium assiduum*—a permanent committee of the curia, which was constantly and closely attached to the person of the king. Then the two councils were themselves subdivided. The Court *ad scaccarium*, or Court of Exchequer, which sprang from the *concilium assiduum*, took cognisance of affairs of finance, then of actions affecting the revenue, and lastly of civil suits generally. The Courts of King's Bench and Common Pleas—descended from the *magnum concilium*—respectively acquired their separate jurisdictions. These changes had been accomplished by the end of the reign of King John. They were merely successive delegations of the royal authority, and left the king's prerogative as

the fountain of law unaffected. In spite, therefore, of the establishment of regular tribunals, the sovereign still continued to exercise judicial authority, if not personally, at least through the agency of his chancellor and of the council, whose jurisdictions, afterwards so clearly distinguishable, were originally united. In the time of Edward III., however, the Chancery was rapidly becoming a separate tribunal; and by the end of the reign of his successor its establishment as the great court of equity had been effected. The *concilium assiduum*, also, had become a separate assembly of royal officials, bound by a particular oath and paid a regular salary, equally distinct from the courts of law and equity and from the *magnum concilium*, and regarded with no little jealousy by them both.

From the accession of Richard II. to the end of the reign of Henry VI. the Privy-council were not merely the servants but the ministers of the crown, and acted as a check upon the royal authority. While in theory the king could choose and dismiss the members of the council at his pleasure, the exercise of this prerogative was in fact subject to various restrictions. Some of the officers of the state were members of the council *ex officio*. The two archbishops claimed to belong to it as of right. The presence of other ecclesiastics, with whom the papal was a higher authority than the royal, introduced a further element of independence, and the occasional efforts of parliament to wrest the appointment of privy-councillors from the king made his influence over the council still weaker. The Privy-council exercised its control over the royal authority in two ways. Sometimes it merely advised and recommended. A more powerful kind of check was the refusal of the chancellor to affix the Great Seal to any royal grant of which the council disapproved. The English sovereigns endeavoured to defeat the operation of this check by the use of a privy-seal, and by retaining the Great Seal in their own hands. But the privy-seal passed into the custody of a separate official, and by the middle of the 15th century the council had succeeded in bringing every royal grant under its own notice at each stage in the procedure necessary for obtaining it. In the time of Henry V. the council assumed the name of Privy-council, by which it is now generally known. Its functions were then partly administrative and partly judicial. The former included the control of matters of finance, the establishment of *staples*—i.e. markets in which alone certain commodities could be exposed for sale—the regulation of the statutes which limited freedom of commerce between different parts of England, and the preservation of the peace. The latter cannot be better defined than in the words of Mr Dicey: 'Whenever, in fact, either from defect of legal authority or from want of the might necessary to carry their decisions into effect, the law courts were likely to prove inefficient, then the council stepped in by summoning before it defendants and accusers.'

In the third or modern period of its history, which commenced when the Wars of the Roses were drawing to a close, the character of the Privy-council has undergone a variety of changes. The destruction of the feudal system, and the overthrow of the old ecclesiastical supremacy, reduced it to a position of absolute dependence on the crown. At the same time the power of the council as regards the people was greatly increased (1) by the subjection of particular places to its control—e.g. Ireland under Poyning's Act (1494), and the Channel Islands; (2) by the exercise of the right to issue proclamations; (3) by the erection of new courts under its supervision—e.g. the High Commission and the Court of Requests; and (4) by the extension of its judicial authority in the Court of

Star-chamber (q.v.). The judicial powers of the Privy-council were, however, restricted by the Long Parliament (16 Car. I. chap. 10, sect. 3), and in the 17th and 18th centuries its functions as the adviser of the crown in matters of government and state policy were gradually usurped by the Cabinet (q.v.).

Present Constitution and Functions.—The list of privy-councillors now includes the members of the royal family, the Archbishops of Canterbury and York, the Bishop of London, the great officers of state, the Lord Chancellor, the Lord Chief-justice of England, the Master of the Rolls, the Lord President and Lord Justice Clerk of Scotland, the Lords Justices of the Court of Appeal, the President of the Probate, Divorce, and Admiralty Division, the Lord Advocate of Scotland, the members of the Judicial Committee (see below), the Speaker of the House of Commons, the Ambassadors, the Commander-in-chief, the First Lord of the Admiralty, the Vice-president of the Board of Trade, the Paymaster of the Forces, &c., and necessarily all the members of the cabinet. Members of the council are in their collective capacity styled 'His [or Her] Majesty's Most Honourable Privy-council;' individually each member is styled 'Right Honourable.' (The Lord Mayor of London, although styled 'Most Honourable,' is not *ex officio* a privy-councillor. See *Notes and Queries*, first series, iii. 496; iv. 9, 28, 137, 157, 180, 236, 284; ix. 137, 158.) Under the authority of letters-patent dated 28th May, 10 James I. 1612, privy-councillors take precedence after Knights of the Garter. Amongst themselves they take rank according to seniority of appointment when no other principle of classification is applicable in the individual instances. Privy-councillors are appointed by the sovereign without either patent or grant, and are subject to removal at his discretion. By the common law, the Privy-council, as deriving its whole authority from the sovereign, was dissolved *ipso facto* upon the demise of the crown; but, in order to prevent the inconvenience of having no council in being at the accession of a new prince, it was enacted (6 Anne, chap. 7, sect. 8) that the Privy-council shall continue for six months after the demise of the crown, unless sooner determined by the successor of the deceased sovereign (cf. Stephen, *Comment.* vol. ii. p. 491). It is now understood that no members attend the deliberations of council except those who are specially summoned. In ordinary cases only the ministers, the great officers of the Household, and the Archbishop of Canterbury are summoned; but on some extraordinary occasions summonses are sent to the whole council. Thus, on November 23, 1839, the whole of the Privy-council were summoned to Buckingham Palace to receive Queen Victoria's announcement of her intended marriage with Prince Albert. Meetings of council are usually held at intervals of three or four weeks at the sovereign's residence; and six privy-councillors at least, with one of the clerks of council, constitute a meeting of council.

A privy-councillor must be a natural-born subject of Great Britain. His duties are defined by the oath of office as follows: (1) to advise the king to the best of his cunning and discretion; (2) to advise for the king's honour and good of the public, without partiality through affection, love, need, doubt, or dread; (3) to keep the king's counsel secret; (4) to avoid corruption; (5) to help and strengthen the execution of what shall be resolved; (6) to withstand all persons who would attempt the contrary; and (7) to observe, keep, and do all that a good and true counsellor ought to do to his sovereign lord. The personal security of a member of the Privy-council was formerly safeguarded by several statutes repealed by 9 Geo. IV. chap. 31.

Immediately on the decease of the sovereign the Privy-council assembles and proclaims his successor, the Lord Chancellor affixing the Great Seal to the proclamation. The members of the Privy-council are then re-sworn as council of the new sovereign, after which a privy-council is held, and the sovereign makes declaration of his designs for the good government of the realm, and subscribes the oaths.

The functions of the Privy-council in modern times depend on a great variety of statutes, and it is only possible here to give a brief and very general survey of the whole field. The subject is one full of confusion, partly because of the vast mass of detail which it involves, and partly because the long historical development which the Privy-council has undergone has borne its natural crop of legal fictions, anomalies, and technicalities. It will be convenient to divide our observations under four heads:

(1) *The Privy-council as synonymous with the Executive Government.*—It is a commonplace of constitutional law that the cabinet, which is the organ of the executive government, is quite unknown to the law. In theory the cabinet is only a committee or inner circle of the Privy-council, and the Privy-council is still the only instrument through which the sovereign can exercise his prerogative. But the theory no longer corresponds with the facts; the power is exercised by the cabinet alone, and the Privy-council is never consulted. This is the sense which must be attached to the statements that the 'sovereign in council' has wide authority in the colonies, can make and enforce laws in such colonies as have no representative assemblies, and can allow or disallow the legislative acts of such as do possess them. The case is the same with orders in council relating to blockades, reprisals, or embargoes. And, in harmony with these expressions, it is the regular course in acts of parliament conferring specific powers on the executive government to confer them in terms on the 'sovereign in council.' In such cases the mention of the council is purely formal, and if the power is exercised it will be by the ordinary government (cf. also 13 and 14 Vict. chap. 59, sect. 30). It may be added that, as the executive power is thus dependent on the authority of the legislature, so no executive act can be done, and no order in council can be made, which an act of parliament cannot override.

This is now a recognised mode in which the legislature delegates defined legislative functions to the executive; and it is on this principle that the Board of Trade, for example, can make regulations for carrying out the provisions of an act of parliament, though the act may simply state, 'It shall be lawful for His Majesty by order in council' from time to time to make such regulations.

(2) *The Privy-council as a separate Department of State.*—As the *aula regis* was the mother of parliament and of the various courts of law, so the Privy-council has given being, in quite recent times, to several administrative bodies (such, for instance, as the Board of Trade and the Local Government Board), to which many of its own administrative powers have been transferred. The different stages or methods in this process of differentiation are curious. The Board of Trade, established on its present basis in 1782, was at first, and still is in name, a committee of the Privy-council; it is defined in the Interpretation Act, 1889, sect. 12, as 'the Lords of the Committee for the time being of the Privy-council, appointed for the consideration of matters relating to trade and foreign plantations.' But for all practical purposes it is a distinct department of state, controlled by a president, who is a member of the government. The Board of Health created 1848, was ten years

later superseded partly by the Home Office, partly by the Privy-council. In 1871 the Local Government Board was created, in succession to the Poor-law Board, and to it were transferred many duties formerly exercised by the Privy-council in relation to the public health, such, for example, as the appointment and control of public medical officers and the carrying out of the Vaccination Acts. All the powers of the Local Government Board were in 1919 (9 and 10 Geo. V. chap. 21) transferred to the Ministry of Health. In 1889 a new Board of Agriculture was established, and took over the powers of the Privy-council in connection with the Destructive Insects Act and the Contagious Diseases (Animals) Acts. Neither the Local Government Board, nor the Poor-law Board (which, created in 1847, ceased to exist, as we have already mentioned, in 1871), nor the Board of Agriculture was ever formally a committee of the Privy-council, but in each case a portion of the administrative functions of the council was transferred to the new department. The Ministry of Agriculture and Fisheries was constituted in 1919 (9 and 10 Geo. V. chap. 21). The Committee of Council on Education, established in 1839, remains in a different position. It has not been completely detached from the Privy-council and erected into a distinct department of the administration; and the member of the government who presides over it is still known as the President of the Board of Education. The law as to the functions of this department has been consolidated by the Education Act, 1921 (11 and 12 Geo. V. chap. 51).

In 1885 the Secretary for Scotland Act further transferred to the new secretary the powers and duties of the Privy-council in connection with the Board of Manufactures and the Public Health Acts so far as Scotland is concerned. The Secretary for Scotland was also entrusted with control over Scottish education, under the title of Vice-president of the Scottish Education Department, which is still nominally a standing committee of the Privy-council.

With regard to the administrative business which remains with the Privy-council as a separate department of state it must be remembered as a general principle that the work is actually done by permanent government officials, under the control of the Lord President of the Council, who is responsible to parliament and to the country. It is believed that this is substantially the case even when special committees are appointed by act of parliament for special administrative purposes. That the members of such committees are little more than advisers results naturally from the modern doctrine of ministerial responsibility. With this limitation, committees of the Privy-council exercise in many cases a delegated legislative power. For example, in the grant of charters to boroughs under the Municipal Corporation Act, 1882, every petition for a charter is referred to a Committee of Council, which has power to consider it, and to settle a scheme for adjusting the rights and liabilities of the existing local authority. Under the Medical Acts the Privy-council is entrusted with the supervision of the qualifications and the registration of medical practitioners; and kindred powers are conferred by the Pharmacy Act, 1868, and the Veterinary Surgeons Act, 1881. For the Committee of Council on Education, see EDUCATION. A Universities Committee of the Privy-council was constituted for England in 1877, and for Scotland in 1889 (see UNIVERSITIES).

The style under which administrative duties are imposed on the Privy-council varies. Sometimes it is referred to simply as the Privy-council; occasionally a clause is added that 'all powers vested in the Privy-council by this act may be exercised by an order in council made by two or

more of the Lords and others of H.M. Most Honourable Privy-council' (Veterinary Surgeons Act, 1881, sect. 18). Sometimes the duty is laid upon 'the Lords and others of H.M. Most Honourable Privy-council, or any three or more of them of whom the Lord President of the Council, or one of H.M. principal secretaries of state for the time being, shall always be one' (9 and 10 Vict. chap. 96).

(3) *The Privy-council in its widest Comprehension.*

—The Privy-council, as a body, has in modern times no regular duties at all, administrative or judicial. Membership of it is a coveted honour, conferring rank, precedence, and titular dignity. It cannot, however, be fairly described as obsolete or dead, and on rare and abnormal occasions it has exercised powers not falling strictly within the sphere of ordinary legislative or judicial authority. Thus, the Privy-council in 1788 took on itself the duty of inquiring into the sanity of George III. and receiving the reports of the royal physicians. In 1821 it determined the constitutional question of Queen Caroline's right to be crowned as Queen Consort. But in general it is a force kept permanently in reserve, apart from the working elements of the constitution. And, as the character of British constitutional growth has ever been the adaptation of old expedients to newly felt needs, the possibility remains that some unforeseen constitutional convulsion may recall this ancient and honourable body from its merely nominal dignity to at least temporary life and usefulness.

(4) *The Judicial Committee of the Privy-council.*

—The most important of all the offshoots of the Privy-council is the Judicial Committee. Officially it is merely a committee. In essence it is a court of law, possessing a wide and (indirectly owing to its connection with the Privy-council) a peculiarly elastic jurisdiction, which includes appeals from the ecclesiastical courts and, above all, appeals from Indian and colonial courts of law. The history of this last branch of the appellate jurisdiction of the Privy-council is exceedingly complicated, and cannot be entered upon minutely here. A few landmarks may, however, be indicated. Three distinct and conflicting theories have been promulgated upon the subject. (1) According to Pownall (*Administration of the Colonies*, 1774), when the necessity for an appeal from the decisions of the colonial governors, who, although not properly qualified lawyers, were yet called upon to preside in the courts of law, was clearly apprehended, the one precedent of a judicature within the realm possessing foreign jurisdiction which presented itself to the minds of the English sovereign and his advisers was that of the jurisdiction of the Privy-council over the Channel Islands. Since the time of King John (1204) appeals from the royal courts in Jersey and Guernsey—with the latter of which Alderney and Sark were for judicial purposes united—had been brought before the king and his council in England. Now the English sovereign claimed—a claim which the colonists acquiesced in, and which the House of Commons itself had tacitly admitted—that his colonial settlements and possessions were the demesnes of the crown, lying quite beyond the jurisdiction or cognisance of the state. The historical relation between the feudal duchies of King John and the royal plantations and possessions abroad being so intimate, no great effort of administrative imagination was necessary to make the analogy complete. Thus it came to pass that appeals from the courts constituted in the various colonies were taken not to the House of Lords, nor to the courts of law and equity, but to the king in council. (2) A second theory is suggested by Macqueen—viz. that the Privy-council originally entertained colonial petitions under the authority of a reference from the peers,

and that, when the intervals, gradually becoming longer, between the sessions of parliament rendered this mode of redress unsatisfactory, the council came to discharge in their own right those functions which would have been delegated to them by the peers if parliament had been summoned. (3) The statute 25 Hen. VIII. chap. 9 appears to suggest a third explanation of the origin of the appellate jurisdiction of the Privy-council. Under that act, a subject aggrieved by the decision of any court in any part of the king's dominions might appeal to the king in chancery. Every such appeal was referred by commission under the Great Seal to the Court of Delegates, the decisions of which were, in spite of a distinct prohibition in a statute of Elizabeth, reviewed upon petition by the Privy-council. One central fact, the right of the sovereign to entertain an appeal from any colonial court, is undisputed and indisputable. We know that, in less than a century, the body to which the crown entrusted the administration of colonial affairs was repeatedly reconstituted, and there is no reason why the *judicature* for colonial appeals may not have undergone similar changes in the course of three centuries. The statute 2 and 3 Will. IV. chap. 92 transferred to the king in council the jurisdiction of the Court of Delegates; 3 and 4 Will. IV. chap. 41 formally created the judicial committee, and vested in it all the judicial authority of the Privy-council, the Commissioners of Appeals in prize causes, and the Court of Delegates. The judicial committee comprises the Lord President of the Council, the Lord Chancellor, the Lords Justices, and such other members of the Privy-council at large as shall hold or shall have held certain judicial or other offices enumerated in the acts. By 34 and 35 Vict. chap. 91 Queen Victoria was empowered by order in council to appoint by warrant under her sign-manual four additional *paid* judges, each being, or having been, a judge of one of the superior courts at Westminster or Chief-justice of Bengal, Madras, or Bombay, to act upon the judicial committee. Under the Appellate Jurisdiction Act, 1876 (sect. 14), provision was made for the substitution of two additional 'lords ordinary of appeal' for the four paid judges appointed under 34 and 35 Vict. chap. 91, and thus for the ultimate merging of the judicial committee in the House of Lords—a reform which the proposals at the colonial conference of 1910 for the creation of an Imperial Court of Final Appeal once more brought into prominence. By the Judicial Committee Amendment Act, 1895 (and see the Appellate Jurisdiction Act, 1913), it was provided that the judges of certain self-governing colonies should, if members of the Privy-council, be members of the judicial committee. Provision has also been made for certain colonial judges acting as assessors to the judicial committee (Appellate Jurisdiction Act, 1908).

The customary conditions of appeal from colonial courts to the Privy-council are that the amount at stake should exceed a certain sum in value, that leave to appeal should be asked from the court below within a certain time after the date of the judgment appealed against, and that proper security should be found. It is, however, the inherent prerogative right, and on proper occasions the duty, of the king in council to exercise an appellate jurisdiction over *all* colonial courts and in all colonial cases, civil as well as criminal. In the exercise of this jurisdiction, and in the absence of any charter or statutory right, the sovereign in council may grant special leave to appeal in *civil* cases of substantial, general, or constitutional importance, where the judgment appealed against was plainly wrong or attended with sufficient doubt to justify the judicial committee in recommending that

it should be reviewed, and in *criminal* proceedings, where it is shown that by disregard of the forms of legal process, by some violation of the principles of natural justice, or otherwise, grave and substantial injustice has been done.

The decisions of the judicial committee are pronounced by one member of the committee only, and not, according to the usual practice in divisional courts, the court of appeal, and the House of Lords, by each of the presiding judges; and an order in council of 4th February 1878 prohibits any publication from being made by members of the committee as to how the particular voices and opinions went.

The Lord President of the Council is the fifth great officer of state, and is appointed by letters-patent under the Great Seal. The office is very ancient, and was revived by Charles II. in favour of the Earl of Shaftesbury in 1672.

Scotland once had a Privy-council of its own, but it was merged in that of England by 6 Anne, chap. 6. There was a separate Privy-council for Ireland, whose members were sworn pursuant to a sign-manual warrant directed to the Lord-lieutenant. The Privy-council of Ireland has been replaced in Northern Ireland by the Privy-council of Northern Ireland, and in Southern Ireland by the Executive Council of the Irish Free State. There is an appeal from the Irish Free State to the Privy-council by special leave.

See Dicey's *Privy-council* (1860; new ed. 1887); Hearn's *Government of England* (ed. 1887); Macpherson's *Practice* (1860; new ed. 1873); Macqueen's *Appellate Jurisdiction of the House of Lords and the Privy-council* (1842); Safford and Wheeler's *Privy-council Practice*.

Privy-seal. See SEAL.

Prize, property captured from an enemy; but the term is generally applied exclusively to property taken at sea. As between the belligerent powers themselves the property in a ship or other thing captured passes at once by the mere capture to the captor. Up to the close of the Crimean war all property of an enemy even when carried in a neutral ship was liable to capture, as also was the property of a neutral if captured on board a belligerent ship. This involved a claim to the right of searching neutral ships, a claim which Britain was only able to enforce during the great war with France in consequence of her mastery of the sea; it was a right, however, which was continually being disputed, and the enforcement of it in the case of American ships led repeatedly to difficulties with the United States. When the treaty of Paris was signed in 1856 it was universally agreed that private property in neutral bottoms so long as it is not contraband of war should no longer be liable to capture (see NEUTRALITY, ENEMY, BLOCKADE). In naval cases, a ship taken must be sent to a port belonging to the capturing power, where the Court of Admiralty, on full evidence, adjudicates whether she be lawful prize or not. If the decision be affirmative the prize is then sold. The dock dues, stevedores' wages, lawyers' expenses, and brokers' fees for selling cargoes and ships are deducted from the produce of the sale; the rest is lodged in the hands of the Accountant-general of the Navy.

Prize-money.—Previous to August 1914 the prize-money arising from the capture of a ship was distributed among the officers and men of the ship or ships taking part in the capture. But the circumstances of the Great War, in which a few ships captured many prizes, whilst other men-of-war were engaged in other military operations away from the trade-routes, led to Mr Winston Churchill, then First Lord of the Admiralty, having an order in council, dated 28th August 1914, issued which

cancelled the above-mentioned system of distribution, and declared in lieu thereof the intention to substitute a system of gratuities for more general distribution to the officers and men of His Majesty's naval forces. The Naval Prize Act, 1913, set up a tribunal whose functions were to review all cases dealt with in the prize court, and the net proceeds of all such as they declared to be *droits* of the crown were transferred to the naval prize fund for distribution amongst the officers and men of His Majesty's fleet. Eligibility for a share in the prize-money consists of service in a sea-going ship of war, including offensively armed auxiliary vessels, which include armed boarding-steamer, trawlers and drifters, &c. Trained pilots and observers and the crews of naval airships and others who fly continuously at sea are eligible whilst they are borne on the books of one of His Majesty's ships and attached to a naval air-station. Examples of shares are as follows: Commander-in-chief, Grand Fleet, 1000; admiral commanding-in-chief, 850; vice-admiral commanding a squadron, 600; rear-admiral commanding a squadron, 400; a senior captain in command, 160; captain's rank, 40; commander's rank, 30; lieutenant's rank, 20; warrant officer, 12; midshipmen and chief petty officers, 10; naval cadet and petty officers, 8; able seamen, 5; boy, 3. Warburton's *Prince Rupert* (vol. iii.) gives an interesting distribution of prize-money in the 17th century.

Prize Bounty is a grant to the officers and crews of such of His Majesty's ships of war as are actually present at the taking or destroying of any armed ship of the enemy. The amount to be distributed is calculated at the rate of £5 for each person on board the enemy's ship at the beginning of the engagement. Prize bounty shares are similar to those for prize-money, except in the cases of flag officers, who get more—e.g. Commander-in-chief, Grand Fleet, 2000; admiral commanding-in-chief, 1250; vice-admiral commanding a squadron, 750; rear-admiral commanding a squadron, 500.

Prize-court. See ADMIRALTY COURTS.

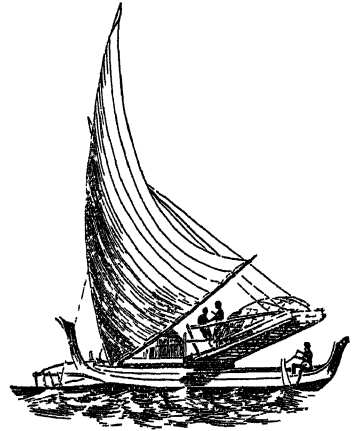
Prize-fighting. See PUGILISM.

Prizren, a rich and industrious town 40 miles WNW. of Skoplje, gained by Serbia from Turkey in 1912-13. It was the scene of a Bulgarian victory over the Serbs in 1915. Pop. 16,000.

Prjevalski, NICHOLAS, Russian traveller, was born in the government of Smolensk on 31st March 1839. He entered the army (1855), and took part in quelling the Polish insurrection of 1861. Having joined the general staff in 1867, he was moved to Siberia. There he began to satisfy his longing for travel by exploring the Usuri region, south of the Amur. This, however, was a small thing in comparison with his subsequent labours in geographical exploration. The three years 1871-73 he spent in travelling from Peking through southern Mongolia (region of the Ordus) to the Ala-shan, Koko-nor, and the upper waters of the Yang-tze-Kiang. Four years later he made the first of the journeys undertaken with the hope of reaching Lhasa, the goal of all his subsequent efforts. He rediscovered Lob-nor, but failed three times in the same year to penetrate into Tibet. Two years afterwards he once more set out, and, after crossing the difficult highland region between East Turkestan and Tibet, had reached a point some 160 miles north of Lhasa, when the Tibetan authorities turned him back. He then went east, and explored the upper course of the Hoang-ho for about 200 miles, and finally reached Kiakhta after a journey of nearly 15,000 miles. In the winter of 1883-84 he once more crossed the Desert of Gobi, and got as far as the upper Yang-tze-Kiang, but, not being able to cross it or travel down it, was

obliged to return. He died at Karakol, on the east side of Lake Issykkul in West Turkestan, just starting on his fifth expedition, on 1st November 1883. Prjevalski brought back from these journeys most valuable collections of animals and plants, now all preserved at St Petersburg; amongst other things that he discovered were the wild camel and the wild horse, the ancestors of the domesticated varieties. His accounts of his journeys were published in the *Proceedings* of the St Petersburg Geographical Society, in *Petermann's Mitteilungen*, and other journals, as well as in two independent Russian works (1875 and 1883).

Proa (Malay *prahu*), sometimes known as the 'flying proa,' is a peculiarly-shaped canoe in use by the natives of the Malay Archipelago, and on the China Seas, especially by the Ladrone islanders. It is about 30 feet in length by 3 in width, and has the stem and stern equally sharp, so as to sail backward or forward without being turned round. One side is flat,



Proa.

and in a straight line with the stem and stern; the other side is rounded, as in ordinary boats. This peculiar formation would make it liable to be easily upset, were it not for a framework which projects to windward, supporting a weight which counterbalances the pressure of the wind on the sail. The sail resembles the ordinary lug-sail, and is formed of mat. Slight variations from this form are found, but the principle of construction is the same.

Probabilism. See CASUISTRY.

Probabilities, CHANCES, or the THEORY OF AVERAGES. To assign a number which measures the probability of a future event may at first seem impossible; and yet the whole business of many large companies instituted in every civilised country for the 'insurance' or 'assurance' of lives, &c. is mainly based upon the methods of assigning such a number. When it is certain that a future event will take place, or will not take place, a fixed number is selected for each case to indicate that then the probability amounts to certainty: and these two measures are the limits of our scale. Will the sun rise to-morrow morning in the east? Probability = 1, certainty in favour. Will full moon be seen to-morrow morning in the east? Probability = 0, certainty against. Between these two limiting numbers, 0 and 1, lies the number (a proper fraction) which measures the probability of any undecided event. The number, then, by which we mark the chance, or expectation, or probability of anything occurring in the future, must be a fraction like $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or $\frac{273}{274}$, and can never be so large as 1, which was fixed as the higher limit, certainty: and by the fractional number assigned to any event we can readily compare its probability with those of other future occurrences.

To assign the proper fraction to any future event will, in general, imply knowledge of a large

number of similar events. Thus, in January, what is the probability that on next 12th April the sun will rise bright and unclouded? Relying on the constancy of nature and the doctrine of averages, we consult the calendars and weather-notice of the last 50 years, say, and find that in 17 of these the result was favourable and in 33 unfavourable. On these data the probability required is $\frac{17}{50}$, rather over $\frac{1}{3}$. In other words, the odds are nearly 2 to 1 against the event. The fraction $\frac{33}{50}$ measures or shows the probability that the event will *not* happen. More generally, if any future event may occur in 12 ways and fail in 15 ways, then the probability of its occurring is $\frac{12}{12+15} = \frac{4}{7}$; and the

probability of failure, $\frac{15}{12+15} = \frac{5}{7}$. In such a case the 27 ways are supposed to have each the same chance of occurrence: and, since the event must either happen or fail, the sum of the two probabilities = certainty—i.e. $\frac{4}{7} + \frac{5}{7} = 1$. Thus, if $\frac{4}{7}$ is the chance of an event, $1 - \frac{4}{7} = \frac{3}{7}$ = chance that it will not occur. In a certain town only 4 days of May—taking the average of many years—are rainless: what will be our chance of finding next 15th May rainless? Chance = $\frac{4}{31}$; and $1 - \frac{4}{31} = \frac{27}{31}$ = chance of having rain. The principle involved in such simple solutions is the foundation of the mathematical treatment of chance or probability. Of all the occurrences, all equally possible, which relate to a future event, if

a are favourable and x unfavourable, then $p = \frac{a}{a+x}$, where p stands for probability of the event occurring. Sometimes it is easier to find the probability of the event failing, and subtract that result from 1 as in the examples just given.

Out of 100 sailors who mutinied there were 10 ringleaders. If 2 are selected by lot for capital punishment, find the chance that both will be ringleaders. The total number of pairs is $\frac{100 \cdot 99}{1 \cdot 2}$, and the number of pairs among the ringleaders is $\frac{10 \cdot 9}{1 \cdot 2}$.

Hence chance required = $\frac{10 \cdot 9}{1 \cdot 2} \div \frac{100 \cdot 99}{1 \cdot 2} = \frac{9}{110}$; i.e. the odds are 109 to 1 against the event. A bag contains 5 sovereigns and 4 shillings: if a child is asked to draw three coins at random, what is the probability that 2 will be sovereigns and 1 a shilling? Here the total number of groups of 3 which can be formed out of all the 9 coins is $\frac{9 \cdot 8 \cdot 7}{1 \cdot 2 \cdot 3}$, or 84, which forms our denominator. Of the sovereigns there are $\frac{5 \cdot 4}{1 \cdot 2} = 10$ pairs, each of which may be drawn with each of the 4 shillings, giving 40 groups of 3, which forms our numerator. Hence chance required is $\frac{40}{84} = \frac{10}{21}$; i.e. the odds are 11 to 10 against the event.

Sometimes actual trial seems to throw discredit on the mathematical measure of a chance. Thus, if a die be thrown, the chance of a 5 or any other number turning up must be $\frac{1}{6}$ by our definition: whereas a person may cast a die, say 20 times in succession, with the result: ace, 4 times; 6 and 4, each 3 times; 2 and 3, each 5 times; 5 not at all. How then explain the mathematical estimate? Simply that 20 is much too small a number to take an average from, and the result 'chance = $\frac{1}{6}$ for each side of the die' refers to the most general case possible—i.e. a very large number or even an infinite number of throws. Register for 10,000 throws, then for 100,000 or 1,000,000, and the results would more and more approximate to the mathematical result, and prove that each side has chance = $\frac{1}{6}$ —the die being of course a perfect cube.

An important extension of the theory is that the probability of two independent events *both* occurring is measured by the product of their separate probabilities. Thus, if A's chance of passing a certain examination is $\frac{2}{3}$ and B's $\frac{1}{2}$, then (1) the chance that *both* will pass is $\frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$ —i.e. the odds are 7 to 5 against; (2) the chance that *both* will fail is $(1 - \frac{2}{3})(1 - \frac{1}{2}) = \frac{1}{6}$; (3) the chance that A passes and B fails is $\frac{2}{3}(1 - \frac{1}{2}) = \frac{1}{3}$; and (4) the chance that A fails and B passes is $(1 - \frac{2}{3})\frac{1}{2} = \frac{1}{6}$. By comparing these four results we see that the last event is the most probable of all, the odds being 25 to 24 in favour of it. Moreover, these results exhaust the possible alternatives of double event, therefore the four probabilities should together amount to certainty: and $\frac{1}{3} + \frac{1}{6} + \frac{1}{3} + \frac{1}{6} = 1$, Q.E.D.

By the same principle we solve many useful and curious problems. A town-council of 20, 12 Liberals and 8 Conservatives, have to choose a deputation of 5 by ballot: find the probability that it will contain 3 Liberals and 2 Conservatives. Total number of groups of 5 is $\frac{20 \cdot 19 \cdot 18 \cdot 17 \cdot 16}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5}$, or 19.3.17.16, which forms our denominator. Number of groups of 3 from the Liberals is $\frac{12 \cdot 11 \cdot 10}{1 \cdot 2 \cdot 3}$, or 2.11.10, and number of

pairs of the Conservatives is $\frac{8 \cdot 7}{1 \cdot 2}$, or 4.7; therefore, multiplying 2.11.10.4.7 = total number of groups of 5 which fulfil the conditions; and required probability is $\frac{2 \cdot 11 \cdot 10 \cdot 4 \cdot 7}{19 \cdot 3 \cdot 17 \cdot 16}$, or $\frac{77}{1156}$. In other words, the odds are 584 to 385, or more than 3 to 2 against the event.

When a person buys lottery tickets his chance of success is found as in our opening paragraphs, and if multiplied by the value of the money attainable the product is called his 'expectation.' In this connection may be noted an important distinction between the moral and mathematical values of 'expectation,' owing to the assumption that in such speculations the loss of money paid for tickets is not to be regarded. If one man of moderate means risks £500 in order to gain £5 when the odds are 100 to 1 in his favour, and another risks £5 to gain £500 when the odds are 100 to 1 against, the speculation in the former case appears much more reckless and immoral than in the latter, although in both cases the stake is exactly equal to the expectation.

We now reach the most important of all the applications of the theory of probability, its use in the calculation of life insurances and annuities. During the early part of the 18th century the celebrated London mathematician De Moivre constructed a formula of great simplicity which is still available, although largely superseded by elaborate 'tables of mortality' which have since been compiled in all commercial countries. By De Moivre's hypothesis, out of 86 children born at the same time 1 dies every year until all are extinct. Thus, for a man 40 years old, $86 - 40 = 46$, 46 years on an average are still before him and 45 others; and his chance of life is the average number between 0 and 46—i.e. $\frac{1}{2} \times 46 = 23$. Generally a person's probability of life or expectation is $\frac{1}{2}(86 - n)$, where n is the present age. Actuarial writers have found that this simple formula agrees with their official tables, except in the case of young children and aged persons. The tables are based upon long-continued observations of the mortality in the class of persons dealt with, and from them the theory of probability is easily applied in calculating annuities, reversionary payments, and other results.

For ascertaining the various life contingencies the Institute of Actuaries employ a table giving all the ages from 10 upwards, and, beginning with 100,000 persons alive at the age of 10, place opposite each succeeding age the number of survivors, till at 98 years none are left. At 40, survivors = 82,284; at 50, survivors = 72,726; therefore the chance that a man of 40 shall live to 50 is $72,726 \div 82,284 = .884$. The Belgian tables give .832 for the same event in the case of a married man living in town; and if his wife is 30 years old her chance of surviving for ten years is .862. These data give the following calculation of the chances of the four double events occurring 10 years hence:

Both being alive	$.832 \times .862 = .717$
Both dead	$(1 - .832) \times (1 - .862) = .023$
Husband alive only	$.832 \times (1 - .862) = .115$
Wife alive only	$(1 - .832) \times .862 = .145$

As we have seen already the sum of these four probabilities must = 1, which verifies the reckoning. The chance of both these persons being alive is evidently more than $\frac{7}{10}$ —i.e. the odds in favour are better than 7 to 3.

Some of the higher applications of the doctrine of probability require a knowledge of the infinitesimal calculus, and are of interest only to experts. It is proved, for example, by integration and the theory of averages that the mean latitude of all places north of the equator is $32^\circ 7' 44''$; and when four points in the circumference of any circle (radius = r) are taken at random, the mean area of the quadrilateral so determined is $\frac{3\pi}{2} = r^2 \times .955$.

There are works on the subject by De Morgan (1837), Boole (1854), Todhunter (1865), Venn (1866), Whitworth (1886), Procter (1887), and Poincaré (1896).

Probang, an instrument of various shape and material, for pushing obstructions down the oesophagus of a choking animal. See CHOKING.

Probate. The Probate Court was created in England in 1558, in lieu of the old Prerogative Courts to exercise jurisdiction in matters touching the succession to personal estate. Since the Judicature Acts of 1873-75 the Probate Court is included in the Probate, Divorce, and Admiralty Division of the High Court of Justice. If a man at his death leaves a will, then it must be produced and verified so as to prove that it is an authentic will, duly executed and signed in presence of witnesses, and therefore that the right to the personal estate is vested in the executors named by the will. The will is proved in common form by depositing it in one of the registries of the court, by making affidavit of the amount of the property, and by paying a duty varying according to the amount of the property and nearness of kin to the deceased (see DEATH DUTIES). The executors receive a copy of the will, accompanied by a grant of administration; and this probate copy is usually shown to bankers, &c. when the executors lay claim to the property of the deceased. If the authenticity of the will is disputed it must be proved by witnesses in court. If there is no will the personal estate devolves on the next of kin and widow, if any; and it is necessary that an application be made to the court to appoint an administrator. This is called taking out administration, and the act of the court appointing administrators is called letters of administration.

Probationer, one who is on probation; especially, in Scotland, a divinity student who, having completed his studies and performed the prescribed exercises, is licensed to preach by the presbytery, and is entitled to become a candidate for a pastoral charge.

Proboscidea. See ELEPHANT.

Proboscis Monkey (*Nasalis larvatus*), a native of Borneo, one of the dog-like (Cynomorph) Catarrhines, nearly allied to the genus Semnopithecus. The nose is very long, especially in the old males, and is mobile and retractile like a proboscis. In the young monkeys it is short and



Proboscis Monkey (*Nasalis larvatus*).

blunt. There are bushy whiskers, which, with the long hair on the back of the head, encircle the neck. The colours—brown, red, yellow, and gray—are bright. The adult males are about 3 feet in height; the body is lank, and the tail is very long. In habit these animals are arboreal and gregarious.

Probus, MARCUS AURELIUS, emperor of Rome, was born at Sirmium, in Pannonia, early entered the army, and had the good fortune to attract the favourable notice of the Emperor Valerian. His subsequent conduct justified his rapid promotion, for he greatly distinguished himself on the Danube, and in Africa, Egypt, Asia, Germany, and Gaul. By the Emperor Tacitus he was appointed governor of the Asiatic possessions of Rome; and such was the zealous attachment evinced for him by his soldiers that on the death of Tacitus they forced him to assume the purple; and, his rival Florianus having been removed, Probus was enthusiastically hailed emperor by all classes (276 A.D.). His brief reign was signalised by brilliant and important successes; the Germans were driven out of Gaul, and the Barbarians from the Rhætian, Pannonian, and Thracian frontiers; and Persia was forced to agree to a humiliating peace. The external security of the empire being established, Probus devoted himself to the development of its internal resources. But fearing that the discipline of the army would be deteriorated by inactivity, he employed the soldiers as labourers in executing various extensive and important works of public utility. Such occupations, considered as degrading by the soldiers, excited among them the utmost irritation and discontent; and a large body of troops engaged in draining the swamps about Sirmium murdered their excellent emperor in 282.

Process Engraving. See ILLUSTRATION, PHOTOGRAPHY.

Procession of the Holy Spirit. See SPIRIT, CREEDS.

Processions, as solemn and religious rites, are of very great antiquity. With the Greeks and Romans they took place chiefly on the festivals of Diana, Bacchus, Ceres, and other deities; also before the beginning of the games in the Circus; and in spring, when the fields were sprinkled with holy water, to increase their fertility. The priests went at their head, bearing images of the gods and goddesses to be propitiated, and started either from

certain temples or from the Capitol. Among the Jews certain processions around the altar were—and still are to a certain extent—usual on the Feast of Tabernacles; and from them the Mohammedans have adopted their mode of encompassing the sanctuary seven times at Mecca. Processions also form a prominent part of the Buddhist worship. The practice was early introduced into the Christian church, but seems to have been adopted by Chrysostom at Constantinople to counteract the influence of the Arian processions through the streets to their churches outside the walls. Ambrose speaks of them as ancient in his day. During the middle ages processions were arranged on a scale of great magnificence, as at the Corpus Christi Festival. Since the Reformation they have been much less elaborate, especially in mixed countries; but at Vienna, and still more at Munich, the Corpus Christi procession is still magnificent. Processions are either Supplicatory processions or Cross processions, and are either directed to a certain distant place, to some miraculous image or object, or they are confined to the streets of the cities and the churches. Banners, crosses, and images are generally carried in front; the clergy follow; and the people make up the rear, singing hymns or reciting prayers. Processions to beseech the special mercy of God are variously to be described as *Litanies*, *Rogationes*, *Stationes*, *Supplicationes*, and *Exomologeses*; and again, they are to be distinguished as being with or without the Blessed Sacrament, relics, or images of the Virgin or Saints. Some are extraordinary and specially arranged; others are ordinary and fall under the common ritual, as those on Candlemas, Palm Sunday, St Mark's Day, three Rogation days, and at funerals. The Processional is the service-book containing the prayers, hymns, and ceremonial of processions. There is no doubt that, whatever their general intrinsic value, they offer in many instances one of the most strikingly picturesque features of the Roman faith, and that they answer a certain instinctive craving of the multitude. Processions through the streets are frequent in modern life as political and social demonstrations, as during strikes and the like, and, when not decreed dangerous to order or obstructive to traffic, are claimed as a privilege of free-born citizens; and they have been introduced to break the quiet of many English towns and villages as part of the peculiar warfare of the Salvation Army. For extensive pilgrimages, as such, their history and rites, see PILGRIM, MECCA, FESTIVALS, &c.

Prochein Ami. See INFANT.

Pro'cida, an islet of Italy, between the island of Ischia and the mainland (Cape Miseno), 12 miles W. by S. of Naples. Area, 1½ sq. m.; pop. 10,700. On its shores is the city of the same name, with a harbour, a royal palace, a state-prison, and a marine school. The people fish coral, tunny, and sardines, and grow fruits, wine, and oil. The island was occupied by Britain on two or three occasions between 1799 and 1813.

Proclamation, a public notice given by the sovereign or governing power to the people. The power of issuing proclamations is part of the prerogative of royalty as the fountain of justice. They sometimes consist of an authoritative announcement on some matter of state, or act of the executive government affecting the duties and obligations of subjects. The demise of the crown, and accession of a new sovereign, a declaration of war, and the issue of new coin are all occasions on which a royal proclamation is issued. In time of war, the crown by a proclamation may lay an embargo on shipping, and order the ports to be shut. But the most usual class of proclamations are admonitory notices for

the prevention of offences, consisting of formal declarations of existing laws and penalties, and of the intention to enforce them; such as the proclamation against vice and immorality, formerly read at the opening of courts of assize and quarter sessions in England. In Scotland proclamations summon the Scottish peers to elect representatives to the House of Lords.

Proclamations are binding when they enforce the execution of laws already in being. Towards the end of Henry VIII.'s reign it was enacted that the king's proclamation should have the same force as an act of parliament; but this ill-judged law was repealed in the first year of Edward VI. It is now clear that the sovereign can neither make a new law, nor dispense with the existing law, unless by consent of parliament. A meeting which is proclaimed is not thereby rendered illegal; the proclamation is only a notice that, in the opinion of the government, the meeting is likely or certain to assume an illegal character. Proclamations are issued under the Great Seal, and are read aloud by heralds or other royal officers in the capital cities of the United Kingdom; the reading is prefaced with a fanfare of trumpets.

Proclus, the Neoplatonist, called the SUCCESSOR (*Diadochos*), i.e. of Syrianus, as the head of the Athenian school, was born in Constantinople about 411 A.D. He was of Lycian origin, and received his first instruction at Xanthus, in Lycia. He then studied at Alexandria under Arion, Leonaras, Hero, and especially under Heliodorus, with whom he applied himself chiefly to Aristotelian and Platonic philosophy. Thence he went to Athens, where a certain Plutarch, a philosopher, and his daughter, Asclepigeneia, a priestess of Eleusis, became his instructors, chiefly in theurgic mysteries. The vivid imagination and enthusiastic temperament which in his childhood already had led him to believe in apparitions of Athena and Apollo, naturally convinced him, when all the influences of the mysteries were brought to bear upon him, still more of his immediate and direct intercommunication with the gods; and he came to distinctly believe himself one of the few chosen links of the Hermaic chain through which divine revelation reaches mankind. His soul had, he thought, once lived in Nicomachus the Pythagorean, and, like him, he had the power to command the elements to a certain extent, to produce rain, and to temper the sun's heat. The Orphic Poems, the writings of Hermes, and all the mystical literature of that occult age were to him the only source of true philosophy, and he considered them all more or less in the light of divine revelations. That same cosmopolitan spirit in religious matters which pervaded Rome towards her end had spread throughout all the civilised pagan world of those days, and Proclus distinctly laid it down as an axiom that a true philosopher must also be a hierophant of the whole world. Acquainted with all the creeds and rites of the ancient Pantheons of the different nations, he not only philosophised upon them in an allegorising and symbolising spirit, as many of his contemporaries did, but practised all the ceremonies, however hard and painful. More especially was this the case in the severity of his fasting in honour of Egyptian deities—a practice, which, if it fitted him more and more for his hallucinations and dreams of divine intercourse, on the other hand more than once endangered his life. Of an impulsive piety, and eager to win disciples from Christianity itself, he made himself obnoxious to the Christian authorities in Athens, who, in accordance with the spirit of religious intolerance and fanaticism which then began to animate the new and successful religion against which Proclus waged

constant war, banished him from this city. Allowed to return, he acted with somewhat more prudence and circumspection, and only allowed his most approved disciples to take part in the nightly assemblies in which he propounded his doctrines. He died in 485, in his full vigour, and in the entire possession of all those mental powers, for which he was no less remarkable than for his personal beauty and strength.

As to his system, some modern philosophers have exalted it to an extent which his own writings scarcely warrant. Victor Cousin holds that he has concentrated in it all the philosophical rays which emanated from the heads of the greatest thinkers of Greece, such as Pythagoras, Plato, and Aristotle. The predominant law of development is *triadic* in character. The existence of what is produced in that which produces it, its emergence from it, and its return to it (*μονή, πρόοδος, ἐπιστροφή*) are the three moments, by the continued repetition of which the totality of things is developed from their origin. The final source of this development is the original essence, elevated above all being and knowledge, between which and the intelligible there intervenes an intermediary member—the absolute unities (*αὐτοτελεῖς ἐνάδες*), together forming the single supernal number. Next to this comes the three spheres of the intelligible, the intellectual-intelligible (*νοητὸν ἅμα καὶ νοερόν*), and the intellectual. The chief property of the first is being; of the second, life; of the third, thought. Of these spheres the first two are again divided into three triads each, and the triad again into hebdomads, each separate member regarded as a divinity. The soul is made of three kinds of parts—souls—divine, demonic, and human. Of these the divine fall into three orders: the four triads of hegemonic gods, an equal number of gods free from the world (*ἀπὸ κόσμου*), and the gods within the world, who are divided into star-gods and elementary gods. The demons are divided into angels, demons proper, and heroes. The soul enters temporarily into the material body, but it does not create matter, which comes directly from the unlimited—with the limited and the mixed, the components of the first intelligible triads. Space he considers as a body consisting of the finest light, which body penetrates that of the world. He distinguishes the principle of unity or divinity in the soul from thought or reason. It is capable by divine illumination of mystic union with the Deity. Indeed, faith alone is essential to the attainment of Theurgy, which, comprising mantic and supernatural inspiration, is preferable to all human wisdom; and in this Proclus chiefly differs from Plotinus, with whose system he agrees in most other respects.

There is no edition of the complete works of Proclus, but that of Victor Cousin (6 vols. 8vo. Paris, 1820) contains the *Commentaries* on the *First Alcibiades* and the *Parmenides*, and the treatises *De Libertate*, *Providentia*, et *Malo* (in a Latin translation); his second edition (1 vol. 4to, 1864) contains in addition to these the *Hymns*. Thomas Taylor, 'the Platonist,' published in 1788–89 translations of the *Commentary on Euclid*, with the *Life* by Marinus; the *Six Books on the Theology of Plato* in 1816; the *Commentaries* on the *Timæus* in 1820; the *Fragments on the Lost Writings* in 1825; *On Providence*, and *On Evil*, in 1833. The *Commentarius in Platonis Timæum*, several times edited, was the one among his treatises that Proclus esteemed most highly. See NEOPLATONISM.

Proconsul, a Roman magistrate not holding the consulship, who was invested with powers nearly approaching those of a consul, not, however, extending over the city and its vicinity. The proconsul was, at first, one who had held the office of consul, whose *imperium* was prolonged to enable

him to bring an unfinished campaign to a close. The duration of the office was a year. During the later period of the republic, when the consuls were expected to spend the year of their consulate at Rome, they were generally appointed at its close to undertake as proconsuls, either the conduct of a war in some province, or its peaceful administration. Occasionally the office of proconsul, with the government of a province, was conferred on a person who had never held the consulship. Under Constantine parts of certain dioceses came to be governed by proconsuls.

Procop, ANDREW, the Hussite leader, was born in 1380. Originally a monk, he served under Ziska, and on Ziska's death became commander of the Taborites. It was under his command that the fearful raids into Silesia, Saxony, and Franconia were carried out (see HUSS), and he repeatedly defeated German armies. He and his colleague, Procop the Younger, headed the internal conflict of the Taborites with the more moderate Calixtines; and in the battle with the Bohemian nobles at Lipan, near Böhmisschbrod, on the 30th May 1434, both the Taborite commanders fell.

Procopius, the most eminent of the Byzantine historians, was born at Cæsarea, in Palestine, towards the close of the 5th century, and, having studied law, was taken by Belisarius in his train when he led the Roman armies against the Persians (526 A.D.), the Vandals in Africa (533), and the Ostrogoths in Italy (536). He appears to have displayed remarkable practical as well as literary talent, for he was on two occasions placed at the head of the commissariat. Returning to Constantinople shortly before 542, he was highly honoured by Justinian, and appointed prefect (if it was this Procopius) of the metropolis in 562. His death occurred, it is thought, about three years later. Procopius's principal works are his *Historia* in eight books (two on the Persian war, from 408 to 550; two on the war with the Vandals, from 532 to 546; and four on the Gothic war, going down to 552); *De Edificiis*, or six books on the buildings executed or restored by Justinian; and *Anecdota*, or *Historia Arcana*, a sort of *chronique scandaleuse* of the court of Justinian, in which the emperor, his wife Theodora, Belisarius, his wife Antonina, and other distinguished persons, are depicted in the darkest colours. The most valuable of these productions is undoubtedly the first, in which Procopius writes with the clearness and fullness of knowledge that might be expected of a man who had been an eye-witness of much of what he narrates, and who had occupied a position that fitted him to understand thoroughly what he had seen. He is the chief authority for the reign of Justinian.

The best edition of his complete works is that by Haury (1905, et seq.). The Loeb Library edition (7 vols. 1914, et seq.) has a translation by H. B. Dewing. See Dahn, *Procopios von Cæsarea* (1866); Renan, *Essais de Morale*; Bury's Gibbon; Haury, *Procopiana* (1891).

Procrustes (Gr. *Prokroustēs*; from *prokrouein*, 'to beat out,' 'to stretch out'), the surname of a celebrated robber of Attica, named Damastes, or Polypemon. All who fell into his hands he placed on a bed which was either too long or too short for them, but to which he adjusted them either by racking or by amputation till they died. This he continued to do until Theseus overpowered him, and made him suffer the tortures he had inflicted on others.

Procter, BRYAN WALLER ('Barry Cornwall'), was born in Leeds, 21st November 1787. Educated at Harrow, with Byron and Peel for schoolfellows, he was articled to a solicitor at Calne, about 1807 came to London to live, and in 1815 began to con-

tribute poetry to the *Literary Gazette*. He published four volumes of poems, and produced a tragedy at Covent Garden, whose success was largely due to the acting of Macready and Kemble. He was called to the bar in 1831, from 1832 to 1861 was a metropolitan commissioner of lunacy, and died 4th October 1874.

His works, issued under the pseudonym 'Barry Cornwall' (a faulty anagram of his real name), comprise *Dramatic Scenes* (1819), *A Sicilian Story* and *Marcian Colonna* (1820), *The Flood of Thessaly* (1823), and *English Songs* (1832), besides memoirs of Kean (1835) and Charles Lamb (1866). The last is always worth reading; but his poems may be safely neglected. Yet 'Barry Cornwall' will be remembered as the man whom every one loved—that every one including a hundred of the greatest of the century: Lamb, Wordsworth, Coleridge, Leigh Hunt, Keats, Landor, Scott, Tennyson, Browning, Matthew Arnold, Swinburne, Hazlitt, Macaulay, Carlyle, Dickens, and Thackeray were only a few of his numberless friends and acquaintances.

See *Bryan Waller Procter: an Autobiographical Fragment* (1877), edited by Coventry Patmore; Gosse in *Ward's English Poets*.

ADELAIDE ANNE PROCTER, Barry Cornwall's daughter, was born in London, 30th October 1825, and died there 3d February 1864, having in 1851 become a Roman Catholic. By her *Legends and Lyrics* (1858-60), first written some of them for *Household Words*, she made her name known.

Proctor, or PROCURATOR, one who acts for another. This name was formerly given to a class of practitioners in the English Admiralty and ecclesiastical courts; but proctors are now merged for almost all purposes in the general body of solicitors. The King's Proctor is an officer (now the Solicitor to the Treasury) who intervenes to oppose a petition for divorce if he has reason to suspect fraud or collusion. The clergy appoint proctors to represent them in the convocation of their province.

In each of the universities of Oxford and Cambridge there are two proctors, whose duties are to preserve the peace of the university, to repress disorders among the students, and inflict summary academical punishment. They have the command of the academical constabulary, and have also an extensive police jurisdiction in the town. They patrol the streets after dark, attended by officers popularly known as 'bull-dogs.' The proctors must be Masters of Arts, and are chosen by the colleges according to a certain rotation. They nominate two pro-proctors to be their deputies and assistants. The summary authority of the proctors extends both to undergraduates and Bachelors of Arts. They vote in the election of some of the professors and other officers. At Durham also there are two proctors, who, however, do not personally patrol the streets, and have command over only the university police.

Proctor, RICHARD ANTHONY, astronomer and popular author, was born at Chelsea in March 1834. He was educated first at King's College, London, and then at St John's, Cambridge, where he devoted himself chiefly to athletics. His first literary venture was, in 1865, an article on 'Double Stars' in the *Cornhill Magazine*, and from that time he gave himself to astronomy. In 1866 he was elected an F.R.A.S., and in 1872 its honorary secretary, but he retired in 1873 to make a lecturing tour in America. About this time he communicated to the R.A.S. some important papers on 'The Construction of the Milky Way,' 'The Transit of Venus,' 'Star Distribution,' &c.; and his name is associated with the accurate determination of the rotation of the planet Mars,

and with the theory of the solar corona. One of his undertakings was the charting of the 324,198 stars contained in Argelander's great catalogue. His science magazine *Knowledge* was founded as a weekly in 1881, and became a monthly in 1885. He settled in Florida, and died at New York, 12th September 1888. A man of untiring energy, and author of fifty-seven books, he found time to cultivate music, and was a great chess and whist player. His most important work was in connection with stellar distribution.

Procurator-fiscal, a legal officer in Scotland at whose instance criminal proceedings are taken in the local and inferior courts. He is appointed by the Lord Advocate, and is not removable from office except by the Secretary for Scotland for inability or misbehaviour, on a report by the Lord President and the Lord Justice-clerk (7 Edw. VII. chap. 51, secs. 22, 23). His business is to take the initiative in the prosecution of crimes. There being no coroner's inquest in Scotland, he does the work which that functionary does in England by way of inquiry into the cause of deaths occurring under circumstances of suspicion. Whenever he has reason to believe a crime has been committed, his duty is to apply for a warrant to arrest the alleged criminal, to summon and precognosce witnesses, and to bring the case to trial. A private person can only prosecute in the inferior criminal courts in Scotland by obtaining the concurrence of the procurator-fiscal. Such concurrence is as a general rule granted as a matter of course. Private prosecution is now practically unknown except in summary cases. When the procurator-fiscal takes the precognitions of the witnesses, he sends a copy of them to the crown agent, who submits them to the crown counsel, of whom the Lord Advocate is the chief; and, if these counsel think the evidence is strong enough, the prosecution is proceeded with to trial. See CRIMINAL LAW.

Procyon. See RACCOON.

Producer Gas. See GAS (HEATING, &c.).

Professional. See AMATEUR.

Professor, an officer in a university, college, or other seminary, whose duty it is to instruct students, or read lectures on particular branches of learning. In the early times of universities the degrees conferred on students were licenses to act as public teachers; and the terms Master, Doctor, and Professor were nearly identical in signification. As, however, the body of graduates ceased in the course of time to have any concern in public teaching, a separate class of recognised teachers sprang up, paid sometimes with salaries, in other instances by fees from their hearers. These were called professors; and in the German and Scottish universities they became the governing body, and sole recognised functionaries for the purpose of education. In the universities in which collegiate foundations prevailed, as Oxford and Cambridge, they became, on the other hand, only secondaries or auxiliaries, attendance on their lectures not being generally deemed indispensable, and the necessary business of instruction being carried on by the functionaries of the several colleges. Nowadays a professor is expected to divide his time between teaching and research; some, indeed, are untrammelled by teaching duties. See UNIVERSITY; the articles on the several universities; and ROYAL SOCIETY.

Profit-sharing was defined in a Board of Trade report on Profit-sharing in 1912 as involving 'an agreement between an employer and his workpeople under which the latter receive, in addition to their wages, a share, fixed beforehand, in the profits of the undertaking.' It is held by those in favour of the system that profit-sharing, by giving

employees an interest in the welfare of the establishment, advances its prosperity by increasing the quantity and improving the quality of its product, by promoting greater care of implements and economy of material, and by lessening the antagonism generally between capital and labour; to these motives is frequently added that of altruism on the part of an employer towards his employees. The promotion of profit-sharing schemes has been almost wholly the work of employers, while Trade Unions have generally opposed them as threatening the solidarity of their movement, and as tending to depress wages. The name has been extended to include a great variety of schemes by which the additional fund due to the workman may be paid to him directly in cash, or put to his credit as an inducement to thrift, or as a deferred benefit for sickness, old age, &c., or it may be allotted to him in whole or in part in the form of shares in the company. This last, the method of co-partnership, has become of increasing importance in the practice of sharing profits. A sliding scale relating wages to profits has been adopted by some industries, while others grant various types of bonuses. Bonuses, however, are outwith the definition of profit-sharing given above. Profit-sharing as distinguished from co-operation has been tried in concerns as various as gas undertakings, iron-foundries, paper, cotton, and woollen factories, the painters' and decorators' trade, millinery businesses, and all sorts of retail shops.

Turgot in 1775 recognised a principle of profit-sharing, but Edme-Jean Leclaire (q.v.), a successful Parisian painter and decorator, was the first to carry it to a practical issue. Leclaire by wonderful energy and capacity had risen to the front rank in his trade, and become a large employer of labour. For the benefit of his workmen in cases of illness he had established a mutual aid society in 1838, and he read everything he could lay his hands upon which tended to help him to improve the social condition of his workmen. M. Frégier in 1835 suggested that the participation of the workmen in the profits of the master would promote harmony between capital and labour. In June 1840 Leclaire introduced some preliminary changes, and in January 1842 he announced his scheme of profit-sharing. The men were sceptical as to Leclaire's intentions, until in February 1843 an object-lesson in the shape of a bag containing some 12,000 francs—their share of the year's profits—was thrown on a table before them. In 1869 the firm received legal status as the *Maison Leclaire*, with the arrangement that the net profits of the business should be divided in a certain fixed proportion between the managing partners, mutual aid society, and the regular workmen. Since 1870 every workman has been entitled to a share of the profits proportionate to his wages. After Leclaire's death in 1872 the system was maintained in the business, now known as Brugnot, Cros, et Cie. Some critics have attributed its success to the energy of Leclaire rather than to any intrinsic merit of the scheme, but its object has been achieved in that it has made management an affair of permanence and the workmen sober, thrifty, and industrious. The Co-operative Paper Works, Angoulême, founded by M. Laroche-Joubert, adopted a system of profit-sharing in 1843, quite independently of Leclaire, provision being made for the admission of workmen shareholders.

One of the most interesting lessons in co-partnership has been afforded by the *Familistère* of Messrs Godin (now Colin et Cie) of Guise. In this iron-foundry the workmen's share of profits accumulates towards the purchase of shares in the firm. The Bon Marché retail store in Paris also has a long-standing scheme of co-partnership in operation.

In Great Britain many systems of profit-sharing have been tried, some indeed as far back as 1829. The one adopted at the Whitwood Collieries of Messrs Briggs, Yorkshire, lasted beneficially from 1864 to 1875, when it ceased on account of the participation of the workmen in a strike against reduction of wages. In 1889 the South Metropolitan Gas Company, under Sir George Livesey, began to share profits with its employees, using a sliding scale to make the dividend on shares and on wages vary inversely with the price of gas. Later the employees were enabled also to acquire shares in the business. Some 40 gas companies in England have adopted some system of co-partnership. Messrs J. T. and J. Taylor, woollen cloth manufacturers, Batley, instituted in 1896 a scheme by which employees receive a proportion of profits in the form of company shares, the dividends being paid in cash. These shares, however, carry no voting power, though they now represent more than half the capital of the business. An interesting scheme of profit-sharing is that started in 1909 by Lever Bros., soap manufacturers, Port Sunlight, with the object of promoting more economical working among their employees. The latter receive annually, according to the value of their services, a number of 'partnership certificates,' which do not represent real capital, but merely entitle the holders to an annual dividend. The dividend, however, is paid in the form of cumulative preferred ordinary shares representing real capital, and conferring voting rights. Partnership certificates are subject to forfeit, but in cases of retirement, &c., are exchanged for similar holdings in preferential certificates. The system is not pure co-partnership: it has been called 'prosperity-sharing.' Further variations are presented by the firms of Armstrong, Whitworth, & Co., Clarke, Nickolls, & Coombs, Rowntree & Co.; and the movement has spread since the Great War, especially in larger concerns.

Profit-sharing enterprises are numerous in the United States. Two of the most successful examples are the Procter & Gamble Company, of Ivorydale, Ohio, and the N.O. Nelson Manufacturing Company, of St Louis, Mo. In the former, employees are enabled to buy common stock at specially favourable terms. The United States Steel Corporation started a somewhat similar plan in 1903. The N.O. Nelson Company, brass manufacturers, began a system of profit-sharing in 1886, first in cash, then in shares, and in 1905 consumers were also admitted to a dividend. The principles have been applied also in Germany, Holland, Italy, Switzerland, &c.

The merits of profit-sharing as a factor in industrial remuneration have been variously judged. Of the 380 schemes started in Great Britain by 1920, 198 had been abandoned. Much depends on the type of industry involved—gas companies have been specially successful. In industries liable to violent fluctuations, profit-sharing schemes usually succumb to the discontent of employees in years when there are no profits to share. Experience has also showed that cash profit-sharing is not so likely to succeed as a scheme of co-partnership which gives the employee a live interest in the welfare of the business.

See Hart's *Maison Leclaire* (1883); Taylor's *Profit-sharing* (1884); Böhmert's *Participations aux Bénéfices* (1888); Gilman's *Profit-sharing between Employer and Employee* (1900); Bushill's *Profit-sharing and the Labour Question* (1891); Schloss, *Methods of Industrial Remuneration* (3d ed. 1917); T. Burt, M.P., *Twenty Years of Co-operation at Guise* (1904); C. Gide, *L'Actionnariat Ouvrier* (1910); Board of Trade's *Report on Profit-sharing and Labour Co-partnership* (1912); C. R. Fay, *Co-partnership in Industry* (1913); A. Williams, *Co-*

partnership and Profit-sharing (1913); L. L. Price, *Co-operation and Co-partnership* (1914); A. W. Burritt, H. S. Dennison, &c., *Profit-sharing: Its Principles and Practice* (1918), giving the American aspect of the subject; H.M.S.O. *Report on Profit-sharing and Labour Co-partnership in the United Kingdom* (1920), with a very full bibliography; J. A. Bowie, *Sharing Profits with Employees* (2d ed. 1923); and the articles CO-OPERATION, SOCIALISM.

Prognostications. See ALMANAC; METEOROLOGY; STORMS; WIND.

Programme Music, a term applied to music written on a pictorial or literary basis, which, however, must preserve its musical significance. The listener must be able to take pleasure in it *qua* music, though his enjoyment would be considerably enhanced by a knowledge of the picture or story which the composer had in mind. Direct imitation of natural phenomena has little artistic value, but suggestion in music of situations external to music can be done, frequently with singularly happy results. Programme music is no new creation. Many of the pieces in the Fitzwilliam Virginal Book (Elizabethan), Kuhnau's Bible Sonatas (1700), some of Rameau's works for the harpsichord, including *La Poule* and Bach's *Capriccio on the Departure of a Brother* are frankly descriptive. Beethoven described his *Pastoral* symphony as 'rather the expression of feeling than of painting,' but his piano sonata *Les Adieux, l'Absence et le Retour* has really but the slightest of outside associations. In the 19th century the enormous advance in orchestral technique and the much closer association of poetry and music gave a great stimulus to programme music, which now proceeded along two separate lines. Schumann with his *Carneval* and Debussy with his *Préludes* added fantastic titles, indicating merely a certain mood or line of thought. Berlioz (though not always very consistently), Liszt, and later Strauss and some of the modern Russian school, on the other hand, turned their attention to symphonic poems, dealing with a definite episode or story. The *leit-motif* of the Wagnerian drama and passages such as the Rhine-music and the fire-music from the *Ring* are nothing but excursions into the domain of programme music. From a logical point of view, programme music can be considered as merely particularising an abstract sentiment or emotion. Instead of writing a serenade of a general type, Ravel chooses that of a Spanish court jester (*Alborado del Gracioso*), and an emotional conflict, instead of being expressed on this occasion in a symphony, is illustrated by Tchaikowsky from Dante's episode of *Francesca da Rimini*. See MUSIC.

Progreso, the port of Mérida, in Yucatán, from which it is 25 miles N. by rail. It stands on an exposed, open bay, and is one of the worst harbours in the world; but it has a large trade, exporting much henequen or sisal. Pop. 5000.

Progression, in Arithmetic, is the succession, according to some fixed law, of one number after another. A series of numbers so succeeding one another is said to be 'in progression.' Progression may be of various kinds, but the three forms of most frequent occurrence are *Arithmetical Progression* (q.v.), *Geometrical Progression* (q.v.), and *Harmonical Progression*. If the terms of an arithmetical progression be inverted they form a series in harmonical progression; thus, 1, 2, 3, 4, 5, 6, &c. is an arithmetical progression; and 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. is a harmonical progression. This series is principally important in connection with the theory of music, in determining the length of the strings of instruments. See HARMONICS.

Progression, MUSICAL. The regular succession of chords or the movement of the parts of a

musical composition in harmony, where the key continues unchanged, is called Progression; where a new key is introduced it is not progression, but Modulation (q.v.).

Prohibition. See LIQUOR LAWS, and TEMPERANCE.

Projectile is the name given to any mass thrown so as to describe a path in air near the earth's surface. The path described is called the trajectory. The importance of the subject springs from its close connection with Gunnery (q.v.). Any mass projected into the air is under the action of two forces: first, its weight, acting downwards and practically constant; second, the resistance of the air to motion through it, which resistance is a function of the speed, and depends also on the form, size, and mass of the projectile.

If we consider the action of gravity alone, the problem is a very simple one. Since the force of gravity is always vertical, there can be no change in the value of the horizontal component of the velocity. The projec-

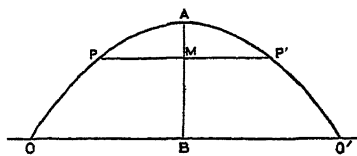


Fig. 1.

tile, projected from any point O (see fig. 1) at any inclination, will some time or other reach the highest point A. At this point the vertical velocity will be zero; and, if the horizontal velocity were here suddenly reversed, the projectile would travel back along the same trajectory to O. As it is, the projectile proceeds along the path AO', which must be exactly similar to AO. In short, the trajectory is symmetrical about the vertical line drawn through the highest point A. Reckoning from A, let us suppose the projectile to reach P' after t seconds. Then, if the horizontal velocity is v , the distance of P' from the vertical line AB—P'M—namely—is measured by the product vt . But the projectile in falling through the height AM has acquired a vertical velocity gt , where g is the acceleration due to gravity. Thus the space fallen through, being measured by the product of the average speed and the time, is

$$AM = \frac{1}{2}gt^2 = \frac{1}{2}gMP^2/v^2 = \frac{1}{2}gMP^2/v^2.$$

The trajectory is therefore a Parabola (q.v.) with its axis vertical.

If we suppose the projectile to be projected with a velocity whose vertical and horizontal components are respectively u and v , then the angle of projection has its trigonometrical tangent equal to u/v . The time taken to reach the highest point is u/g ; and the total range on the horizontal plane is

$$OO' = 2.OB = 2vu/g.$$

If we interchange v and u so that the tangent of the angle of projection becomes v/u , instead of u/v , we get still the same range. Generally, then, a given point, O', can be reached by two trajectories with the same initial speed of projection. It is easy to show that the two corresponding directions of projection are equally inclined to the line that makes 45° with the horizontal; and the range is greater according as the components u and v of the given initial velocity are less unequal in magnitude. The greatest range is attained when $u = v = V/\sqrt{2}$, V being the total velocity of projection—i.e. when the angle of projection is 45° . In this case the range is V^2/g . Thus, to throw a ball to a distance of 100 yards or 300 feet it is

necessary to project it with a velocity of at least 100 feet per second (nearly). Practically, however, because of the atmospheric resistance, it would need a distinctly greater speed of projection than that just given to attain the desired range.

A very simple observation suffices to show that the parabolic trajectory is only approximately realised in air. A well-driven cricket or golf ball will be seen to a spectator suitably placed to describe a trajectory which is distinctly asymmetrical about a vertical line through the highest point. The path will be found to be less curved during the ascent than during the descent; while the highest point is considerably nearer the end than the beginning of the trajectory. In fig. 2 the general character of a real trajectory, AB', is compared

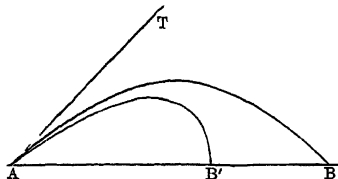


Fig. 2.

with the parabolic trajectory, AB, which would have been described if the air had offered no resistance. AT shows the direction of the initial projection. The same features causing deviation from the parabolic form are still more characteristic of the long flat trajectories of cannon-balls. These, projected with very high speeds, have their approximately horizontal velocities rapidly cut down in the earlier stages by the resistance of the air.

The first approximately accurate ideas of the resistance presented by the air to bodies moving through it at high speeds were obtained by Robins (see GUNPOWDER, GUNNERY, CHRONOGRAPH). Bashforth, by means of his electric chronograph, elaborately investigated the subject. His results indicated that up to velocities of from 800 to 900 feet per second Newton's theoretic law that the resistance varies as the square of the speed holds practically true. The same law (but with a different coefficient) holds for all measured velocities above 1300 feet per second; but between the limits named the resistance depends on higher powers of the speed. Between the velocities of 1000 and 1100 feet per second—the velocity of sound in air, in fact—the resistance grows very rapidly, varying for a certain interval as the *sixth* power of the velocity. The resistance also depends on the form of the projectile, a spherical shot being nearly twice as much resisted as an ogival-headed shot of the same diameter and weight. For different sized projectiles of the same form the retardation due to the resistance is directly as the square of the diameter and inversely as the weight. It is usual to express the diameter in inches and the weight in pounds; and the following numbers are for an ogival-headed projectile, whose weight in pounds equals the square of its diameter in inches. The first line gives the velocity and the second the corresponding resistance-acceleration (negative):

Velocity.....	1500	1200	1100	1000	900	800	400
Acceleration....	318	188	143	79	54	39	10

For a sphere of same weight and size, the resistance-acceleration for speeds lower than 850 feet per second is given by the formula $1.183 \times 10^{-6} v^2$, where v is the velocity. From this it may be shown that such a sphere falling in air can never attain a velocity of 522 feet per second. If projected downwards with a greater velocity it will be retarded, since the resistance due to the atmosphere

is greater than the weight of the body. If projected upwards with a speed of 800 feet per second it will reach a height of only 5112 feet instead of nearly 10,000, and will return to earth again with a velocity of 351 feet. These results show why a meteoric stone never reaches the earth's surface with a velocity of more than a few hundred feet per second. It matters not with what relative speed the meteor may meet the earth. Once it gets into the atmosphere its kinetic energy is rapidly dissipated in heat, and much of its substance volatilised at the high temperature that results. Our atmosphere, in fact, acts as a practically perfect shield to meteoric bombardment.

For projectiles discharged from firearms, see the articles on Bullet, Cannon, Cartridge, Firearms, Gun, Rifle, Shell, Shot.

Projection is the representation on any surface of objects or figures as they appear to the eye of an observer. It thus includes Perspective (q.v.), and is most simply illustrated by the shadow of an object thrown by a candle on a wall; the shadow being the projection and the place of the light the position of the eye. The theory of projections is of great importance, both in mathematics and geography, being, in the former case, perfectly general in its application, while in the latter only the projection of the sphere is required. Projections of the sphere are of various kinds, depending upon the position and distance of the eye from the sphere, and the form of the surface on which the projection is thrown; thus we have the *orthographic*, *stereographic*, *globular*, *conical*, and *cylindrical* or *Mercator's* projections, all of which are treated of under the article MAP. Another projection frequently employed is the *gnomonic*. In the gnomonic projection the eye is supposed to be situated at the centre of the sphere, and the surface on which the projection is thrown is a plane surface which touches the sphere at any one point (called the *principal point*). It is evident that a map constructed on the gnomonic projection is sensibly correct only for a circular area whose circumference is at a small angular distance from the principal point. From the position of the eye in the gnomonic projection (which is not suited for representing large portions of the earth's surface) it follows that all great circles or portions of great circles of the sphere are represented by straight lines, for their planes pass through the eye. The gnomonic projection derives its name from its connection with the mode of describing a gnomon or Dial (q.v.). The gnomonic and stereographic projection of crystals is described and illustrated at CRYSTALLOGRAPHY.

Prolapsus Ani is a common affection of the termination of the intestinal canal, and consists in an eversion of the lower portion of the rectum, and its protrusion through the anus. It may depend on a naturally relaxed condition of the parts, as in infancy, or may be caused by violent straining in cases of costiveness, piles, &c. Whenever it occurs the parts should be washed, and if possible replaced by careful pressure with the hand; and if they do not easily return the forefinger should be oiled and pushed up into the anus, and it will convey the protruded intestine with it, after which the patient should retain the recumbent position for some hours. If it cannot be returned by the above means surgical assistance should be at once sought. In order to remove the tendency to prolapsus the patient should regulate his bowels so as to avoid costiveness, should sponge the parts after every evacuation with cold water or soap and water, and if necessary use astringent injections, as, for example, a weak solution of sulphate of iron, 1 grain to the ounce. In young children the power

of straining, and therefore the tendency to the occurrence of the protrusion, may be much diminished by preventing their feet from resting on the ground during defecation. The tendency of the bowel to prolapse may also be diminished by adoption of the following plan—viz. that when the stools are passed the skin near the anus should be drawn to one side with the hand so as to tighten the orifice. In children the occurrence of prolapse gradually lessens, and usually disappears entirely as the child increases in size and in strength. If after the adoption of these means the bowel continues to descend certain surgical means must be resorted to, the usual procedure consisting in the removal of a ring from the prolapsing mucous membrane.

Prolapsus Uteri. See WOMB.

Proletariat, a term used to denote the lowest and poorest classes of the community. It is derived, through the French, from the Latin *proletarii*, the name given in the census of Servius Tullius to the lowest of the centuries, who were so called to indicate that they were valuable to the state only as rearers of offspring (*proles*). The word has come much into use in the literature of Socialism (q.v.); see also MARX, DICTATOR.

Prologue, a preface or introduction to a discourse or poem, as the *prologue* to Chaucer's *Canterbury Tales*; but more especially the discourse or poem spoken before a dramatic performance, corresponding to the Epilogue (q.v.) at its close. This usually stands outside the action of the piece, an external adjunct to it, being, indeed, a mere address to the public occasioned by the play. The introduction proper, again, belongs to the action itself, and this we find provided for in the prologue of Euripides, spoken by one of the characters, in narrative form, half within and half without the action; in the separate *induction* of many old English plays; and in the preludes and prologues of modern dramas like *Faust*.

Prometheus, a great culture-hero of Greek mythology, the son of the Titan Iapetus and of Clymene, brother of Atlas, Menœtius, and Epimetheus. Hesiod tells his history as follows: Once, under the reign of Zeus, when men and gods were disputing with one another at Mecone as to which portions of the victims at sacrifices were to be given to the gods, Prometheus, to outwit Zeus cut up an ox, and placed on one side the best parts covered with offal, on the other the bones covered with fat. Zeus was asked to choose, but, finding the deceit practised upon him, avenged himself on the mortals by withholding from them the fire necessary for the cooking of the meat; whereupon Prometheus stole it in a hollow fennel-stalk, and brought it to them. Zeus next caused Hephestus to mould a virgin of wondrous beauty, Pandora (q.v.), whom Epimetheus was unwise enough to receive as a present from Hermes, and thus brought through her all imaginable ills upon humanity. Prometheus himself was chained to a rock, and an eagle sent to tear his liver by day, while Zeus caused it to grow anew during the night. At length Heracles killed the eagle, and by the permission of Zeus delivered the suffering Prometheus. Thus far Hesiod's legend. In the splendid tragedy of Æschylus, the *Prometheus Vinctus*, Prometheus is an immortal god, a friend of the human race, who does not shrink from opposing the evil designs of Zeus against mankind, and even from sacrificing himself for their salvation. He is the long-suffering hero, who, although overcome by Zeus's superior might, yet does not bend his mind. He takes from man the evil gift of foreseeing the future, but gives him the two infinitely superior gifts of hope and of fire; and he is the inventor of architecture, astronomy, writing,

figure, medicine, navigation, the mystery of prophecy, the arts of metal-working, and all other arts which embellish and adorn life. For these boons conferred on the human race he is by Zeus's order chained to a rock in Scythia by Hephestus, who fulfils this task reluctantly. Here he is visited by the Oceanides, by Io, and by Hermes, who endeavours to find out that which Prometheus alone knows, who will be the son of Zeus and his successor. Refusing to divulge this secret, he is struck by Zeus's lightning and hurled into Tartarus, whence he only re-issues after a time to undergo new sufferings. He is now fastened to Mount Caucasus, and the eagle, an offspring of Earth and Tartarus, comes to torment him daily. Cheiron the Centaur at last offers himself to supply the place of Prometheus in Hades—for on no other condition was he to be liberated than that some other immortal should offer himself in his stead. Cheiron, incurably wounded by Heracles, is accepted by Zeus. Other legends make Prometheus the creator of man out of earth and water. There can be no doubt that Prometheus is a culture-hero, analogous to the Maori *Manu*, and the Finnish *Wainamoinen*. The possession of fire to early man was a matter of enormous importance, and the legend of its being originally stolen from heaven by a primeval hero is very widely spread over the world. The Greek name means 'fore-sight'; Epimetheus ('after-thought') is obviously its opposite. See FIRE.

Promise. See CONTRACT, MARRIAGE.

Promissory-note, a written promise by one person (the maker) to pay another (the payee) or bearer a sum of money either on demand or on a future day. It is in the following form:

£100.

LONDON, 1st January 19—.

Three months after date I promise to pay to Mr William Smith or order One Hundred Pounds for value received.

JOHN BROWN.

With certain necessary exceptions, such as the rules regarding acceptance, the law of Bills of Exchange (q.v.) applies equally to notes.

Promotion in the commissioned ranks of the British army, since the abolition of the purchase system in 1871, is obtained by seniority to fill a vacancy, by selection or by brevet for distinguished services. Regimental promotions from second-lieutenant to lieutenant, captain, major, and lieutenant-colonel usually follow on seniority, provided that the necessary examinations have been passed. The rank of Colonel (q.v.) stands on a separate footing, but succeeding steps of major-general, lieutenant-general, and general are made on selection; the seniors, however, have the preference if otherwise eligible, and not above the age limits, which are fifty-five, sixty-two, and sixty-seven respectively. Field-marshal is selected from the generals, with the approval of the sovereign, for special distinguished service. Brevet (q.v.) promotion does not apply when the recipient is serving with his regiment. Non-commissioned officers are sometimes promoted; and quartermasters, music-directors, and riding-masters receive honorary commissions.

Promotion in the navy is governed partly by seniority and partly by selection. On a midshipman passing all his examinations for the rank of lieutenant, he receives his commission as sub-lieutenant, and is then advanced to lieutenant, except in a few special cases, by seniority. Advancement from the lieutenants' to the commanders' list may be said to be by pure selection. There is an intermediate rank of lieutenant-commander from which the selection is made, but these promotions are generally to be found among

officers who have ten to fifteen years' seniority in these two ranks with a proportionate amount of good service. Promotion from the commanders' list to the captains' is also by selection. The rank of Commodore (q.v.) is a temporary one. Captains, rear-admirals, vice-admirals, and admirals are promoted on their respective lists by seniority, but admirals of the fleet are specially selected with the approval of the sovereign.

See articles on the different ranks, ADMIRAL, GENERAL, &c.; also COMMISSIONS (ARMY), RANK, NAVY, MILITARY SCHOOLS.

Promptorium Parvulorum was an English-Latin dictionary, compiled about 1440 by Geoffrey the grammarian, a friar-preacher at Lynn in Norfolk.

Prong-horn. See ANTELOPE, HORN.

Proof. See EVIDENCE; also ENGRAVING.

Proofs, CORRECTION OF. The corrections to be made on a 'proof' of printed matter are marked on the margin; and for this purpose an established set of signs or shorthand is used. The following specimen of a proof exhibits the application of most of these signs:

'To rule the nations with imperial
sw^ofy, to impose terms of peace, to
spare the humbled, and to crush the
proud, resigning itto others to de-
scribe the courses of the heavens, and
explain the rising stars; this, to use
the words of the poet of the Æneid
in the apostrophe of Anchises to
Fabius in the Shades, was regarded
as the proper province of a Roman.
The genius of the people was ~~even~~
more adverse to the cultivation of the
physical sciences than that the Euro-
pean Greeks, and [seen] we have| that
the latter left experimental philosophy
chiefly in the hands of the Asian and
African colonists. The elegant litera-
ture and metaphysical speculations
of Athens, her histories, dramas, epics,
and orations, had a numerous host of
admirers in Italy, but a feeling
of indifference was displayed to the
practical science of Alexandria. [This
repugnance of the Roman mind at
home to mathematics and physics, ²
extending from the Atlantic to the
Indian Ocean, from Northern Britain
to the cataracts of the Nile, annihila-
ted in a measure all pure sciences
in the conquered districts where they
had ~~had~~ been pursued, and prohibite^d
attention to them in the mother
country.]

Long, indeed, after the age of
Ptolemy, the school in connection
with which he flourished, remained
in existence; &c.

1 a

2 tr.

3 #

4 |

5 *Italic.*

6 ,/

7 *S. caps.*

8 *set.*

9 O

10 of

11 ;/ 2 tr.

12 w^f.

13 ©

14 δ

15 tr.

16 *Roman.*

17 *New line.*

18 *and its
despotism
abroad,*

19 # 15 C

20 the

21

22 δ

23 -/

24 *Run on.*

25 *Caps.*

26 ✓

(1) A wrong letter. After every mark of correction a line / should be drawn, to prevent its being confounded with any other in the same line. (2) A word or letter to be transposed. Where letters only are to be transposed, it is better to strike them out, and write them in their proper sequence in the margin, like a correction. (3) A space wanted. This mark is also used when the spacing is insufficient. (4) A space or quadrat *striking up*. (5) Alteration of type. One line is drawn under the word for *italics*, two for *SMALL CAPITALS*, three for *CAPITALS*. (6) Correction or insertion of stops. (7) A word struck out, and afterwards approved of (*Lat. set.* 'let it stand'). (8) A turned letter. (9) An omission. (10) A letter of a wrong fount. (11) A word or letter to be deleted. (12) Alteration of type. (13) A new paragraph. (14) Insertion of a clause. (15) A space to be removed or diminished. (16) A wrong word. (17) When letters or lines do not stand even. (18) Mark for a hyphen. (19) No new paragraph. (20) The manner in which the apostrophe, inverted commas, the star and other references, and superior or 'cock-up' letters and figures are marked.

The immediate object of a 'reader' or corrector of the press is to observe and mark every error and oversight of the compositor, with a view to make the printed sheet a perfect copy of the author's manuscript. This is on the supposition that the manuscript itself is quite correct, which is seldom the case; and therefore the duty of a good reader extends to seeing that there are no inconsistencies in orthography, punctuation, abbreviations, &c., and in many cases to the verification of quotations, dates, and proper names. Where extensive alterations, omissions, or additions are likely to be made by writer or editor, it is more convenient to take the proofs on long slips, before division into pages. The making of new paragraphs, or the suppression of those in type, should be avoided as causing trouble and expense.

The duty of securing consistency in spelling and punctuation is especially important in the case of works on which several writers are employed, such as newspapers and cyclopedias. The corrector has also to direct his attention to the numbering of the pages; to the arrangement of chapters, paragraphs, and notes; to running titles, &c. It is part of his business to observe the mechanical defects of the work—defective types, turned letters, inequalities of spacing between words, sentences, and lines, crooked lines, and to secure symmetry in verses, tables, mathematical operations, and such like. In almost all cases two proofs are taken, and in difficult works, such as those in foreign languages, tables, &c., even more. Lastly follows the revision, in which little more is done than seeing that the compositor has made all the corrections marked on the last proof. It is usual for the writer or author to reserve the correction of the second proof for himself.

The thankless and monotonous business of a corrector or reader is more difficult than the uninitiated would believe. It requires extensive and varied knowledge, accurate acquaintance with the art of typography, and, above all, a peculiar sharpness of eye, which, without losing the sense and connection of the whole, takes in at the same time each separate word and letter. See BOOK, PRINTING.

Propaganda (*Lat. De Propaganda Fide*), the name of a Congregation (q.v.), and also of a College, in Rome, the object of which is to direct and forward the propagation of the Catholic religion, especially among the heathen, although Christian dissenters from the Roman Church are also included in the sphere of its operations. The institution was originated by Pope Gregory XIII. (1572-84); but it was fully organised by Gregory XV., who in 1622 established a special Congregation for the purpose. This his successor, Urban VIII., extended and endowed, annexing a college for the education of missionaries to the several countries. One great feature of that college has been to provide for such work natives of the several countries, who are conveyed to Rome at an early

age for the purpose of being specially educated in all the necessary learning of a missionary. In 1908 Pius X. withdrew from the jurisdiction of the Propaganda Great Britain, Canada, the United States, Holland, and Luxemburg, leaving to it (generally speaking) those countries in which the hierarchy was not established.

Propertius, **SEXTUS** (for the second family-name, Aurelius, often given him there is no authority), the most impassioned of the Roman elegiac poets, was a younger contemporary of Tibullus, born about 48 B.C. in Umbria, probably at Asisium (the modern Assisi). Nearly all we know of him is gleaned from his writings, according to which he came of an undistinguished, comparatively poor family, lost his father in boyhood, and had a portion of his patrimony confiscated, after Philippi, by the Triumvirs, to reward their veterans, but retained means enough to proceed to Rome for education, and, having chosen his residence, like Virgil and Mæcenas, on the Esquiline, to make poetry the business of his life. The school then fashionable was the Alexandrian, represented by Callimachus and Philetas, and these he made his models, drawing from them his learned tone and his wealth of mythological colouring. In the political and martial movements of the time he took no part, though his patriotism was pure and strong—witness his exultation over the victory off Actium, his scorn of Cleopatra and her presumptuous ambition to dominate the mistress of the world, above all, his appeal to the Romans to renounce self-indulgence and to return to their neglected legends for the civic virtues and the heroism of 'the brave days of old.' Such was his precept; while his practice was the emotional poetic life, in the congenial society of Ovid, Virgil (whose *Æneid* he has nobly eulogised), the epic poet Ponticus, and Julius Bassus. Like them he won the favour of Mæcenas, to whom he dedicated a book of his poems, and even ingratiated himself with Augustus, whose achievements he duly celebrated. But the central figure of his inspiration was his mistress Cynthia, a lady somewhat older than he, whose real name was Hostia. For many years he cherished a glowing passion for this highly gifted and beautiful, but far from virtuous woman, till about 24 B.C. he disentangled himself from her spells. She died before him; but even after death she lived in his memory as she still lives in the poems that have immortalised her. Propertius left Rome, it would appear, only once, on a visit to Athens, when he may have experienced the shipwreck he has so vividly described. The year of his death has, with probability, been placed about 14 B.C. Of his poems only the first book, devoted entirely to Cynthia, was published during his lifetime; certainly the last of the four was given to the light, in terms of his will, by his friends. Its contents are youthful pieces, in which he celebrates the legends of early Rome in the style of Callimachus, and have a special interest in having most likely inspired Ovid to the composition of his *Fasti*—perhaps even of his *Heroides*. As a poet Propertius ranks high in Roman literature—the tone of the later criticism (with Goethe at its head) being one of increasing admiration for his native force, his eye for dramatic situation, his power over the reader's sympathies, giving the effect of reality to what in the hands of Tibullus or even Ovid is merely conventional. He has more in common with Catullus than with either of these, while he lacks the artistic graces peculiar to the three, being often rough to harshness and obscure from defect of finish.

There are texts by Müller (1880), Bæhrens (1880), Postgate (1894), Phillimore (1901), Butler (1905), and Rothstein (1924); notes by Paley (1872) and Postgate;

English translations by Cranstoun (1875), Phillimore (1906), and Butler (1913).

Property. See HERITABLE AND MOVEABLE, LAND LAWS, PERSONALTY, POSSESSION, REAL.

Prophecy. See BIBLE, ISAIAH, JEREMIAH, &c.; and the *Cambridge Ancient History*, vol. iii. chap. xx. with bibliography; and for prophecies of another sort see MERLIN, NOSTRADAMUS, SHIPTON, THOMAS THE RHYMER, SORTES VIRGILIANÆ, SIBYL, ZADKIEL.

Propolis. See BEE.

Propontis. See MARMORA.

Proportion, in Arithmetic and Geometry, is a particular species of relation subsisting between groups of numbers or quantities. Notwithstanding that the idea of proportion is found to exist in perfection in the mind of every one, yet a good definition of it is a matter of extreme difficulty. The two definitions which, on the whole, are found to be least objectionable are that of Euclid and the ordinary arithmetical definition. The latter states proportion to be the 'equality of ratios,' and throws us back on the definition of the term *Ratio*, which may most simply be considered as the relation of two numbers to each other, shown by a division of the one by the other. Thus, the ratio of 12 to 3, expressed by $\frac{12}{3}$, or 4, denotes that 12 contains 3 four times; and the ratio of 8 to 2 being also 4, we have from our definition a statement that the four numbers, 12, 3, 8, and 2, are in proportion, or, as it is commonly expressed, 12 bears to 3 the same ratio that 8 does to 2, or $12:3::8:2$. In the same way it is shown that $3:8::13\frac{1}{2}:36$; for $\frac{13\frac{1}{2}}{36} = \frac{27}{36} = \frac{3}{4}$. It will be gathered from the two arithmetical proportions here given, and from any others that can be formed, that '*the product of the first and last terms (the extremes) is equal to the product of the second and third terms (the means)*,' and upon this property of proportional numbers directly depends the arithmetical rule called 'proportion,' &c. The object of this rule is to find a fourth proportional to three given numbers—i.e. a number to which the third bears the same ratio that the first does to the second; and the number is at once found by multiplying together the second and third terms, and dividing the product by the first. Proportion is illustrated arithmetically by such problems as, 'If four yards cost six shillings, what will ten cost?' Here, 15 being the fourth proportional to 4, 6, and 10, fifteen shillings is the answer. The distinction of proportion into *direct* and *inverse* is not only quite unnecessary, but highly mischievous, as it tends to create the idea that it is possible for more than one kind of proportion to subsist. *Continued proportion* indicates a property of every three consecutive or equidistant terms in a 'Geometrical Progression' (q.v.)—for instance, in the series 2, 4, 8, 16, 32, ..., $2:4::4:8$, $4:8::8:16$, &c., or $2:8::8:32$, &c. In the above remarks all consideration of incommensurable quantities has been omitted. The definition given by Euclid is as follows: Four magnitudes are proportional when, any equimultiples whatever being taken of the first and third, and any whatever of the second and fourth, according as the multiple of the first is greater, equal to, or less than that of the second, the multiple of the third is also greater, equal to, or less than that of the fourth; i.e. A, B, C, D are proportionals when, if mA is greater than nB , mC is greater than nD ; if mA is equal to nB , mC is equal to nD ; if mA is less than nB , mC is less than nD ; m and n being any multiples whatsoever. The apparent cumbrousness and circum-

location in this definition arise from Euclid's endeavour to include incommensurable quantities; throwing them out of account, it is sufficient to say that four magnitudes are proportional if, like multiples being taken of the first and third, and like of the second and fourth, when the multiple of the first is equal to the multiple of the second, the multiple of the third is equal to the multiple of the fourth. For example, take the numbers 12, 3, 8, and 2; multiply 12 and 3 respectively by such numbers as will give equal products, say by 4 and 16, the product being then 48 in both cases; the products of the remaining numbers, 8 and 2, by these multipliers are equal to one another, being both 32; and therefore these four numbers are proportional.

Prorogation, the continuance of parliament from one session to another. Prorogation not only suspends all business, but quashes all proceedings pending at the time, except impeachments by the Commons and writs of error and appeals before the House of Lords. A bill must be renewed after a prorogation as if it had never been introduced. See PARLIAMENT.

Prosecution. See CRIMINAL LAW.

Prosecutor, he who takes the initiative in bringing a person to trial on a criminal charge. In England a prosecutor may begin by taking steps to have the accused brought before a magistrate; the magistrate may send the accused for trial, or, in certain cases, he may bind the accused over to prosecute. On a charge of perjury, conspiracy, libel, &c. the prosecutor must proceed before a magistrate, unless a judge or law officer of the crown has given him leave to prefer an indictment. In other cases, a prosecutor may, at his own discretion, begin by preferring an indictment which will come in due course before the Grand Jury (see JURY) at assizes or quarter sessions. The liberty of prosecution thus permitted is a valuable safeguard; the government cannot shield offenders by refusing to prosecute; it must, however, be remembered that the Attorney-general can always stop the trial of a prisoner by entering a *nolle prosequi*. In cases which concern the state it is the duty of the Attorney-general to prefer an indictment or information; in other cases the law was formerly content to leave the parties injured by a crime to commence proceedings at their own expense and risk. Of late years the government has shown a disposition to take upon itself the duty of prosecuting in cases where the public interest is concerned. In 1879 a public prosecutor was appointed. The public prosecutor is the creation of three 'Prosecution of Offences' statutes of 1879, 1884, and 1908. The regulations provide for the public prosecutor taking action in cases of importance or difficulty, or in which special circumstances or the refusal or failure of a person to proceed with a prosecution appears to render the action of the public prosecutor necessary to secure the due prosecution of the offender. Criminal courts have also been empowered to allow costs to prosecutors; and these costs are now paid by the Treasury. In Scotland the Procurator-fiscal (q.v.) makes inquiry in regard to crimes committed within his district; cases are prepared and conducted by the Lord Advocate or by one of his deputies; and prosecutions by private persons are practically unknown. In Northern Ireland prosecutions are usually undertaken by crown solicitors and by counsel acting under the control of the Attorney-general. There are public prosecutors in the United States. See CRIMINAL LAW.

Proselytes (Gr. *pros-elytos*, Heb. *gerim*), an English form of the Greek translation of the name given by the Jews to those heathens who

became converts to Judaism. There were two kinds of proselytes distinguished: 'Proselytes of the Gate,'—i.e. heathen strangers, who, in order to be allowed to reside in Palestine, had undertaken to submit to the 'Seven Commandments of the Sons of Noah,' that prohibit blasphemy, idolatry, murder, incest, theft, disobedience to the authorities, and the eating of flesh with the blood in it: commandments which probably had grown out of certain restrictions originally put upon the 'strangers' by the Mosaic Law (Exodus, xii. 19; xx. 10, &c.). These 'Proselytes of the Gate,' or 'Sojourners,' could not claim all the privileges of an Israelite, could not redeem their first-born, and, at a later period, were not allowed to live in Jerusalem. The second class of proselytes was formed by the *gere hatsadek* ('Pious Proselytes'), or *gere haberith* ('Proselytes of the Covenant'). These accepted all the dogmas and customs of Judaism to their fullest extent, and were called 'Complete Israelites.'

Proserpine (in Latin Proserpina, a form of the Greek Persephone), daughter of Zeus and Demeter (Ceres). The story of her abduction by Pluto, god of the under-world, of her mother's unceasing search for her, and of her living part of the year above and part underground, is detailed under DEMETER. There can be little doubt that the myth is an expression of the revival of nature in spring after the death of winter. Proserpine was usually worshipped under the name of *Korē* ('maiden') along with her mother Demeter. The chief seats of her worship were Sicily and Magna Græcia; but she had also temples at Corinth, Megara, Thebes, and Sparta. The pomegranate is her symbol, and the pigeon and cock are sacred to her. In works of art she bears a cornucopia, or is represented with ears of corn and a cock.

Prosody (Gr. *prosōdia*), that part of grammar which treats of the rules of rhythm in metrical composition. See METRE, RHYME, BLANK VERSE.

Prosper of Aquitaine, the zealous champion of Augustine and Augustinian doctrine against the Semi-Pelagians, was born in Aquitaine about the end of the 4th century, was a prominent theologian in southern Gaul in 428-434, and in the latter year settled in Rome. The date of his death is not known. Besides letters, *Responsiones*, and pamphlets on the doctrines of grace and free-will, he wrote a chronicle, coming down to 455 A.D., a long hexameter poem against the Pelagians, and a *Liber Sententiarum* compiled from Augustine's works. There is an edition of Prosper's works by Le Brun and Mangeant (Paris, 1711). He is sometimes called St Prosper, the 25th June being his day in the Catholic calendar.

Prossnitz (Czech *Prostějov*), a town of Moravia, 13 miles by rail SW. of Olmütz, has celebrated corn-markets and manufactories of clothing, linen and cotton stuffs, and distilleries and breweries. Pop. 31,000.

Prostate Gland, a firm body of muscular and glandular structure which surrounds the male urethra immediately below the neck of the bladder. In size and shape it is not unlike a chestnut. It occasionally is the seat of tumours, and of acute inflammation, sometimes leading to abscess; but far the most frequent disorder to which it is subject is a chronic enlargement occurring after middle life, which is the most common cause of retention of urine at that period. See URINE.

Prostitution dates unhappily from the earliest stages of human culture, and was a recognised institution in the times of the Jewish patriarchs (Gen. xxxviii. 15). The religious prostitution of women in honour of the goddess of fertility was usual in

ancient Babylonia, and was an integral portion of the worship of Ashtoreth in Phœnicia; and similar licentious orgies disgraced the worship of the Egyptian Isis at Rome. Venal prostitution was legalised at Athens, and the Romans had regular brothels. Christian kings issued at various times strenuous laws aiming at the suppression of the vice; some of the earliest examples of this legislation being found amongst the capitularies of Charlemagne. The Crusades gave a great impetus to unconcealed immorality; and in the middle ages it may be said that prostitution was recognised as a necessary and inevitable part of the social organism. In the Thirty Years' War swarms of women followed the armies of both sides. Modern states vary much in their attitude to this vice, either disregarding it, regulating it by specific ordinances, or trying to check it. In Japan (q.v.) prostitution may even be regarded as an honourable self-devotion.

In the language of English law, a prostitute is a woman who carries on a course of habitual and promiscuous immorality. Acts of immorality are not always criminal; but in England a brothel or disorderly house is a nuisance, and a person who keeps such a house may be indicted and punished by fine and imprisonment; if two ratepayers make a complaint to the police the local authorities undertake the prosecution, and the expenses are paid out of the rates. The landlord of a house is also liable to penalties if it is used with his knowledge as a brothel. Special penalties are imposed on brothel-keepers harbouring thieves, and on publicans who permit prostitutes to assemble on their premises. The Criminal Law Amendment Act, 1885, deals with the offence of procuring any woman or girl to have unlawful connection with any person, or to become an inmate of a brothel at home or abroad, and with the offence of using threats, or false representations, or drugs for the same unlawful purpose. A search-warrant may be granted under the act in case there is reason to suspect that a woman or girl is detained as an inmate of a brothel. No punishment is inflicted on the men who frequent a brothel; not because the guilt of sexual vice is less in a man than in a woman, but because immoral women form a definite class of the community and immoral men do not. In the law of contract prostitution is regarded as a worthless or as an illegal consideration, according to circumstances. Thus, a bond providing for *future* illicit cohabitation is void, as being founded on an illegal consideration; a promise to pay money for *past* cohabitation is founded on no consideration at all, and is binding if made under seal. A person who lets lodgings or supplies dresses, &c. to a woman for the purpose of enabling her to live as a prostitute cannot recover the rent of the premises or the price of the goods sold. In some continental countries the law extends a certain toleration to brothels, and deals with prostitutes for the purpose of preventing the spread of venereal disease. By the Contagious Diseases Acts, 1864-68, a system of inspection was established in certain military and naval stations in England and Ireland; magistrates were empowered to order the examination and detention in hospital of women suffering from contagious diseases. As to the medical and moral results of the acts, there is an extraordinary conflict of evidence. A resolution condemning the whole system of examination was adopted by the House of Commons in 1883, on the motion of Mr Stansfeld; the acts have been repealed; and in India the same system was in 1897 abolished by the governor-general in council.

See CONTAGIOUS DISEASES ACTS, WOMEN'S RIGHTS.

Protagoras (c. 485-c. 411), the earliest of the Greek sophists, was a native of Abdera, who at

Athens and in Sicily taught a system of practical wisdom, specially fitted to train men for the duties of citizen in a Greek state. The basis of his doctrine was the proposition that 'man is the measure of all things.' See SOPHISTS.

Proteacea, a family of evergreen dicotyledons, containing about 1000 known species of shrubs and small trees, chiefly natives of South Africa and of Australia, and forming a remarkable feature of the vegetation of these regions. Some of them, as species of *Protea* and *Banksia* (q.v.), are frequently cultivated in gardens and green-houses. The timber of some of the larger species is used for various purposes.

Protection. The causes which have made for changes of fiscal policy in this country have never been simple, self-consistent, or necessarily prolonged over more than a short period of years. Adam Smith's work was directed not against the landed interest at all, but against the manufacturer and merchants who relied on the commercial system, and his political opponents were, in consequence, the Whigs as Protectionists, and not the Tories as comparative Free Traders. Yet his policy came to full flower by the joint combination of Whigs and Conservatives, founded on an agitation conducted by the manufacturing class against the interests of the Tory landed gentry. It is as well, then, to review the progress of the fiscal controversy at intervals, and to observe that the modification of position, or even the joint action of sections of opinion which vary slightly among themselves, does not necessarily imply that the fall of an older system is not imminent. When Mr Chamberlain brought the tariff issue once more into the political arena, he found the country eager to discuss it, and singularly unprovided with the general arguments and statistical information required for the purpose. Cobdenism, indeed, was possessed of a large if somewhat antiquated armament, and was able to furnish up with some rapidity the rusty weapons of its political forebears. Its opponents, on the other hand, had the political disadvantage, if the philosophic merit, of having to consider the whole problem as one entirely new. The Fair Trade controversy of the early 'eighties had had but a trifling effect on modern Conservative thought, and, beyond that, the struggles of 1846 had from the 20th-century standpoint little more than historical interest. To the progressive forces in the tariff controversy the industrial world had been made anew since the split between Peel and Disraeli. The Free Traders alone seemed satisfied with the reiteration of the old arguments. Under the circumstances, it is not surprising that it took no inconsiderable space of time to imprint on the minds of the new Tariff Reformers the fundamental doctrines which underlie the system of scientific Protection as practised in Europe and America to-day, and as carried out in England both in the comparatively recent and in the more remote past. In addition, such economic training as is given in our universities has for more than a generation been entirely directed to proving that the teachings of the orthodox school of English and French economists are not only valid but almost inspired. As a consequence, the ordinary public man in England remained practically ignorant of the works of List, of the views of the great historical school which had prevailed in Germany for half a century, of the new historico-critical method of which Vienna was the centre, and of the success with which English and Italian professors had applied mathematical formulæ to economic problems. The effect of these competing influences was to give to the earliest contentions of the Tariff Reform movement an element of crudity which has now been removed by a prolonged course

of controversy and study. This particular immaturity of thought would appear now to remain the possession of Free Traders, who were older in the school, and therefore less ready to apply modern experience to the existing facts of national production and international exchange.

But before we proceed to any historical analysis it may be as well to give an outline of the two competing theories which it is proposed to test by the experience of the past. The advantage of the Free Trade system, whether from the point of view of explaining it or from the point of view of attacking it, is its extreme simplicity. As with all views which claim to be permanent and universal truths, adhesion to it does not compel the believer to possess any special knowledge either of current facts or of past events, for the doctrine once based on a system of *a priori* reasoning obviously stands beyond the outside criticism of fact. From the Free Trader's standpoint it must be destroyed by an alternative theory. On the other hand, like all other universal doctrines, Free Trade at once rouses antagonists who observe some real or apparent contradiction between the general theory and the practical results which it produces. When the objectors have formulated a hostile theory of their own upon their observation of fact, the battle between the two schools is fairly joined. Indeed, on the whole, the distinction is well maintained. The historical school have arrived at their conclusions by a study of the economic development of nations, and have based their Protectionist theories on inductions from the facts they have observed. The deductive school of economists, on the other hand, have, with certain notable exceptions, deduced their Free Trade theory from certain *a priori* and far more general conceptions of the nature of man and the development of human society.

Nothing, indeed, could be wider than the general series of propositions which underlie the Free Trade concept. In the first place, universal Free Trade would, by the universal flow and division of industry, lead to the fullest possible development of the total resources of the world. In the second place, such a process would be to the best advantage under any and every circumstance of the individual nations which go to make up the sum total of commerce and industry. In the third place, just as there is conceived to be no conflict between the maximum development of the world's resources and the interest of any particular nation claiming a share, so it is contended that the profit of the individual is identical with and inseparable from the interest of the nation to which he belongs. A certain number of Free Trade writers and orators, and among them Lord Asquith, have, indeed, contented themselves of late years with the assertion that the Free Trade system is simply of the best advantage to the inhabitants of these islands; but as the arguments on which this assertion is based are drawn entirely from the original thesis of their creed, it will be better to postpone a discussion of them to a later period.

The general proposition here put forward is in itself so tremendous as to be almost staggering to the philosophic mind. In no other sphere to which the art of government has been applied has it ever been contended that if the interests of the whole civilised world were left without any governmental control, either of a national or of an international character, the result would be not only the best interests of the whole, but the specialised best interest of any and every state concerned, and, further than that, the absolute best interest of every individual within each separate state. In any other sphere, such as that of war or of police or of social legislation, it would be regarded as

nothing but a strange and perverted expression of the tenets of international anarchy, and it was in a sense so conceived by the small band of philosophic Liberals who gave so much theoretic backing to the practical statesmen and practical manufacturers who carried Free Trade in the 'forties. Brought to the test of experience, the whole doctrine and each of its co-ordinated parts can be proved utterly devoid of foundation; but before approaching the international concept, it will be simpler to go first to the root theory from which that concept springs. Adam Smith, though too practical a man always to carry his views to their logical conclusion, declared when speaking of the employment of capital that the study by every individual of his own advantage 'naturally or rather necessarily leads him to prefer that employment which is most advantageous to society.' The reasons which led Adam Smith to this somewhat startling conclusion are stated by himself with admirable simplicity: 'No regulation of commerce can increase the quantity of industry in any society beyond what its capital will maintain. It can only divert a part of it into a direction in which it might not otherwise have gone.' The individual capitalist thus 'labours to render the annual revenue of the society as great as he can.' On this primal contention is built the whole gigantic edifice of the Cobdenite creed. It follows, according to Adam Smith, that the only effect of state regulation of industry must be to transfer capital and labour from an industry which by nature pays better, and is therefore preferred by the capitalist, to an industry which, if left to its own devices, will not pay either the individual capitalist or, in consequence, the nation as a whole as well as the alternative one. The capital or 'stock' to be employed to the individual and national advantage is of course regarded either as a fixed quantity or something which can only be increased by the savings made out of the industry. From this view the modern Protectionist dissents on the following grounds: (1) that it implies a static conception of national trade—that is to say, the belief that because at any given moment production abroad may in a given industry be cheaper than production at home, it follows that that fact represents an unalterable and natural state of affairs; (2) that it presupposes the absolute and equal fluidity of capital and labour between one industry and another; (3) that it implies that the national capital is of a precisely similar character to the capital of the individual. Against all these contentions, and against many other trade theories which spring inevitably from them, the Protectionist can bring unanswerable objections in so far as the dogmas concerned are represented as being eternal and universal in their application. The first theory would go far to stereotype industry in any country which applied it; for the important point, as List has said, is not the interchange of present values, but the potential productive powers of the country. Professor Ashley has put the point with such force and moderation that I may perhaps be allowed to quote from his book on *The Tariff Problem*:

'To take the favourite example of Mill, Poland had once an "advantage" over England in the production of wheat. Will it be maintained by any who know the social conditions of Poland that it would have been well for Poland that it should continue to be a purely agricultural country?

'The point is one of more than antiquarian interest. Adam Smith's whole conception is a static one—of permanent advantages enjoyed by one country over another. But suppose goods are for a time offered to us at a lower price than that at which they can as a rule be produced in the country of origin. Suppose the cheapness does not corre-

spond to a real advantage enjoyed by the exporting country, but to a temporary need. Suppose that our buying them, and refusing to protect the competing industry, means *not* that we permanently enjoy the lower prices, but that when our market is captured and the competing English industry is killed (for a time or for ever) we have to pay (for a time or for ever) higher prices than we otherwise should. Does it follow in this case that "what is prudence in the conduct of a private family"—to buy in the cheapest market—"can scarce be folly in that of a great kingdom?"

It is, in fact, to this general conception of the dynamic energy applied under government protection to the development of potential internal resources that Germany and the United States owe their present position. Without the application of this tariff theory the long lead that this country had obtained in trade and industry must have retarded, and in many cases destroyed, their nascent industries and their growing populations. It is hardly, perhaps, necessary at this point of the prolonged tariff controversy to labour the contention that capital cannot and still less can labour be transferred without loss from one source of employment to another. But the mistake is not without its significance in the history of Free Trade philosophy. The whole Free Trade theory is based upon the doctrine of the mobility of capital, and this doctrine springs in turn, as has been stated, from the dogma that private and national capital are identical. The real national capital is something very different, something of which the individual capital is merely the by-product. National capital consists of the actual or potential products of the soil, and of the actual or potential energy, acquired skill, morality, and intelligence of its inhabitants. It surely does not require much insight to see that industry might well be conducted in such a manner as to increase the individual capital while it positively decreased the capital of the nation. A capitalist, for instance, who under the stress of altered industrial conditions gradually withdrew his business from the manufacture of a highly finished article through every process of that manufacture, and turned it into a business for the supply of partially finished articles to be made up abroad, might quite possibly actually increase his turnover and so increase his private capital. He would do so, however, at the cost of throwing out of employment the long-acquired skill of hundreds of men who would have little prospect of any further employment save that of casual labour. The national capital would have been depreciated to the temporary advantage of the individual concerned. In other words, the Protectionist is peculiarly insistent on the character of the trade which the nation does, because it is on that character rather than on any other aspect of it that the safety and increase of real national capital in effect depends.

A precisely similar line of argument applies to the universal conception of Free Trade. The tendency of any such movement, were it ever realised, would not necessarily result in the greatest possible production of the whole world's wealth. Least of all would every individual nation profit under such a scheme. The natural result, as Cobden and his friends well knew when they worked for universal Free Trade in the 'forties, would be to standardise existing industrial conditions in the interests of the parties who possessed at the given time the overwhelming lead in any particular industry. As a consequence, the national capital of many countries—that is to say, the local products and the local energies of the weaker countries—would be indefinitely denied the opportunity to fructify, and these potential sources of power would be com-

pelled on the ground of cheapness of consumption to remain hewers of wood and drawers of water for their more highly developed neighbours. Nationality and national protection have, so far from holding back the development of the world, been of the greatest assistance in increasing the total international output.

The general theory of Protection outlined has been, as a matter of fact, followed, except at more or less brief intervals, by the government of England ever since the time of Edward III. Yet so short is the memory of people to-day that until recent years the great majority of the inhabitants of this country unquestionably regarded the policy of Protection as an almost revolutionary proposal, instead of a return to the fundamental conceptions of English policy. The prohibition of the export of wool in the reign of Edward III. in order to develop the great woollen industries of this country is precisely in accord with the general view of modern Protection, and would find an exact parallel if the United States placed a tax on the export of raw cotton in order to develop further their own cotton industries. Whether the application of such a policy is or is not wise under particular conditions has long ceased to be of practical interest to this country, since, with the exception of coal, the United Kingdom has ceased to be an exporter of raw material. It is sufficient to observe that the legislature of Edward III. had grasped the fact that it was the character and paying quality of trade as represented by skill and wages that was of real importance, and that, compared to this, the bulk of export trade remained a matter, as it remains to-day, of comparatively minor importance. Internal dissensions, however, made a consecutive fiscal policy quite impossible until the end of the Wars of the Roses brought a strong central executive once more into being. Indeed, it may be observed that the unity of the kingdom and the internal peace which strong central government brought with it has throughout English history always been accompanied by a protective fiscal system. On the other hand, the intervals of Free Trade have nearly always synchronised with periods of internal disturbance which left the government too preoccupied for any measures of external trade defence. The only exception—if it be an exception—to this general thesis is the period of Henry VII. and Henry VIII. But Henry VII. was insecurely seated on the throne, and Henry VIII. mainly concerned with the religious difficulties he had himself partly evoked. The distress resulting from the latter monarch's internal policy was such as to induce the government of Elizabeth to introduce a drastic system of Protection. 'The importation of finished goods from abroad was prohibited early in her reign. The list of articles to be excluded is not as lengthy as that in the statutes of Edward IV. or Richard III.; . . . but the principle of action is precisely similar to that of preceding monarchs, and the preamble urges the old pleas in the encouragement given to artisans abroad and the consequent enrichment of other realms while our own workmen were unemployed. The exportation of unmanufactured products which might be worked up at home was also restricted' (Cunningham, *Growth of English Industry*, vol. ii. p. 201).

Here again we see the vital Protectionist principle of discouraging both the import of highly finished goods which might be made at home, and the export of raw materials which might also have been made up in England. This policy was continued, with a few exceptions, from the time of Elizabeth to the time of Adam Smith, and undoubtedly laid the foundations of the national greatness and prosperity. Cromwell, indeed, was

one of its chief executors, since the Protectorate represented a moment when the central government was strong and the national spirit high. The justification of the policy, with all its occasional puerilities, must be found in the establishment of the great English industries on a permanent and successful basis long before the inventions of the later 18th century and the Napoleonic wars gave to a country secure from invasion and rich in coal and iron an almost unique economic opportunity. The England of the Middle Ages was of all European countries, except Prussia or Russia, the farthest removed from the centres of art, civilisation, and industry which still clustered round the Mediterranean or were to be found scattered up the great waterways of France and Germany. English civilisation could in consequence no more compete without a Protective system against the finished products of the great European municipalities than the inhabitants of the Sudan to-day could, if the raw materials were available, start unaided a cotton manufactory able to compete with Lancashire. The wisdom of our governors, however, laid the foundations of our future prosperity firstly in the Middle Ages, and secondly in the time of Elizabeth.

A similar policy was pursued in dealing with our Dutch and Flemish rivals. In politics and religion the England of the Reformation was in close agreement with its nearest European neighbours, but in trade and commerce the two sides of the Channel were in the fiercest competition. The Navigation Laws of 1651 were devoted entirely and not without success to the suppression of our chief competitors, while our naval policy was largely dictated by similar considerations. Holland and the Flemish provinces were in their time, and for the comparisons of their time, as great a commercial power as this country was in the middle of the 19th century. None the less, this country by a combined policy of war and of tariffs crushed them out of existence as a serious naval or commercial rival. Such a result could never have been obtained by any adherence to the ideas of the orthodox Free Trade economists. On the contrary, Cobdenism could only have led us to perpetuate in the interests of French, Italian, German, or Dutch manufacturers a temporary inferiority of production.

All these historical facts are so far beyond dispute that the change of fiscal policy in the 19th century would on the face of it appear amazing. But the explanation is, after all, extremely simple. So long as England was the country with potentialities in its soil and an undeveloped people, a policy of protecting native industries, in order to give the dynamic of the people and of the soil full play, not only commended itself to all statesmen of common-sense, but was inevitable unless both population and industry were to stagnate. The conjoined facts, however, of the Napoleonic wars and of inventions which placed a premium on the presence of coal and iron within the same areas utterly changed the whole surface of affairs; while the Navigation Laws, the commercial system of the 18th century, and the victories of our fleets on the seas had bestowed on us a vast increase of capital as the result of a great extension of our markets. The historic position thus becomes reversed, and it is the crippled industries of Europe or the nascent industries of the New World which become clamorous for protection against the dominant influence of an England which is able to undersell them within their own markets. The first and perhaps the most significant symptom of this change of front is to be found in the policy of Alexander Hamilton when faced with the British attempts to undersell the American market. 'In the beginning of the year 1792,' says the address

of the American Society for the Encouragement of Domestic Manufactures published in 1817, 'when the report of General Hamilton, then Secretary of the Treasury, made by order of the House of Representatives was published in England, it created such alarm that meetings were held in the manufacturing towns, and Manchester alone subscribed £50,000 towards a fund to be vested in English goods and shipped to this country for the purpose of glutting our market and blasting the hopes of our manufacturers in the bud.' This raiding of the American market by what would be known to-day as the process of dumping was continued again after the close of the war of 1812-15. Lord Brougham, referring in 1816 to the flooding of American markets with the produce of British factories upon the opening of American ports at the close of the war, said: 'It is well worth while to incur loss upon the first exportation in order by the glut to stifle in the cradle those rising manufactures in the United States which the war had forced into existence contrary to the natural course of things. Eighteen millions worth of goods were exported to North America in one year, and for a considerable part of this no returns have been received' (Curtis, *Industrial Development of Nations*, vol. i. p. 135).

This early development of the Cobdenite policy throws a considerable light on later developments. From henceforward Great Britain had outlived for the moment the needs of industrial protection for the simple reason that it was stronger in the field than any of its possible competitors. It was therefore, as Cobden perceived with insight and with truth, concerned to preserve a more or less static condition of the trade of the world. The import duties on foreign manufactures were useless, since they produced no effect except a small revenue for the exchequer; while the remains of the somewhat antiquated code of the eighteenth century hindered here and there the importation of raw materials. On the other hand, as the realisation of these facts began to force itself on the impoverished industrial countries of Europe, a tendency towards Protection at once made itself manifest. It is significant that the first petitions for Free Trade, whether insular or international, come from London merchants and manufacturers, when protective duties are first placed on British imported goods after the close of the great war. Indeed, the culminating efforts of the 'thirties and 'forties to modify our tariff system were inspired to no small extent by the vain hope that a Free Trade England would result in a Free Trade Europe and America. That hope, although it failed, and failed disastrously, in the long-run, yet obtained for a certain period some kind of fruition in fact, and it remained for the foreign tariffs, of the 'seventies, 'eighties, and the 'nineties to destroy for ever the pleasing illusion that the world would embrace Free Trade in order to rivet upon it the shackles of a British industrial domination.

The history of this development may be read in the relative figures of American, German, and British trade, in so far as those figures are obtainable. In all cases one may observe a great rise in the relative output and production of the protected countries, and in consequence a relative falling back of British pre-eminence in industry. The old justification of the Free Trade position has thus once more disappeared, and any responsible statesman is bound to consider whether a change in the existing circumstances of trade is not bound to lead to a change in our fiscal policy. In other words, we recur once more to the pre-Adam-Smith period, and must examine with the utmost care all those curious shibboleths on which a Free Trade England was based.

The symptoms which mark the trade conditions of to-day first began to appear in the early 'seventies. Up to that period the vast increase in the volume of foreign trade which took place from 1850 till 1870 seemed to the lay mind the complete justification of a Free Trade policy, although that policy was from the industrial point of view almost entirely unconnected with the dramatic events of 1846. The abolition of import duties had been a gradual process, beginning in the early 'twenties and not completed until the end of the 'sixties. None the less, the nation had confused the Anti-Corn-Law agitation with the general creed of Cobdenism, and regarded the increase of its production as in some sense connected with the repeal of the Corn Laws. The result was the entire collapse not only of any possible Protectionist reaction, but even of the body of thought in the Conservative party which held the Protectionist point of view. As a consequence, the rapidly changing conditions of international exchange and production found few people in this country to mark them, or to point out their tendencies to their less observant fellow-citizens. In the meantime both foreign tariffs began to grow in height and foreign industries in size, with the result that the British increase in industry became less relatively marked than had been the case in the 'forties, 'fifties, and 'sixties. In 1873 Bismarck launched the first high protective German tariff, and the United States were not slow to follow in a series of protective measures which culminated in the McKinley tariff. In face of this development abroad, all the old philosophic weaknesses in the Free Trade position became by degrees more and more apparent. The joints in the armour, invisible as long as this country maintained a clear industrial lead, became gaping rents as soon as external competition became again for the first time in a hundred years a formidable factor in our domestic economy.

We are thus face to face to-day in a changed world with all the old trade dogmas based on the original static view of industry held by Adam Smith and his later disciples. Trade and industry, we are told once more, follow their own natural channels to the best advantage of the whole country. Imports pay for exports or exports for imports; and whatever the character of the exchange, the fact that such an exchange *exists* proves that it is the most profitable form of commerce both to the individuals concerned and to the nation at large. Again the Protectionist reply is simply that because the trade pays the individuals concerned in it, this does not prove for a moment that if the change in it be of a certain character it is not over a period of years impairing the productive efficiency of the people, which is the real capital of the country. The export of machinery for cotton manufacture to be erected in new mills in Japan was unquestionably profitable to the exporters concerned. The next step was an enormous demand for semi-manufactured cotton goods to be exported and finished by the new Japanese cotton industry, an industry which employs labour under conditions fortunately impossible in this country. Again the immediate process was unquestionably extremely profitable. Yet if the net result in the course of years were to be, as it is likely to be, the loss to our Japanese competitors of the cotton market in the Far East, the net result would hardly be a satisfactory one for the total production of Lancashire or the productive efficiency of the working men of that country. Our cotton exports to the East would, in a word, be changing their character, and would tend more and more to be partially finished instead of fully manufactured products. Once more, the

prosperity of the country is determined by nothing except its total production, and if an extension of foreign trade leads in the long-run to a diminution or check on that production, it is a national evil and not a national good.

Further, the development of modern industry has produced certain new features of which Adam Smith in the days of home employment could never have dreamed. Cheapness of production has become largely dependent on the size and sustained volume of the output. In other words, a manufacturer in one country may have precisely the same 'natural' advantage as his rival in another; his wages bill and his freight charges may be the same, and the cost of his raw material may be identical. But if he possesses a larger market, and particularly in addition a securer market, than his foreign competitor, he would be able to undersell him in the open market. This admitted fact has a peculiar significance at the present day, because the world consists partly of protected countries and partly of Free Trade or semi-Free-Trade countries. The German manufacturer, for instance, possesses a very adequate degree of protection in his own home market. He has, in addition, a free market in Great Britain, and beyond that he has an equal *entrée* into what are commonly known as the neutral markets. His British rival, on the other hand, has no monopoly of his home sales—which, indeed, he must contest with any rival; while in the protected zones of the world he has to surmount the tariff before he can compete at all. The consequence is a tendency towards restricted and fluctuating production as far as the Free Trade manufacturer is concerned in the two markets first mentioned. On the other hand, the German or American producer has a considerable advantage at home, and at least one free market abroad, and the tendency in his case is towards greater certainty and a greater extension of industry. The result of this difference between the situation in the protected and in the Free Trade market acts with a culminating effect on the struggle for the neutral markets of the world, where as a rule both the protected and the unprotected competitors are on equal terms. The cheaper production given by the greater control on the first two markets tends to enable the Protectionist country to outsell its Free Trade rival in the markets more or less open to both.

This particular disadvantage has been intensified by another modern industrial development. It is of the utmost importance for the profitable conduct of a modern industrial enterprise to keep production at a fairly level rate. If progress is to be made, that progress must not be too rapid, and, above all, a serious reaction, which throws all calculations based both on capital, plant, and skilled labour utterly out of gear, must be avoided. The net consequences of this fact in the tariff world as it exists to-day is the policy of dumping on a Free Trade country. If a depression sets in, it will pay a manufacturer better to keep his plant running full time, and to refrain from dismissing his workmen by relying for his profits on his home market in which he is reasonably secure, and by throwing the surplus of his stock either at or below cost price on any market which is open to him. Here again two conflicting theories of trade come to close grips. The Free Trader would maintain that the home consumer in a Protectionist country has to pay rather more for his goods, while the consumer in a Free Trade country may buy his materials cheaper. But the answer of the Protectionist is again a very simple one, and is based once more on the conception of the dynamic efficiency of the people which underlies his whole logical position. The real result of a policy of dumping is to keep

protectionist industry and all the people employed in it fully engaged, and to enable that industry to take immediate advantage of the first turn of the tide and the first demand for an extended sale. To put it in another way, the protected industry and the protected country feel the depression less, and recover from it far more rapidly. On the Free Trade side nothing is gained except a slight reduction in price in some specified article; while the industry, taking, for instance, the tin-plate industry, is thrown into a state of complete disorganisation either from the point of view of labour or the point of view of capital. Part of its works have to be closed down, and the skill accumulated is dispersed by throwing the unwanted workmen on to the casual labour market. A British tariff would make it far more difficult for any rival country to resort to this particular method of attack. It has only been possible to state in general terms, for indeed space forbids a detailed examination of statistics or of a vast number of particular instances, the main ground of contention between the two schools of thought. The problem of the tariff will, as time goes on, grow more and not less insistent as the relative strength of our foreign competitors grows greater and greater, and as the facts which form the basis of the Protectionist case stand out in an ever-clearer light. As this development progresses there must be an ever-increasing probability that the United Kingdom will return to the principles which, in Disraeli's words of 1846, 'have made and kept England great.'

[For the other side of this problem, see the article **FREE TRADE**.]

See *A Short Handbook for Speakers* (Tariff Reform League); *Imperial Union and Tariff Reform* (Mr Chamberlain's speeches); *India and the Empire*, by M. de P. Webb; *The Fiscal Question* (Reprint of five speeches by A. Bonar Law); *The Rise and Decline of the Free Trade Movement*, by Dr W. Cunningham; *The Tariff Problem*, by Sir William J. Ashley; *A Project of Empire*, by J. Shield Nicholson; *Constructive Imperialism* (Speeches delivered by Lord Milner in autumn 1907); *England's Foundations: Agriculture and the State*, by J. Saxon Mills; *The Imperial Conference* (2 vols.), by Richard Jebb; *British Dominions*, by Sir W. J. Ashley; *Mr Chamberlain: His Life and Public Career*, by S. H. Jeyes; *Unionist Policy*, by Lord Birkenhead; *The Nation and the Empire*, by Viscount Milner; *The Britannia Question*, by Richard Jebb; *The National System of Political Economy*, by Friedrich List; *Fiscal Reform Speeches*, by Lord Balfour.

Protective Coloration. See **MIMICRY**, **PIGMENTS OF ANIMALS**.

Protector, a title sometimes conferred on the regent during the sovereign's minority—as on Humphrey, Duke of Gloucester, in 1422; on Richard, Duke of Gloucester, in 1483; and on the Duke of Somerset in 1547. In 1653 Oliver Cromwell took the title of Lord Protector of the Commonwealth of England, Scotland, and Ireland. His son Richard was never formally installed in the Protectorate.

Protectorate. See **COLONY**.

Proteins. Proteids, proteid substances, and albuminoids are names formerly applied almost indiscriminately to a large and important group of substances—some of animal origin and some of plant origin—which are now known collectively as proteins. The proteins are all complex nitrogenous compounds, the proportion of nitrogen usually varying from about 15 to 17 per cent., although in some instances it amounts to as much as about 30 per cent. They also contain, as a rule, over 50 per cent. of carbon, with about 22·5 per cent. of oxygen, about 7 per cent. of hydrogen, and a much smaller proportion of sulphur (from less than 0·5 to about 2 per cent.). They make up the major part

of the nitrogenous constituents both of plants and of animals. Individual proteins differ very considerably from one another in their chemical and physical properties, as may be appreciated readily on recalling the greatly differing properties of, for example, ordinary gelatin, the albumen of the white of an egg, and the materials composing horn and hair. The first two of these are dissolved by cold water, while the substances last named are insoluble in water and in solvents generally. Many of the proteins which dissolve in water undergo a change called coagulation when their solutions are heated to a moderate temperature. This occurs to the white of an egg when boiled, and the coagulum obtained is insoluble in water. Coagulation also takes place in many instances upon the addition of alcohol, or of various mineral acids or metallic salts to the aqueous solutions of proteins. Dissolved proteins are good examples of colloid substances, and some of their most important properties depend upon their character as colloids. A certain proportion of suitable protein matter is indispensable as a constituent of the food of animals. In the processes of digestion the proteins are resolved, with the aid of enzymes, and by interaction of the elements of water (hydrolysis), into mixtures of easily soluble substances of much less complexity.

Proteles. See **AARD-WOLF**.

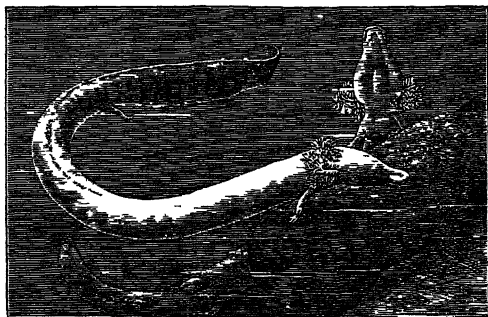
Proterosaurus (Gr. *proteros*, 'first,' *sauros*, 'reptile'), a genus of fossil reptiles occurring in the Permian system, which is the lowest horizon at which reptilian remains have as yet been detected. It is a primitive generalised type, with a single surviving relative in the 'New Zealand Lizard,' *Sphenodon* (q.v.).

Protestantenverein, an association of Protestant ministers, professors, and others belonging to the 'liberal' or advanced school of theology in Germany, formed in 1863 to promote what its members insisted was the spirit of true Protestantism in opposition to what they regarded as reactionary and obscurantist. By the orthodox and conservatives the association was denounced as rationalist or infidel.

Protestantism, a term derived from the part taken by the adherents of Luther in *protesting* against the decree passed by the Catholic states at the second diet of Spire or Speier in 1529. This decree had forbidden any further innovations in religion, and enjoined those states that had adopted the Reformation so far to retrace their steps as to reintroduce the Mass and order their ministers to avoid disputed questions, and to use and explain the Scriptures only as they had hitherto been used and explained in the church. The name is repudiated by a considerable section of the Anglican Church. See **CHURCH HISTORY**, **LUTHER**, **REFORMATION**.

Proteus, in the Homeric or oldest Greek mythology, appears as a prophetic 'old man of the sea' (*hailios gerōn*), who tends the seal-flocks of Poseidōn (Neptune), and has the gift of endless transformation. His favourite residence, according to Homer, is the island of Pharos, off the mouth of the Nile; but according to Virgil, the island of Carpathos (now *Scarpanto*), between Crete and Rhodes. Here he rises at mid-day from the floods, and sleeps in the shadow of the rocky shores, surrounded by the monsters of the deep. This was the time when those who wished to make him prophesy must catch him. But it was no easy task. Proteus, unlike most vaticinal personages, was very unwilling to prophesy, and tried to escape by adopting all manner of shapes and disguises. When he found his endeavours hopeless he resumed his proper form, and then spoke out unerringly about the future.

Proteus, a genus of tailed amphibians with persistent gills, represented by a single species (*P. anguinus*) in the caves of Carniola and Dalmatia. They are lank animals, towards a foot in length; and with their peculiar habitat may be associated their whiteness (except the three pairs of bright red gills), and their blindness, for the eyes are hidden below the opaque skin. It has been shown, however, that sensitiveness to



Proteus anguinus.

diffuse light persists. In an illumined laboratory the olm or *Proteus* soon develops pigment and becomes dark in colour. Larvæ reared in red light show a very striking development of the eye, which reaches the skin and becomes capable of some vision. A related form, *Typhlomolge rathbruni*, also blind, has been obtained from an artesian well in Texas—a near relative at a great distance! A nearly related genus, *Necturus*, lives in North American rivers and lakes.—The name *Proteus animalcule* was formerly used as a synonym for *Amœba* (q.v.).

Protevangelium, a very old apocryphal gospel attributed to James, the brother of the Lord (see APOCRYPHA); also used of a primitive gospel (Ger. *Ur-evangelium*) from which it has been held several of our gospels were derived. See GOSPEL.

Protococcus (Gr., 'first-grain'), a genus of very simple unicellular green plants, one species of which (*P. viridis*) is everywhere abundant as a green film on tree-trunks and damp walls, or in stagnant rain-water. The colour is sometimes reddish, and the organism may be found passively encysted during drought, and at other times actively motile with a couple of cilia. See ALGÆ.

Protocol (Gr. *prôtos*, 'first'; and *kolla*, 'glue'), (1) the rough draft of an instrument or transaction, and more particularly the original copy of a government despatch, treaty, or other document; (2) a record or register.

Proto-genes, a painter of ancient Greece, was born at Caunus in Caria, and practised his art at Rhodes, where he worked steadily on through the din of the siege of 305–304 B.C. A contemporary and friend of Apelles (q.v.), he was a slow and careful painter, sparing no pains to secure a natural and finished piece of workmanship. His best-known pictures were Lalysus (a Rhodian celebrity), a Satyr, 'Paralos and Ammonias' (sacred ships of the Athenians, executed for the Propylæa at Athens), 'The Thesmothetæ' (for the Athenian senate-house), 'Alexander and Pan,' 'Cydippe and Tleptolemus,' and some portraits.

Protogine (Gr., 'first-born'), a granitic rock, composed of the same ingredients as true granite, but the mica is more or less altered so as to resemble talc, for which it was formerly mistaken. It received its name because it was supposed to

have been the *first-formed* granite. It abounds in the Alps, and is sometimes called Alpine granite. The term Protogine, however, is now rarely used, since modern research has shown that the rocks so named are simply altered, often gneissic, granites.

Protonopsis. See MENOPOME.

Proto-notary, a member of the College of Proto-notaries Apostolic in the papal curia, whose duties are to register pontifical acts, make and keep the records of beatifications, &c.

Protophytes (Gr. *Prôtophyta*, 'first plants'), a term often applied to the simplest plants, such as Protococcus in the algaoid, and Bacteria in the fungoid series. See ALGÆ, BACTERIA.

Protoplasm (*prôtos*, 'first,' *plasma*, 'formed substance') is a technical name for living matter. The term was first applied (1846) by the botanist Hugo von Mohl to the 'slimy, granular, semi-fluid' contents of vegetable cells, but before that Rösel von Rosenhof (1755) had studied the amœba, which is a unit-mass of relatively pure living matter. Robert Brown and other botanists had watched the rotation of the living substance inside the cells of some plants, and Dujardin (1835) had described the 'sarcode' of Foraminifera as 'a glutinous, transparent, living jelly.' After Dujardin and Von Mohl had thus directed attention to 'sarcode' and 'protoplasm,' observations on both gradually accumulated, the idea began to be mooted that the two substances were essentially the same, and in 1861 Max Schultze defined the cell as a nucleated mass of living matter or protoplasm. Huxley's description of protoplasm as 'the physical basis of life' is very convenient, if it be recognised that, while there may be something common to all, the protoplasm of one kind of organism is specifically different from that of another. If the whole cell-substance be called cytoplasm, and the obviously unessential non-living inclusions, such as pigment granules or starch grains, be called metaplasm, then the theoretical subtraction of metaplasm from cytoplasm would leave protoplasm. The probability is that there is no one substance that can be called protoplasm, but that it is a subtle mixture of proteins and other complex substances. Protoplasm may be conveniently studied in the unicellular Protozoa, such as Amœbæ and Foraminifera; in a spreading mass like 'Flowers of Tan' and other 'slime Fungi'; in the colourless cells of the blood; in the ova of animals where there is not much yolk, as in sea-urchins and pond-snails; in young vegetable shoots and animal embryos; or in the cells of a relatively simple plant, such as the Stonewort (*Chara*) or the filamentous *Spirogyra* from the ditch.

When a tissue is treated with some 'fixative' such as osmic acid or corrosive sublimate, cut into very thin sections, stained with differential dyes, and mounted in a suitable preserving medium such as Canada balsam, there is often some heterogeneity of structure to be seen in the cytoplasm of the cells studied under high magnification. A net-like structure is often visible, and besides this reticular appearance there may be hints of fibrils, alveoli, and so forth. Much time has been devoted to describing and depicting this minute structure of cytoplasm, but it is now generally recognised that it is in the main the result of the artificial fixation. Different fixatives give different results in the same kind of cell, and Hardy has shown that the reticular appearance can be induced in perfectly structureless gelatine or albumin. As a matter of fact, there is no visible structure in living protoplasm, though there is reason to suppose that very fine film-like partitions, such as those visible around vacuoles, divide the substance into areas, within which different chemical processes may go on.

Ordinary living protoplasm is in a colloid state; innumerable minute particles or immiscible droplets are suspended in a fluid medium, and it is not usual for protoplasm to contain less than 80 per cent. of water. Small granules in cells are sometimes seen to be in constant 'Brownian movement,' which is due to their being buffeted by moving molecules of the fluid. This is best seen when the difficult method of 'dark ground illumination' is employed, in which particles too small to be actually observed even with the strongest lenses betray their presence by intercepting rays of light and appearing as bright spots in a dark field. These bright spots are seen to move freely through the protoplasm. The use of ultra-violet light, instead of visible light, for microscopic photographs has also been helpful; for in this region of the spectrum of radiations some materials quite transparent to ordinary light appear opaque, and the structure of the cell is thus more easily discerned. But ultra-violet light has a disturbing action on fluid protoplasm. The method of micro-dissection, in which cells while under the microscope are dissected or injected with various fluids by means of extraordinarily fine needles operated by delicate screws, has given valuable information in the hands of such workers as Kite and Chambers.

These various methods of investigation all point to the conclusion that protoplasm is a fluid, of very varying viscosity, and sometimes of jelly-like solidity in part. There may even be an alternation between more solid (*gel*) and more liquid (*sol*) conditions in one and the same area of the cell, notably in amoeboid movement. Various agents cause the protoplasm to become more solid, and an irreversible coagulation of the fluid occurs when the cell dies or is killed by a fixing agent. The living material of the cell includes proteins, carbohydrates, fats, ferments, inorganic salts, and water; and much depends on the fact that the innumerable particles and droplets in a liquid system must present a large surface for chemical and physical changes. The organic material in the cell appears to be partly in colloidal and partly in true solution; the rapidity with which changes take place points to the action of enzymes or ferments; the complexity of processes occurring on the heels of one another within very minute dimensions points to the presence of intra-cytoplasmic, ultra-microscopic films dividing the cell into areas, just as the cell-membranes do for a tissue or organ or body as a whole.

We may regard protoplasm as a complex substance or mixture of substances, which shares directly in the constant chemical and physical changes or metabolism of the organism. It is the climax of an ascending series of constructive or synthetic steps, by which food-material becomes more and more complex and unstable; it is subject as the organism lives to constant disruptive or analytic changes, which result in the liberation of energy and in the formation of simpler and simpler waste products. Thus protoplasm is regarded as the changeful central substance in metabolism; it is continually being unmade, breaking up, and wasting as it lives; it is continually being made by the constructive processes of repair. We call the repairing or constructive process *anabolism*, and its chemically discernible steps *anastates*; we call the discharging or disruptive process *katabolism*, and its chemically discernible steps *katastates*.

But, on the other hand, we may regard protoplasm as a kind of ferment which influences the material round about it without itself being so directly affected as the previous conception implies. It is the relatively stable cause of metabolism, acting on less stable material of a less complex nature, acting upon it so that constructive ana-

bolic processes or disruptive katabolic processes predominate for the time.

The English physiologist Gaskell, prompted by his researches on the functions of nerves, some of which command activity while others induce rest, was led to regard what he called anabolism and katabolism as processes which bear to protoplasm a relation similar to that which sleep and wide-awake life bear to the organism. The 'winding-up' process of anabolism or restitution goes on (autonomically) of itself; the 'running-down' process of katabolism or discharge is determined by stimulus. Anabolism is comparable to the self-loading, katabolism to the stimulated firing of a gun. But the German physiologist Hering, prompted by his researches on colour-sensations, was led to regard what he called assimilation and dis-assimilation as two antagonistic kinds of activity, both dependent on stimuli which differ in their direction and results.

Huxley's famous address on *The Physical Basis of Life* and Hutchison Stirling's essay *As Regards Protoplasm* may be cited as outstanding types of the numerous endeavours which have been made to understand the relation between protoplasm and mind. On the one hand, we know through our senses the colloid material that we call protoplasm; on the other hand, we know this and much else because we have minds. That it is hopeless to try to explain such irreducibles as protoplasm and thought, that thought is only a function of protoplasm, that protoplasm is only a form of thought, that thought and protoplasm are different aspects of one reality, are the respective conclusions of the agnostic, the materialist, the idealist, and the monist philosophers who have theorised about living matter.

See BIOLOGY, CELL, PHYSIOLOGY. W. M. Bayliss, *Principles of General Physiology* (London, 1915); E. B. Wilson, *The Cell in Development and Heredity* (3d ed. New York, 1925); *General Cytology*, edited by E. V. Cowdry (Chicago, 1924); L. T. Hogben, *Comparative Physiology* (London, 1926).

Protopterus. See MUD-FISHES.

Prototheria. See ECHIDNA, MAMMALS.

Prototracheata. See PERIPATUS.

Protozoa (Gr. *prōton*, 'first,' and *zōon*, 'animal'), simple unicellular animals, contrasted with the multicellular Metazoa. Except in a few cases, each Protozoon is a single cell, a unit-mass of living matter physiologically complete in itself. This implies the absence of tissues and organs, and of sexual reproduction in the ordinary sense. Yet a Protozoon may show great intricacy, and two individuals may unite in mutual fertilisation. A Protozoon is to any higher animal, from sponge onwards, as an egg-cell is to the body into which it develops. But the exceptional cases to which we referred are very important—they are loose colonies or aggregates of Protozoa. Formed by the incomplete separation of dividing units, they bridge the gulf between single-celled and many-celled animals. Simplest of Protozoa are such forms as *Protomyxa*, whose life is a succession of changeful phases, amoeboid, encysted, flagellate. The others may be classified according to the predominance of one or other of these phases. The Rhizopoda, predominantly amoeboid, include *Amoeba* and others like it, *Foraminifera*, *Heliozoa*, and *Radiolaria*. The Gregarines are predominantly sluggish and encysted. The Infusorians are usually active, ciliated, or flagellate. These classes of Protozoa are discussed separately.

Protractor, a mathematical instrument, used in drawing or plotting, for the laying down of angles. It is variously shaped, and may be circular, semicircular, or rectangular.

Proud-flesh is the popular term for coarse and too luxuriant granulations springing up on Wounds (q.v.) or Ulcers (q.v.). See also INFLAMMATION.

Proudhon, PIERRE JOSEPH, a noted French socialist, was born July 15, 1809, at Besançon, in which town his father was a poor cooper. Through the good offices of charitable friends, he received the rudiments of his education at the college of his native place, and from the first gave great promise of talent. While still very young, however, he quitted the institution in order to aid his family, who had fallen into great distress, and sought employment in a printing establishment. Here he was noted for the most punctual discharge of duty; and, in the hours not occupied in work, he contrived, by a rare exercise of resolution, to complete and extend his education. In 1830 he declined an offer of the editorship of a ministerial journal, preferring an honourable independence as a workman to the career of a writer pledged to the support of authority. In 1837 he became partner in the development of a new typographical process; was engaged on an edition of the Bible, to which he contributed notes on the principles of the Hebrew language; and in 1838 published an *Essai de Grammaire Générale*, in approval of which a three years' bursary of 1500 francs was awarded to him by the Académie de Besançon. On this accession of funds he paid a visit to Paris; and subsequently contributed to the *Encyclopédie Catholique* of M. Parent Desbarres the articles 'Apostasie,' 'Apocalypse,' and others. In 1840 he issued the work entitled *Qu'est-ce que la Propriété?* ('What is Property?') which afterwards became so famous. The nature of the doctrine announced in it is sufficiently indicated in its bold paradox, soon to be widely popularised—*La Propriété c'est le Vol* ('Property is Theft'). Notwithstanding his attack on property, which gave great offence to his patrons, Proudhon held his pension for the regular time. In 1842 he was tried for his revolutionary opinions, but was acquitted. In 1846 he published his greatest work, the *Système des Contradictions Économiques*. During the revolution of 1848 Proudhon attained to great notoriety. He was elected member of Assembly for the Seine department, but he could not there gain a hearing for his extreme and paradoxical opinions. He found more adequate scope for his energy in the press, publishing several newspapers, in which the most advanced theories were advocated in the most violent language. He attempted also to establish a bank which should pave the way for a socialist transformation, by granting gratuitous credit, but failed utterly. The violence of his utterances at last resulted in a sentence of three years' imprisonment, and in March 1849 he fled to Geneva, but returned to Paris in the following June, and surrendered at the prison of Sainte Pelagie.

While shut up there he married a young working-woman. During his imprisonment he gave to the world the works entitled *Confessions d'un Révolutionnaire* (1849), *Actes de la Révolution* (1849), *Gratuité du Crédit* (1850), and *La Révolution Sociale démontrée par le Coup d'État* (1852); the last of which is remarkable, in the light of subsequent events, for the clearness with which it states the alternative of *l'anarchie ou le Césarisme*, as pressed on Louis Napoleon, then president. In June 1852 he was set at liberty, but in 1858 was again condemned to three years' imprisonment, and retired to Belgium, where he continued to publish from time to time on his favourite subjects of speculation. Amnestied in 1860, he died in obscurity near Paris, January 19, 1865.

The theories of Proudhon cannot be presented in a clear or systematic form; we can only give some account of the most important of them. He held

that property was theft, inasmuch as it appropriates the value produced by the labour of others in the form of rent, interest, or profit without rendering an equivalent. He maintained that one service can be duly repaid only by rendering another, whereas the owner of land and capital abuses his position by exacting all manner of service without giving an equivalent. His famous paradox respecting *anarchy*, which he regarded as the culmination of social progress, was simply an exaggerated and premature assertion of the great principle that the fully-developed man should be a law to himself—that is, the moral progress of man should make government and external law unnecessary. In the perfect society order would be secured and maintained in the absence of government through the reasonable self-control of the free individual. Laws, police, the whole machinery of government as now established are the marks of an imperfectly developed society. Personally Proudhon appears as an original and not unattractive character in the monograph of Sainte-Beuve, which unfortunately was not finished. His complete works fill 33 vols. (Paris, 1868-76); his correspondence, 14 vols. (1874).

See Sainte-Beuve, *Proudhon, sa Vie et Correspondance* (1872); A. Desjardins, *Pierre Joseph Proudhon* (1896); the articles ANARCHISM, SOCIALISM, and works there cited.

Proust, MARCEL, French author, was born in 1873, the son of a doctor in government service in Paris. His mother was a Jewess. From childhood he was an invalid, a circumstance which influenced his life and his writings. He adopted no profession, though early he launched a short-lived review (*Le Banquet*) and for a time contributed society gossip to the newspapers. His first work, *Les Plaisirs et les Jours*, appeared in 1896; and in 1904 (*The Bible of Amiens*) and in 1906 (*Sesame and Lilies*) he translated Ruskin. By family he was of the wealthy bourgeoisie, but having penetrated to the aristocratic salons of the Faubourg Saint Germain he there won astonishing social successes; these he enjoyed, but not uncritically, and later, in disillusionment and in growing ill-health, he withdrew to a life of literary reclusion, devoted in his *À la Recherche du Temps Perdu* to memorable delineations of the society in which he had moved. In 1919, in *Pastiches et Mélanges*, he gathered together some earlier prose writings. He died at Paris, 18th November 1922. Proust is essentially a man of one work, *À la Recherche du Temps Perdu* (English trans. by C. K. Scott Moncrieff, 1922, &c.), but the work consists of several sections, and each section really of several novels. The first section, *Du Côté de chez Swann*, appeared in 1913, but attracted little attention till in 1919 the second section, *À l'Ombre des Jeunes Filles en Fleurs* (1918), was awarded the Prix Goncourt; the third section, part one of *Le Côté de Guermantes*, was published in 1920; the fourth section, part two of *Le Côté de Guermantes* and part one of *Sodome et Gomorrhe*, in 1921; and the fifth section, part two of *Sodome et Gomorrhe*, in 1922; the concluding sections, *La Prisonnière* (1924), *Albertine Disparue* (1926), and *Le Temps Retrouvé*, though not finally prepared for publicity before the author's death, were issued posthumously. The work as a whole is a huge psychological novel. Its subject matter is a compound of autobiographical fact and of ingenious fiction. Throughout, the influence of Freud and of Bergson is to be seen; and there is a pessimism and an extreme sensibility not unconnected, one must think, with the invalidism of the author. The style, sometimes wilfully involved, is peculiar, and is at its best in a kind of mingling of ironic metaphors and subtle allusions. As the work proceeds, signs of exhaustion become apparent. By his admirers Proust has been held to be unique as an analyst of the manners and morals of his time,

and as a psychological novelist to be among the greatest. Detractors, however, have pointed to what in Proust's writings they denounce as morbidity and hyperæsthesia. There is a *Life in French* by Pierre-Quint (1925).

Prout, FATHER. See MAHONY.

Prout, SAMUEL, painter in water-colours, was born at Plymouth, 17th September 1783. He studied from nature, and sketched with Haydon through Devon and Cornwall, his drawings in the latter county being made for Britton's *Beauties of England and Wales*. In 1805 he removed to London, in 1815 was elected to the Water-colour Society, and in 1818 went to Rouen by Havre. The picturesque street-architecture and fine Gothic remains there made so strong an impression on his mind that afterwards his principal works were those in which architecture had a prominent place; and from time to time, in his after-career, he made excursions, ransacking every corner of France, Germany, the Netherlands, and Italy for picturesque architectural remains. Prout's name should be dear to all artists and amateurs, for there are few who have not been incited or instructed by his numerous elementary drawing-books, in the slightest of which talent and feeling for art are conspicuous. His water-colour drawings are characterised by decision in handling, great breadth, and clear and pleasing colouring. He died February 9, 1852.

See Ruskin's *Memoir of Prout* in *Art Journal* (1852); and his *Notes on the Loan Collection of Drawings by Prout and Wm. Hunt* (1879-80).

Provençal Language and Literature.

The Provençal language is one of the six principal branches of Latin speech, usually classified by philologists under the title Romance languages. The name Provençal, which appears to be derived from the *Provincia Romana* of Cæsar, was not used in the earlier middle ages except in the restricted sense of the language or dialect of Provence proper. The troubadours themselves used the term *lingua romana* (or *lo romans*). The term *langue d'oc* was also known in the middle ages, but was afterwards transferred to designate a province of France. The Provençal and other Neo-Latin idioms existed as dialects of the Latin previous to the Germanic invasions, having replaced the ancient languages of Gaul. Although the Provençal and the northern French had originally sprung from the same stock, they had gradually grown distinct from one another, until at the time of the troubadours they differed almost as widely as French and Italian. The Provençal language at the time of the troubadours extended far beyond the boundaries of Provence proper. It extended over the area from the Alps to the Pyrenees and the Mediterranean to the Loire. Beyond France it was known in the east of Spain—in Catalonia and Aragon, and in the Balearic Isles—also in Savoy, Piedmont, and part of Switzerland.

The pure Provençal idiom, in which the poets of the 12th century sang, was used by the higher classes over the whole of the district referred to, but the bulk of the people knew only their own dialects—viz. the Provençal (proper), Piedmontese, Gascon, and Catalan, all of which differed but slightly from one another. At the end of the 13th century, consequent upon the establishment of the French domination in the south and the introduction of the northern French language, the literary Provençal began rapidly to disappear, while the vulgar dialects still remained; and it was in them that the compositions of the later middle ages were written. The Provençal language was more highly infected than any of the other Neo-Latin languages, and was

the earliest of these to be fixed grammatically. It was highly adapted for lyric poetry, owing to its melodiousness and its rhyming facilities. The grammarian Vidal referring to it says: '*La parladura francesa val mais et es plus avineus a far romanz et pastourelas, mas cella de Lemosin val mais per far vers et cansons et sirventes*' (The French speech is better and more suited for making epics and pastourelles, whilst that of Lemosin [i.e. the Provençal] is better for making love-songs and satires). In the modern Provençal dialects there is to be noted chiefly a greater simplicity of inflections and grammatical forms and a large admixture of French words.

The first employment of the Provençal language in writing dates back to about the 9th century. The few specimens that survive are mostly writings in Latin, but mixed more or less with Provençal words and phrases. It is to the priests and monks that are most probably due the earliest attempts at composition in the Provençal language. In order to arouse the religious sympathies of the people they composed or translated from the Latin into the vulgar idiom pious tales, allegories, legends of saints, &c. There were also introduced into the liturgy, along with the prayers and hymns in pure Latin, others in the popular dialect. In 813 at the councils of Arles, Mainz, and Tours preaching in the popular language was recommended to the clergy. Towards the close of the 11th century a revival took place in Provençal poetry consequent upon the religious wars of the Crusades and the introduction of the institution of chivalry. The influence of the Moors of Spain undoubtedly, too, had its effect in the development of Provençal poetry and culture. The poetry of mediæval Provence has much in common with that of the Moors.

Although it was in the north of France that epic poetry in the middle ages especially flourished, still in the south it was by no means so neglected as many have supposed. Among the earliest compositions in the Provençal language were undoubtedly epic romances, treating either of his torical subjects, such as the struggles against the Franks or the wars with the Moors of Spain, or else of the semi-mythical deeds of Charlemagne and King Arthur which formed the basis of the Carolingian and Arthurian (or Round-Table) legends. Of these old popular epics which were sung and so handed down from generation to generation we possess but few traces. From the middle of the 12th century epic poetry may be divided into popular and artistic. Of the first class but few specimens remain, but of the artistic epic they are more numerous, probably owing to the fact that, being recited and not sung, it was more necessary to commit them to writing.

The Provençals did not cultivate the drama like the French; in fact the only productions that might come under this head are pieces on pious subjects in dramatised form, such as the *Mystery of the Passion*, the *Marriage of the Virgin*, &c. Provençal literature was essentially poetic, and its prose works are of little importance. They were in the early period mostly translations from the Latin, sermons and chronicles—also the biographies of the principal troubadours. Later, in the 14th and 15th centuries, prose works became more numerous, and included scientific, juridical, philological, and other works. The lyric poetry is by far the best-known branch of Provençal literature. It was in lyric verse that the Provençal poets gave expression to the sentiments of chivalry and love—of that adoration and devotion to women which had become with them a sort of worship.

The word *troubadour* (in Provençal *trobairre*, *trobador*) is derived from the verb *trobar* (Fr.

trouver, 'to find, invent, compose,' from Lat. *turbare*, 'to move,' meaning latterly 'to seek,' and also 'to find'). This verb was used only with reference to the composition of lyric poetry. Hence, strictly speaking, a troubadour means a poet of the lyric form. Epic poets were styled *noellaires* (Fr. *novellistes*, 'romancers'). The troubadours were of two classes—viz. professional and amateur. Amongst the latter were many nobles and even kings, as, for instance, Richard Cœur-de-Lion, Alfonso II. of Aragon, the Counts of Poitou, Provence, and Toulouse; of the professional troubadours also many were of high birth. Generally speaking, the latter were recruited from all ranks of society (merchants, soldiers, monks, lawyers, &c.), and they were of various grades. The majority of the troubadours led a wandering life, frequently travelling beyond the limits of their own country—more especially into Spain, visiting Catalonia and Aragon, and even Castile. Beyond the Alps they visited Piedmont, Lombardy, and Tuscany, where many of them settled. Others—mostly those who were tired of wandering—attached themselves to the households of the great feudal lords, wherein they played an important part. There were no fixed schools of poetry for learning the troubadour's art. They acquired it either by attaching themselves as pupils to some celebrated troubadour, or by visiting the great châteaux which the more distinguished poets were accustomed to frequent. The convent, too, was a great school of song; the monks had both the means and leisure to cultivate the taste for poetic composition, and there were many monks amongst the troubadours. At a later period professors of poetry established themselves in the chief towns of Provence; Peire Cardinal settled as such at Tarascon in the 13th century. The first of the troubadours of whom we know was Guillem IX., Count of Poitiers, a powerful noble of the south of France. He flourished towards the end of the 11th century. To the first half of the 12th century belong Cercamon (or *Cherchemonde*); Marcabrun, who was originally attached to the service of Cercamon in his wanderings; Peire d'Alvern, a troubadour of great merit; and Bernart de Ventadorn, who was famed for the grace and sweetness of his poetry. The second half of the 12th and first half of the 13th centuries was the most brilliant period of Provençal poetry. Of the many poets who flourished during this period the following are the most distinguished: Gaucelm Faidit; Gui d'Uisel; Peirols; Arnaut de Marueilh, the author of many exquisite love-songs; the talented Folquet, Bishop of Marseilles; Peire Vidal of Toulouse, a versatile and most eccentric poet; Arnaut Daniel, the chief of the artificial school; Giraut de Bornelh, considered by the Provençals themselves to be the finest of all their poets (though Dante and Petrarch both regard Arnaut Daniel as superior to him); Raimbaut de Vaquieras; Guillem de Cabestanh, a most melodious singer; the Monk of Montaudon, a powerful and unsparing satirist; Raimon de Miravals; Uc de Saint Circ; Guillem Adhemar; Bertrand de Born, the author of many warlike *sirventes*; Guillem Figueira; and Peire Cardinal, the great writer of moral and religious satire. The latter half of the 13th century shows the poetry of the troubadours in its decline, and few of the poets of this period deserve to be classed with those of the previous one. Towards the close of the century lived Guiraut Riquier, a poet of great renown, who has been termed the 'last of the troubadours.' He specially cultivated the popular forms of lyric poetry, particularly the *pastoreta*. Among the long list of troubadours (about 400 in all) there

are only about a dozen women-singers of whom we know. Their works, so far as one can judge from the scanty fragments that remain, are much inferior in merit to those of the troubadours. The most distinguished among them was the Countess Beatrix de Dia, who has been termed the Sappho of Provence.

The compositions of the troubadours were intended to be sung to the accompaniment of some musical instrument. In most cases the poets themselves composed the melodies for their pieces. The text was called *mots*, the melody *son*. There is no doubt that many of the troubadours sang and accompanied their own compositions. But those who were unable to do so were obliged to have recourse to professional musicians to sing and play for them. These professional musicians they found among the *joglars* (Fr. *jongleurs*) or wandering minstrels. The origin of the *joglars* dates back to the time of the Romans; they were the descendants of the *joculatores*, who took part in the ancient circus-games. The *joglars* of the middle ages were a sort of travelling showmen, who gave performances at village feasts, and were often accompanied by trained dogs and monkeys. There were some of them, however, whose profession was rather more artistic than mere buffoonery or jugglery; they became the singers and accompanists of the troubadours. Some were in the service of the troubadours, and travelled about with them; others went about independently, singing the pieces they had either bought or had presented to them by the troubadours. The latter, as a class, held themselves much above the *joglars*, though it sometimes happened that *joglars* rose to the ranks of the troubadours.

It was only from the 12th century that a poetic system began to be fixed, and the different branches of lyric verse received distinctive titles. Previous to that period every lyric poem was termed *vers*, from the Latin *versus*, 'a hymn,' because the early lyric compositions were modelled on the ecclesiastical verses, whatever their subject might be. Epic compositions were termed *prosa*. The two principal branches of lyric poetry were the *canso* or love-song and the *sirventes* or satire. The *canso* was the outward expression of love and its various phases. In order to write the love-song (to *trobar*) it was essential, according to the ideas of Provençals, that the poet should be in love himself, that he should be inspired by the passion before he could give expression to it. Their idea of love, it may be remarked, was not wholly that of romantic adoration; hence the many licentious pieces among the lyrics of the troubadours. The *canso* generally closed with a few lines in which the poet apostrophised himself or his song, and commissioned it to explain his sentiments to his lady-love. This was termed the *tornada*. The term *sirventes* or *sirventesc* was used to comprise not only satirical poems, but generally every class of lyric composition that did not treat of love. These were divided into various classes—personal, social, political, moral, and religious—the last named including the songs of the Crusades. In their social satires the troubadours attacked with energy the vices and oppression of the nobles. Attacks, too, on the clergy were frequent, more especially at the time of the Albigenses war, when the poets sided (with one or two exceptions) with the heretics against the Church of Rome. In doing so they do not appear to have been influenced so much by questions of doctrine as by hostility to the northern French intruders, and we do not find any of them putting forward heretical opinions in their works, with the single exception of one piece by Peire Cardinal.

The crusades against the Saracens formed a constant theme enabling the troubadours to celebrate in song their love of daring and glory.

Most of the crusade-songs we possess relate to the third crusade, which took place during the most flourishing period of Provençal poetry. In these songs they exhorted their countrymen to rise and take up arms against the infidels. War in general—not merely religious—was a favourite subject with the troubadours. The most famous writer of warlike *sirventes* was Bertrand de Born (q.v.), a typical mediæval baron.

The *tenso* was a sort of dispute or contention in verse in the form of a dialogue between two troubadours, generally upon some question relating to love or chivalry. *Tensos* actually did take place among the troubadours, although in many of their poems the antagonists would appear to be merely fictitious persons. This form of verse was of eastern origin, and was common among the Arabs and Persians.

Besides the *canso*, *sirventes*, and *tenso*, there existed also simpler, more popular forms of lyric verse. Originally the *balada* was a poem intended to be sung in dancing. It consisted generally of three strophes, and was remarkable for its graceful dance-like rhythm. The *pastorela* (*pastoreta*), or shepherd's song, was always a favourite form of verse with the Provençal poets. The *alba* (or dawn-song) and the *serena* (or even-song) were also cultivated by the Provençals. The latter is to be distinguished from the serenade, and was a poem depicting the longing of the poet for the approach of the night and the meeting with his beloved. *Novas*—tales in verse (compare the north French *Fabliaux*, q.v.)—were few and unimportant among the Provençals compared with those of the French.

The Provençal system of versification was most highly elaborated, the poets observing the most intricate metrical rules in their compositions. An instance of such elaborate verse is the *sestina*, which was invented by Arnaut Daniel and imitated by Dante, Petrarch, and other poets. The *sestina* was a species of verse consisting of six stanzas, each of six lines, in which the rhyming words of the first stanza were carried on through all the others in an inverted order. The opposite of the *sestina* was the *descort*, which was subject to no definite rules as regards either metre, rhyme, or length of stanzas. Some poets even purposely sought after discordance. A distinguished troubadour, Raimbaut de Vaqueiras (1180-1207), in one of his pieces uses five different languages (viz. Provençal, Tuscan, French, Gascon, and Catalan) in five succeeding verses, the sixth being a mixture of all five. The *sonnet* is frequently supposed to have been of Provençal origin. But the only two examples we know of in that language were by an Italian who composed in Provençal, Dante da Majano. The probability is that it was peculiar to the Italians, though doubtless it was the outcome of the influence of Provençal versification. *Sonet* in Provençal is simply identical with *son*, meaning melody.

The two distinguishing characteristics of Provençal versification are the rhyme and the syllabic accent. Some have supposed that in their predilection for rhyme they were influenced by the Moors, but it is more than likely it was natural to the Provençals. The great number of final syllables of the same sound existing in the declensions and conjugations of their language offered great ease of rhyming, and doubtless this had much to do with the formation of their poetry. Owing to their excessive regard for form, there is noticeable in the lyrics of the troubadours a certain sameness or want of variety of sentiment, and a tendency to be artificial rather than natural. Yet the high merit of their poetry must be acknowledged when we consider how rough were the

times in which they lived, and how few literary models they had to guide them. The culture of the Greeks and Romans had long been extinct, and of classical literature they knew nothing, whilst at the time of the highest point of their development the poetry of northern France, of England, of Germany, and of Italy was yet in its infancy.

Rapid as had been the rise of Provençal poetry, as rapid was its decline. What more than anything else was the cause of this decline was the war against the Albigenses (q.v.) in the 13th century, which proved disastrous to the nobles of the south of France. Their lands were laid waste, their castles destroyed. Besides this, with the establishment of the French domination in the south the French language began to be generally used among the upper classes; thus there was no longer any encouragement for the troubadours. Their poetry ceased to be cultivated as formerly. The clergy, too, in their fanatic endeavours to extinguish heresy, destroyed large numbers of Provençal works, and in a bull Pope Innocent IV. styles the Provençal a heretical language, and forbade the use of it to the clergy. With the 13th century the real literary life of the Provençals had disappeared. The two following centuries can only be regarded as an after-period in which the traditions of the troubadours still lingered on. In the first half of the 14th century an effort was made to revive the old poetry. Seven citizens of Toulouse, under the title *La sobregaya companhia dels set trobadors de Tolosa*, established in that city a society of song. Under the auspices of this society were organised *Jeuus Floraux*, or poetic contests, at which prizes were given. The activity of the society was not confined to Toulouse; branch societies were formed throughout the south of France, and even in Catalonia and Aragon; but, though it existed for several centuries, this society could never effect what it aimed at—viz. the restoration of the brilliant period of Provençal song. In the 14th and 15th centuries prose works became more numerous. Such were learned treatises—theological, medical, legal, and philological—local chronicles, and pious tales or legends.

During the following three centuries there are almost no Provençal works worthy of notice. In the 19th century, however, a new poetic activity began to manifest itself, commencing with the poet Jacquot Jansemín, or Jasmin (q.v.), and after him Roumanille, the founder of the Society of the *Félibres* (which has in view the preservation of the Provençal language and customs), Mistral (q.v.), a poet of great genius, Aubanel, and others. Poetic festivals, like the *Jeuus Floraux*, have also been introduced to aid the movement.

On the subject of the Provençal Language see Diez, *Grammatik der Romanischen Sprachen* (1836-38; 5th ed. 1882); Raynouard, *Lexique Roman* (1838-44), and his *Grammaire comparée des Langues de l'Europe Latine* (1821); Mahn, *Grammatik u. Wörterbuch der Altprovenzalischen Sprache* (1885 et seq.); D. B. Kitchin, *An Introduction to the Study of Provençal* (1887). On the literature see Diez, *Die Poesie der Troubadours* (2d ed. 1883), and *Altromanische Sprachdenkmäler* (1846); Raynouard, *Choix de Poésies originales des Troubadours* (1816-21); Fauriel, *Histoire de la Littérature Provençale* (1846); Bartsch, *Grundriss zur Geschichte der Provenzalischen Literatur* (1872), and *Chrestomathie Provençale* (4th ed. 1880); Hueffer, *The Troubadours, a History of Provençal Life and Literature* (Lond. 1878); Mahn, *Die Biographien der Troubadours* (2d ed. 1878); Gatien-Arnault, *Monuments de la Littérature Romaine depuis le 11^{me} Siècle*, Millá y Fontanals, *Los Trovadores en España* (Barcelona, 1861); Paul Meyer, *Les derniers Troubadours*; Lommatzsch, *Provenzalische Liederbuch* (1917); Emile Ripert, *La Renaissance Provençale* (1918); and books by Rowbotham (1895), Rábbe (Far. 1898), Justin H. Smith (1900), and H. J. Chaytor (1902).

Provence, formerly a maritime province of France, was bounded on the S. by the Mediterranean, and comprised the modern departments of Bouches du Rhône, Var, Basses-Alpes, and parts of Alpes Maritimes and Vaucluse. It included a portion of the Roman province of Gaul generally called simply *Provincia* ('the Province'), whence it derived its name. The Provençal (q.v.) tongue, however, was spoken over a much larger area (see also the section on the language and literature of FRANCE). Provence was overrun in the 5th century by the Visigoths and Burgundians, for a time was under the Saracens, and in 879 was mostly incorporated with Cisjuran Burgundy (q.v.) and with it was attached to Germany. The main part of the region remained, however, under the Counts of Arles, also known as Counts of Provence, and was practically independent. Early in the 12th century the countship passed by inheritance to Raymond Berengar, Count of Barcelona, and under the protection of his successors Provençal poetry attained its zenith. In 1245 the last count died, and the inheritance passed, through his daughter, to her husband Charles of Anjou, who united Provence with Naples. Under the Angevin princes the constitution of Provence, with its three estates holding the power of the purse, was well balanced and free; and it is possible that through Simon de Montfort (q.v.) the English parliamentary constitution may be indebted to it. The last of the counts, Charles, nephew of René the Good (q.v.), died in 1481, and by his will Provence passed to the French crown. It was united with France in 1486.

Several of Daudet's works give vivid pictures of Provençal scenery, life, and character. See also ANJOU, FRANCE, AVIGNON.

Proverbs. All attempts to define a proverb, from the time of Aristotle downwards, have been unsuccessful. One of the difficulties is to find an essential difference that will not admit or exclude too much, and another is the diversity of opinion among parœmiographers as to where the line should be drawn. Some would include almost any form of popular phrase, while others, like Giusti, refuse to recognise anything that is not a sentence containing a precept or admonition of some sort. In default of an exact definition we must be content with descriptions, such as Earl Russell's—'The wisdom of many, and the wit of one,' or that of Cervantes—'Short sentences drawn from long experience,' or the more complete if less pithy one of Cipriano de Valera—'Short sayings, sententious and true, and long since accepted as such by common consent.'

But the proverb is not of necessity the *wit* of one. Sometimes it is the simplicity or naïveté of one, and the wit lies in the application of it by the many. The Viennese have a good specimen of this kind. The Emperor Ferdinand, driven for shelter one day into a peasant's house, took a fancy to some dumplings that had been just cooked for the family supper. The court-physician, being responsible for the imperial digestion, remonstrated, but his majesty's gracious answer was 'Kaiser bin i', knödel muss i' haben'—'Emperor I am, dumplings I'll have'—which became in course of time a recognised comment in cases of pertinacity. Here we have what is very rare, a proverb traced to a definite source; a few instances there are, but as a rule the proverb is a scrap of unfathered wit or wisdom that came into the world nobody knows how. Modern society has recourse to proverbs in conversation much more sparingly than was usual in the days of our forefathers, and the reasons are plain enough to see. To accept a proverb as an answer implies deference to authority and is in effect an acknowledgment of the wisdom of our

ancestors. In all languages it condemns loquacity and commends silence. It is in fact a primitive form of 'closure.' The Celtic races never greatly favoured proverbs. There is no family perhaps that has not proverbs or rudimentary proverbs of its own, used often to the perplexity of the uninitiated visitor; and what is true of the family is true of the community on a more extensive scale. A man sees another bolting out of his house, and asks what he has been about there. 'You'll see when the eggs come to be fried,' says the other, making off; which is explained when it is time to fry the eggs and it is found that the frying-pan has been stolen. It will be first a family joke; then a parish joke; then a stock saying in the market-place—'very good; time will tell; you'll see when the eggs come to be fried;'; then a saying in many market-places; and so at last a proverb. This is the actual story of one enshrined in Don Quixote—*Al freir de los huevos*.

As they pass from the family and the community to the nation, so they pass from one nation to another. The purely national proverbs form only a portion of the proverbs in any language. It almost seems as though there had been from time immemorial a kind of proverb exchange through which any serviceable proverb in one language passed into any other that stood in need of it; and this makes it a matter of difficulty, or rather impossibility, to settle the nationality of many of the best and most familiar. The proverbs that are strictly national have an interest of a special kind. Coming directly from the people, the chosen vehicles of their sentiments and opinions, they naturally reflect the habits of thought, the turn of mind, the way of looking at things, that prevail among those who use them. Any one at all versed in comparative parœmiology will be able for the most part to make a shrewd guess at the original language from a translated specimen. They reflect other things too—often the history of the nation they come from. The Spaniard, as he was before Ferdinand and Ximenez bridled Aragon and Castile, makes himself heard in 'The king goes as far as he may, not as far as he would;'; there are Teutonic proverbs older than Luther, in which his very spirit seems to speak; there are Italian proverbs that, in their cynicism, distrust of mankind, and open advocacy of lying, are more eloquent on the state of society in mediæval Italy than any of her historians. And the differences they suggest are often curious. The devil figures prominently in the proverbs of Europe; but in those of the Latin races he is always treated with respect, or at any rate credited with astuteness, the only exception, perhaps, being the Italian one that accuses him of weaving a coarse web. In Teutonic proverbs, on the other hand, he is held up to ridicule on the score of his amazing simplicity.

Of the national groups the Spanish is unquestionably the most remarkable. A Spanish MS. by Yriarte contained between 25,000 and 30,000. In Spain almost everything has its proverb. And they are as racy as they are numerous, full of shrewd sense and knowledge of human nature, and rich in that grave, dry Spanish humour which never compromises itself by a descent into facetiousness. The Spaniard is, no doubt, naturally sententious, but the facilities offered by his rich, sonorous Castilian should not be overlooked; and among them must be reckoned its wealth in rhymes, consonant and assonant, of which there is such striking proof in the number and excellence of the Spanish rhyming proverbs. Language, it may be observed, plays an important part in proverbs. Take, for example, the Scots 'Better a toom house than an ill tenant.' Compared with the English 'empty,' how much more effective is the Scandinavian 'toom,' to say nothing of the allitera-

tion. The Basque proverbs, from which several of the Spanish are obviously derived, are of much the same character; and in both, but especially in the Basque, the resemblance to the proverbs of the East is very distinct. The Basque proverbs of course form only a small group; but, relatively to population, their numbers indicate a propensity to the use of the proverb as strong as the Spaniard's. The Italian proverbs, only less numerous than the Spanish, are more remarkable for wit, often bitter, than for humour; in the French, on the other hand, there is little or none of that brilliant wit and epigrammatic neatness of expression which distinguish French literature. But this is only what might be expected. French wit is the product of French culture, and proverbs are natural productions. Our own, including the Lowland Scots, must be regarded as simply a subdivision of the great Teutonic group. Next to Spain, the region richest in proverbs in Europe is probably that watered by the lower Elbe, and including Oldenburg, Hanover, Holstein, and Mecklenburg. Compared with other groups, the Celtic proverbs must be rated as poor. Among the oriental proverbs the Arabic hold the first place in respect of quantity, and perhaps quality likewise, but the Persian and Hindustani are also excellent, and in the Turkish, together with abundant worldly shrewdness, there is sometimes a vein of poetry that is very striking. It is questionable whether the 'tender beauty,' to use French's phrase, of our own proverb of the shorn lamb is not rivalled by its Turkish parallel, 'God makes a nest for the blind bird.'

Proverbs, THE BOOK OF, a canonical book of the Old Testament, holds the second place among the Hagiographa, coming immediately after Psalms. The Hebrew word *mashal*, translated in the title by *paromia* in the LXX. and *proverbium* in the Vulgate, primarily means 'similitude,' and is applicable to any kind of allegory, simile, or comparison, especially when made for purposes of instruction; and every kind of didactic poetry is also included under the name. Typical instances of the use of the word occur in Ezek. xvii. 2 (LXX. *parabolē*, R.V. 'parable'), 1 Sam. x. 12 (LXX. *parabolē*, R.V. 'proverb'), Ps. xlix. 4 ('parable'), Isa. xiv. 4 (LXX. *threnos*, R.V. 'parable'); it thus applies equally to that brief spontaneous product of popular wit or wisdom which in ordinary English parlance is most usually understood by the word 'proverb,' and also to that special kind of literary production which the Romans called *sententia*, the Greeks *gnōmē*, and which is known to the modern French as the *maxime*. The Book of Proverbs as we now have it is made up of a number of originally separate collections; besides the general preface (i. 1-7), usually attributed to the author of chap. i.-ix., it consists of the following eight parts: (1) i. 8-ix. 18 has more appearance of plan, method, and free composition than any of the others, and is specially distinguished by the elaborateness with which its moral lessons are enforced. Its personification of Wisdom as the first creation of God is 'one of the most remarkable and beautiful things in Hebrew literature,' and clearly marks it as belonging to a comparatively late phase of Hebrew thought not far removed from the beginnings of Alexandrian speculation. (2) x. 1-xxii. 16, headed 'the proverbs of Solomon,' consists of 376 miscellaneous distichs, mostly of the antithetic type, of which a good example is furnished by the opening verse of the collection. (3) xxii. 17-xxiv. 22 consists of thirty-two moral precepts, six of which are distichs, seventeen in four lines, and the others of various forms, including a discourse or *mashal* of some length against drunkenness (xxiii. 29-35). An exhortation to heedfulness under instruction is prefixed (xxii. 17-21). (4) xxiv. 23-34 is super-

scribed 'These also are sayings of the wise,' and contains six sayings or precepts of a somewhat trite order, including, however, the familiar description of the sluggard and his vineyard. (5) xxv. 1-xxix. 27 has the heading 'These also are proverbs of Solomon, which the men of Hezekiah, king of Judah, copied out.' Of the total number (127) 114 are distichs, six in four lines, and the rest irregular. This collection has often been thought by critics to contain more elements of high antiquity than the rest of the book, and is specially distinguished by the vigour, freshness, and originality of its observations and expressions. (6) xxx. consists of twelve sets of verses of various import, including some riddles of the Hebrew type. The somewhat obscure heading ought probably to run 'The words of Agur the son of Jakeh of Massa' (cf. Gen. xxv. 14; 1 Chron. i. 30), and the opening verses to be read (as in R.V. margin) 'The man said, I have wearied myself, O God, I have wearied myself, O God, and am consumed, for I am more brutish than any man, and have not the understanding of a man—the despairing expression of a spirit that has exhausted its energies in the effort to reach a true knowledge of God. (7) xxxi. 1-9, 'The words of Lemuel, king of Massa (see above), wherewith his mother instructed him,' a warning against wine and women, and an exhortation to righteousness in judgment. (8) xxxi. 10-31, an alphabetical piece without superscription, consisting of twenty-two distichs in praise of the 'virtuous woman'—i.e. the wise, energetic, capable housewife. There are no data that enable us accurately to determine the relative ages of these eight portions. It seems not unreasonable to suppose that the book may have been brought into its present form by the writer of the first part (i.-ix.). It is not improbable that the book contains individual utterances of very great antiquity—as old as, and perhaps even older than, Solomon himself; but it is impossible to pick out these with certainty. There is no good reason for identifying the main collection (x. 1-xxii. 16), consisting as we have seen of 376 *mashals*, with the 3000 proverbs of Solomon mentioned in 1 Kings, iv. 32, though this has been done by Jerome; that x. 1-xxii. 16 was not before the compilers of xxv. 1-xxix. 27 is evident from the number of doublets contained in the latter series (cf., for example, xxv. 24 and xxi. 9; xxvi. 13 and xxii. 13; xxvi. 15 and xix. 24, and numerous other instances). It is probable that the present book was a slow and gradual growth; and that the process may have been carried on to a very late date is shown by the considerable variations between the Massoretic and Septuagint texts.

For the best account of the Book of Proverbs, with references to the literature of the subject, see C. H. Toy's commentary (Internat. Crit. Comm. Series), and his article in the *Encyclopædia Britannica*; G. C. Martin (*Century Bible*) is concise, but very interesting and useful.

Providence, a seaport and (since 1900 sole) capital of Rhode Island, and one of the great manufacturing centres of the United States, is situated at the head of navigation, on an arm of Narragansett Bay known as Providence River, 35 miles from the ocean and 44 miles by rail SSW. of Boston. It covers an area of over 18 square miles on both sides of the river, which, above its two bridges, expands into a cove, a mile in circuit, on the borders of which is a handsome park, shaded with noble elms. It is a city of large commerce, manufactures, and wealth, abounding with beautiful villas and gardens. Founded before the conventional type of American cities had been discovered, its streets are pleasantly irregular, and the site singularly uneven, rising in one place to

204 feet above high-water; and there are numerous hills and valleys. Among the many notable public buildings and institutions of Providence are a city hall, of granite; facing it the state's soldiers' monument; the state-house; the custom-house and post-office; the Athenæum, and the buildings of the Rhode Island Historical Society; the arcade and the Butler Exchange; a great number of churches, schools, and libraries, hospitals and asylums, including a noble charity known as the Dexter Asylum for the Poor; the Friends' Boarding-school (popularly 'the Quaker College'); and Brown University, a Baptist institution, founded in 1764, and amply endowed: it ranks among the leading colleges of the United States. Providence is a great oil port, and it has become one of the great manufacturing centres of the country; two small rivers afford abundant water-power. The chief establishments are engaged in producing silver-ware, tools, screws, files, stoves, engines, cottons and woollens, &c.; and there are scores of manufactories of jewellery. Providence was settled in 1636 by Roger Williams. Pop. (1870) 68,904; (1880) 104,857; (1890) 132,146; (1900) 175,597; (1910) 224,326; (1920) 237,595; (1925) 267,918.

Province (Lat. *provincia*), a territory acquired by the Romans beyond the limits of Italy, and governed by a Roman Prætor (q.v.) or proprætor, or by a proconsul (see CONSUL). The senate decided which provinces were to be prætorian and which consular. As a rule the provinces were unmercifully plundered by the governors and the tax-collectors (*publicani*). Under Augustus there were twelve *imperial* provinces, requiring military occupation, and under the emperor's immediate control, and ten senatorial provinces, entrusted to senatorial management (see ROME). The provinces of France (q.v.) were superseded at the Revolution by the departments. The great governmental divisions of India, Canada, and other countries are often entitled provinces. The sphere of duty of an Archbishop (q.v.) is his province, usually consisting of several dioceses. The monastic orders are or were distributed in provinces of varying area; the *provincial*, in its monastic reference, is the superior of all the houses and all the members of a monastic order within any particular province. See GENERAL, MONACHISM.

Provins, a town of France (dept. Seine-et-Marne), by rail 59 miles SE. of Paris, has remains of ancient walls, flanked by ruined watch-towers. The most interesting feature is an ancient tower, built in the 12th century, vulgarly called Cæsar's Tower. The neighbourhood was long famous for its roses, and they are still cultivated. There are numerous flour-mills. Pop. 9000.

Provisional Order is an order granted, under the powers conferred by an act of parliament, by a department of the government, by the Secretary of State, or by some other authority, whereby certain things are authorised to be done which could be accomplished otherwise only by an act of parliament. The order does not receive effect, however, until it has been confirmed by the legislature. Till that time it is purely provisional; and even after it has been so confirmed and is in reality an independent act, it retains the title of a provisional order. Provisional orders are most useful in facilitating the modification or extension of the provisions of general acts, so as to adapt them to the special necessities of particular districts. They may be obtained with much greater expedition and less cost than a private bill; the confirmatory act when unopposed may be obtained in a week or two, and has all the facilities of a government measure.

Provisions of Oxford. See MONTFORT.

Provisors, STATUTE OF. The object of this statute, passed in the reign of Edward III. (1350), was to correct and put an end to the abuses which had arisen in the exercise of the papal prerogatives as to the disposal of benefices in England. See ENGLAND (CHURCH OF).

Provo, capital of Utah county, Utah, is on the Provo River, between Utah Lake and the Wahsatch Mountains, and 46 miles by rail SSE. of Salt Lake City. It contains a state asylum and a Mormon university. Pop. 10,000.

Provost (Lat. *prepositus*, 'set over'), in Church Law, the chief dignitary of a cathedral or collegiate church, from which use the title has also been transferred to the heads of other bodies, religious, literary, or administrative. The name is also given to the superiors of certain religious houses of lesser rank, and the relation of which to the more important houses is analogous to that of the priory to the abbey. The head of a cathedral chapter was anciently the archdeacon. At present, in the Roman Catholic Church, cathedral chapters are presided over by provosts in Austria, Prussia, Bavaria, and England, but in other parts of Germany and in France by deans. In the Church of England the Dean (q.v.) is the chief officer of a cathedral; but the title of provost survives, alongside that of dean, in the Scottish Episcopal Church. In the Protestant Church in Germany, in the north especially, where several minor churches or chapels are attached to one chief church, the minister of the latter is called provost (*probst*). In England the heads of Oriel, Queen's, and Worcester colleges in the university of Oxford, and the head of King's College, Cambridge, are designated provost. The head of Eton College is also so called.

In Scotland the chief municipal magistrate of a city or burgh is called provost, the term corresponding to the English word mayor. The provost presides in the civic courts along with the bailies, who are his deputies (see BOROUGH). The provosts of Edinburgh, Glasgow, Aberdeen, Perth, and Dundee, are styled Lord Provost. The Lord Provost of Edinburgh is entitled to the prefix 'Right Honourable,' which may be attached not merely to the name of his office, but to his Christian name and surname. The Lord Provost of Glasgow is also (since 1912) Right Honourable. See ADDRESS (FORMS OF), PRECEDENCE. Within the city and liberties of Edinburgh the Lord Provost takes precedence next after members of the royal family.

Provost-marshal, in the Navy, is a person appointed to have charge of a prisoner before a court-martial, and until the sentence of the court is carried into execution. In the British Army the provost-marshal is an officer, appointed only abroad, to superintend the preservation of order, and to be, as it were, the head of the police of any particular camp or district. He has cognisance of all camp-followers, as well as of members of the army. Under the Army Act of 1881 he cannot as formerly inflict any punishment of his own authority, but may apprehend any offender and bring him before a court-martial. It may then be his duty to see the sentence of the court carried out.

Proxy (contracted for Procuracy), a person who acts as substitute for another for some particular purpose, such as voting at a meeting. Also, the document constituting such relationship. Every member of the House of Lords was formerly permitted to appoint another lord his proxy to vote for him in his absence. Only a spiritual lord could be proxy for a spiritual lord, and a temporal for a temporal lord, and no peer could hold more than two proxies at the same time. Proxies were

never used in judicial business, or in committees of the House, nor could a proxy sign a protest. The practice of admitting proxies in the House of Lords was discontinued in 1868. Shareholders in joint-stock companies may vote by proxy. Formerly princely persons were sometimes, for reasons of state or convenience, represented by deputy at their own marriages; but marriage by proxy is not recognised by the law of England. See **MARRIAGE**.

Prudentius, **MARCUS AURELIUS CLEMENS**, the most important of the Roman Christian poets, was born in the north of Spain in 348 A.D. Nothing is known regarding him except what he has himself told in a poetical autobiography prefixed to his works. From this we learn that he received a liberal education, practised as a pleader, discharged the functions of civil and criminal judge, and was ultimately appointed to a high office at the imperial court. His religious convictions came late in life, and he devoted the evening of his days to the composition of religious poetry. The year of his death is not known. Of his poems the chief are (1) *Cathemerinon Liber*, a series of twelve hortatory hymns, the first half for the different hours of the day, the latter half for different church seasons (Eng. trans. 1845); (2) *Peristephanon*, a collection of fourteen lyrical poems in honour of martyrs; (3) *Apotheosis*, a defence of the doctrine of the Trinity against heretics; (4) *Hamartigeneia*, on the Origin of Evil, a polemic, in verse, against the Marcionites; (5) *Psychomachia*, on the Triumph of the Christian Graces in the Soul of a Believer; (6) *Contra Symmachum*, the first book a polemic against the heathen gods, the second against a petition of Symmachus for the restoration of the altar and statue of Victory cast down by Gratian; (7) *Diptychon*, a series of forty-nine hexameters, arranged in four verses, on scriptural incidents and personages. Bentley calls Prudentius 'the Horace and Virgil of the Christians,' which may be true enough if the critic only meant to say that he is the first of the early Christian verse-makers. See the article **HYMN**.

Editions are by F. Areval (Rome, 1788), reprinted in Migne's *Patrologia*, lix.-lx.; Obbar (Tübingen, 1845); and Dressel (Leip. 1860). See Brockhaus, *A. Prudentius* (1872); Ebert, *Geschichte der Christlich-Latein. Lit.* (vol. i. 1874); Faguet, *De A. Prudentii Clementis Carm. lyricis* (1883); and F. St John Thackeray, *Translations from Prudentius* (1890), with an excellent introduction on his life and times, metre, and style. See also Dr Bigg's *Wayside Sketches* (1906).

Prud'hommes, **COUNCILS OF**. See **FRANCE**.

Prunella, or **BRUNELLA**, a genus of Labiatae. Several species are natives of Europe; one only is found in Britain, *P. vulgaris*, popularly known as Self-heal, a plant very frequent in moist and barren pastures, as it is also throughout most parts of Europe, central Asia, North America, and Australia—once in repute as a febrifuge.

Prunes are dried fruit of the plum-tree (*Prunus domestica*), largely prepared in France, and exported thence. Great numbers come also from Bosnia, Serbia, Italy, California, and Japan; the 'Kelsey' plum producing larger and finer prunes than even the famous Agen plum of the south of France.

Pruning, the removal of branches from trees, in order to the greater production of fruit, the improvement of timber, or purposes of ornament. Some trees will bear clipping which would be utterly destructive of others. Fantastic forms, once esteemed as the finest ornaments of a pleasure-ground are rejected by the simpler taste of the present age, and the 'topiarian art' has few admirers. Much may be done however, by the removal of branches to give a finer form to ornamental trees; but in

this, as in the pruning of trees grown for the sake of their timber, a great mistake is very generally committed in permitting branches to grow to a considerable size before they are cut off. It may be accepted as a general rule that the branches removed should be small in proportion to the bulk of the trunk. The removal of twigs and small branches is attended by no bad effects, and may be beneficial; but the removal of large branches is dangerous. The leaving of stumps or snags is an aggravation of the evil. They rot away and spoil the timber of the stem; indeed, a hole is not unfrequently formed, which may eventually lead to the rotting of the whole of the interior of the trunk of the largest oak. But in the case of forest trees pruning may with advantage be in great part avoided, by taking care to plant at proper distances, and thinning out the plantations sufficiently in early periods of their growth. In this way better timber is obtained and a greater produce from the land. Pines and firs scarcely ever require pruning, and are probably in almost all cases the worse of that which they get, except in the removal of those lower branches which have actually begun to decay. In other trees it is sometimes of importance to watch for branches that would divide the trunk, and to prevent the division, causing the main stem to ascend higher before it forms a crown; but to be of any use this must be done whilst the branches are still very young. Plantations should therefore be examined with a view to pruning, at intervals of not more than two years, after they are six or eight years old.

In orchards and fruit-gardens pruning is necessary, the object being not to produce timber, or the utmost luxuriance of trees, but fruit in the greatest perfection and abundance. The habits of each kind must be studied. Even in the pruning of gooseberry and currant bushes regard must be had to natural diversities, the gooseberry and black-currant producing fruit chiefly on young wood, whilst the red and white currant produce fruit chiefly on spurs from older branches. And so it is amongst trees; apricots, for example, producing fruit chiefly on young wood, cherries mostly on spurs, whilst plums produce both in the one way and in the other. The object of the gardener in pruning is to bring the tree into the condition best suited for producing fine fruit and in the greatest abundance; and to this the training of wall trees must also be accommodated. Sometimes, in order to produce particularly fine fruits for special purposes, the gardener diminishes the number of branches likely to bear fruit beyond what would otherwise be desirable. The Lorette system seeks to promote fruit-bud development at the expense of shoots in fruit trees by a special form of pruning in June or July. The general seasons of pruning are winter and spring; but some trees, particularly cherries and all other drupaceous fruit trees, are advantageously pruned in summer, as they then throw out less gum.

Pruning instruments are of various kinds—knives, axes, saws, bills of very various forms, &c.; and the misnamed *averruncator*, which may be described as a pair of scissors, one blade hooked or crooked, attached to a long handle, and working by a cord and pulley. It is scarcely used except for standard trees in gardens and orchards.

Prunus. See **PLUM**, **CHERRY**, **APRICOT**, &c.

Prurigo is the name applied to a group of diseases of the skin, characterised by the presence of papules, scarcely distinguishable in colour from the normal skin, and so felt rather than seen, accompanied by intense itching. One form of the disease, *prurigo senilis*, is met with in old people. Another form set up by the irritation of lice dis-

appears when these are removed. In its most characteristic form, however, it almost always begins in childhood, and may persist through life: even when it is got rid of for a time it is very apt to recur. It chiefly affects the trunk and extensor surfaces of the limbs, and is worse in winter. The disease is aggravated by the scratching from which the sufferer cannot refrain, and the skin becomes thickened and often eczematous as well. Warm baths and soothing ointments externally, good feeding, cod-liver oil, and arsenic or quinine are generally found to give great relief, and often cure the disease entirely.

Prussia (*Freistaat Preussen*), by far the largest and most important state in the German Reich, is a republic embracing nearly the whole of northern Germany. Prussia includes moreover Hohenzollern (q.v.) and some smaller exclaves or detached territories lying within the bounds of other German states. The area, without the temporarily severed Saar region (see RHEINLAND), is 113,109 sq. m., with (1925) 38,170,633 inhabitants—so that the state comprises nearly two-thirds of the entire German Reich, with over three-fifths of the population; and in area is about equal to the state of Arizona, or somewhat less than Great Britain and Ireland. The following are the provinces into which Prussia is divided:

	Pop. in 1919.	Pop. in 1925.
East Prussia (Ostpreussen).....	2,227,826	2,274,152
Brandenburg.....	2,445,627	2,618,507
Berlin.....	3,808,770	3,981,071
Pomerania (Pommern).....	1,789,216	1,920,196
Grenzmark.....	324,796	387,819
Lower Silesia (Niederschlesien).....	2,988,613	3,158,983
Upper Silesia (Oberschlesien).....	1,299,072	1,372,303
Prussian Saxony (Provinz Sachsen).....	3,129,193	3,281,298
Sleswick-Holstein (Schleswig-Holstein).....	1,483,668	1,585,588
Hanover (Hanover).....	3,027,864	3,211,205
Westphalia (Westfalen).....	4,491,507	4,826,885
Hesse-Nassau (Hessen-Nassau).....	2,273,502	2,408,792
Rheinland.....	6,782,831	7,232,071
Hohenzollern.....	70,751	72,968

Total *... 38,100,236 38,170,633

* Not including the Prussian part of the Saar Territory, which in 1922 had 632,413 inhabitants.

Omitting Berlin, the density of population ranges between 113.5 (Grenzmark) and 763.4 (Rheinland) per sq. m. The Prussia of Frederick the Great embraced only 47,800 sq. m. when he ascended the throne, and 75,000 when he died. In the latter half of the 19th century Prussia increased in area by about one-fourth, the greatest gains being after the victorious war of 1866. By the Great War she lost over 20,000 sq. m. In 1819 the population was 10,981,934; in 1864, 19,254,649; in 1871, 24,689,252; in 1895, 31,855,123; in 1910, 35,000,493.

PHYSICAL FEATURES. *Mountains.*—The greater part of Prussia belongs to the north European plain, while only about a third, chiefly in the south-west, can be described as hilly or mountainous. The division line between the two districts is roughly indicated by an irregular series of heights beginning with the Teutoburgerwald, to the east of the upper Ems, and the Weser Hills, on both sides of the upper Weser, and thence running towards the south-east in the Harz Mountains (q.v.), with the Brocken (3740 feet), and in the northern outliers of the Thüringerwald (Finsterberg, 3100 feet; Inselsberg, 3000 feet). Farther to the south-east this line of heights is continued by the Riesengebirge (q.v.), separating Prussian Silesia from Bohemia, and forming the northern ranges of the Sudetic system. None of these ranges rise above about 5000 feet; the Schneekoppe (5250 feet) in the Riesengebirge is the loftiest summit on Prussian territory. The western and south-western parts of the country, comprising Rheinland, Westphalia, and Hesse-Nassau, thus cut off from the sandy and heathy wastes of the north, are quite distinct in

their physical character from the rest of Prussia. They are divided by the Rhine into two portions. On the west side of the river, between Aachen and the Moselle, is the elevated plain known as the Hohes Venn (now partly in Belgium) and the Eifel, which has a mean elevation of 1600 feet, with a few higher hills (Hohe Acht, 2490 feet). South of the Moselle, and parallel with that river, stretches the Hunsrück, with an average height of 1200 to 1500 feet, and farther south is the Harzt, the northern extremity of the Vosges. On the east side of the Rhine the Sauerland, between the Ruhr and the Sieg, with the Rothaar or Rotlagergebirge, is succeeded farther south by the Westerwald (Fuchskauten, 2155 feet), between the Sieg and the Lahn, and by the Taunus (Feldberg, 2885 feet), between the Lahn and the Main. To the south of the Taunus, famous for its mineral springs, lies the fertile valley of the Main, while to the east the Vogelsberg, chiefly, however, in Hesse, forms a link with the Hohe Rhön (Wasserkuppe, 3115 feet), which may be regarded as an outlier of the Thüringerwald. The soil is generally poor in these districts, though they possess special sources of wealth in their iron and coal mines. The level country between the Rhine and the Maas, bordering the Eifel, is, however, extremely fertile; and Hesse-Cassel is particularly fruitful, cereals of all kinds growing abundantly. The great northern plain, which occupies the rest of the state, is varied by two terrace-like elevations already described under GERMANY. The surface is diversified with numerous lakes, especially in the east, on what are known as the Pomeranian and East Prussian Lake-plateaus. The soil, consisting chiefly of loose sand interspersed with a large number of erratic blocks of granite, is sterile, covered in many places with heaths and belts of stunted pines. On the northern slope, terminating on the shores of the Baltic, there are several fertile districts, more especially along those rivers which have been carefully embanked. The southern elevation of the Prussian plain, running between Poland in the south-east and the Elbe between Magdeburg and Burg in the north-west, attains a height of about 1000 feet near Breslau on the Oder, where it is known as the Trebnitz Heights. Its general character is more fertile than the northern elevation; while the country between the two is, for the most part, extremely sterile. It includes the sandy waste in which Berlin, the capital, is situated. South of this tract, and in Silesia and Prussian Saxony, the country is fertile, including some of the most productive grain-growing districts of Prussia. Hanover has much the same character. Great marshes or peat-moors cover the north and north-west districts; but the valleys that lie among the Harz Mountains in the south are often fertile, and well adapted for agriculture. The coasts are low, and require to be protected from the overflowing of the sea by embankments and dykes. Sleswick-Holstein, to the north of the Elbe, is in part sandy and heathy, like the plain of Hanover, but it has also numerous marshes.

Rivers.—The northern plain is watered by five large rivers—the Niemen, Vistula, Oder, Elbe, and Weser—all of which rise beyond the borders of the state, and the Pregel, Eider, and Ems, which are exclusively Prussian. In the west the chief river is the Rhine, which enters Prussia at Mainz, and thence flows north through a narrow valley noted as one of the most picturesque parts of Germany. The Rhine, which is navigable throughout its entire course in Prussian territory, receives numerous tributaries—as the Lahn, Wied, Sieg, Wupper, Ruhr, Lippe, Berkel, and Vechte, on the right, and on the left the Ahr and the Moselle or Mosel, the latter of which is navigable for more

than 150 miles within the Prussian dominions. The Weser, Elbe, Oder, and Vistula, as also the Spree and Havel, affluents of the Elbe, are, with their canals, of high importance for the inland navigation of Prussia, and are discussed in special articles.

Climate.—The climate of Prussia presents great differences in the eastern and western provinces, the former being exposed to heavy snowstorms in winter and great drought in summer, while the latter have milder winters and a greater rainfall. At Berlin the annual mean temperature is 48° F.; on the Rhine it is 49° (summer, 63°; winter, 34°); in the east provinces and among the mountains it is below 43° (summer, 61°; winter, 25°).

Productions.—Agriculture and the rearing of cattle constitute the principal sources of employment and wealth of the rural population of Prussia, and the state has directed unremitting attention to the furtherance of the one and the improvement of the other. Rye, wheat, oats, barley, peas, millet, rape-seed, maize, linseed, beet-root, potatoes, tobacco, flax, hemp, hops, chicory are extensively cultivated. The finest grain districts are the Börde, near Magdeburg, the low lands on the Warthe and Netze, and on the Plöne and Müritzer lakes, the north-eastern parts of Pomerania, the island of Rügen, the valleys of the Oder in Silesia, of the Saale, Moselle, Saar, and parts of Hesse-Nassau. Magdeburg is the centre of the beet-root sugar industry. Western Prussia is noted for its excellent fruits and vegetables, and its provinces stand pre-eminent for their wines. Nassau is specially famous for its Rhine wines. The forest-lands, which are chiefly in East Prussia, Upper Silesia, Westphalia, Southern Hanover, and Hesse-Nassau, are of great value and considerable extent. The mineral products of Prussia include coal, iron, lead, zinc, copper, cobalt, antimony, manganese, arsenic, sulphur, alum, nickel, black lead, baryta, gypsum, slate, lime, freestone, salt, amber, agate, jasper, onyx, &c. The chief coalfields are in Silesia, Westphalia, and Rheinland, which are at the same time the chief industrial provinces. The region of the Harz in Hanover is also famous for its mining industries. Of mineral springs the most noted and efficient are the sulphur baths of Aachen and Ems, the iron springs of Schwalbach, Wilhelmsbad, Driburg, and the hot and saline baths of Reinerz, Landeck, Flinsberg, Freienwalde, Lauchstädt, Wiesbaden, Schlangenbad, and Selters. East Prussia is noted for its excellent breed of horses. Westphalia enjoys a special reputation for its hams and pork, Pomerania for its smoked geese, and Brandenburg and Hanover for honey and wax. Fish of all sorts are abundant in the rivers and numerous lakes; seals are taken in the Baltic. The wooded districts abound in game of every kind, partridges and wild geese being often found in enormous quantities. Besides stags, fallow-deer, wild boars, foxes, otters, weasels, polecats, martens, badgers, hares, and rabbits, the bear and beaver are occasionally met with, as is the eagle.

Manufactures.—The principal manufactures are linens, for which certain districts of Silesia, Prussian Saxony, and Brandenburg enjoy a European celebrity; while the newer cotton industry has maintained a successful rivalry with the older linens. Besides these there are numerous manufacturing of silk, wool, mixed cotton and linen fabrics; including fine shawls and carpets in Brandenburg, stockings and ribbons in Rheinland, where, as well as in Westphalia and Hesse-Nassau, the flax, hemp, and silk and cotton thread is mainly prepared for the manufacturers. These districts, moreover, stand foremost in regard to the preparation and manufacture of iron, steel (the works of Krupp, at Essen, being world-famous), and other metallic wares, paper, leather, soap, oil, cigars,

and tobacco, and for the number of their distilleries and breweries; while Saxony and Silesia have the largest number of chicory, starch, beet-root, gunpowder, and glass works.

Commerce.—The commerce of Prussia is materially facilitated by her central European position, and the network of river and canal navigation, which makes her territories the connecting medium between several of the great European states, and which, with 20,000 miles of railway, a great system of public roads (all, or nearly all, formed since the time of Frederick the Great), and a coast-line on two seas, gives her a free outlet to the rest of the world. The chief ports are Pillau, Königsberg, Kolberg, Swinemünde, Stettin, Wolgast, Stralsund, Kiel, Flensburg, Altona, Harburg, Geestemünde, Leer, and Emden. The principal commercial towns are Berlin, Königsberg, Breslau, Barmen, Elberfeld, Stettin, Cologne (Cöln), Magdeburg, Aachen, and Frankfurt-on-the-Main. Annual fairs are held at Breslau, Magdeburg, the two Frankfurts, Cologne, and Königsberg.

Religion.—Two-thirds of the people are Protestants. The districts lost by the Great War were mainly Catholic. Since 1817 the Lutheran and Reformed Churches have been united. There is no state church.

Education.—Education is compulsory in Prussia between the ages of six and fourteen, and its management and direction are under the control of the state. In no country are better or ampler means supplied for the diffusion of knowledge among all classes of the community. Prussia has twelve universities—viz. Königsberg, Berlin, Greifswald, Breslau, Halle, Göttingen, Münster, Bonn, Kiel, Marburg, Frankfurt-on-the-Main, and Cologne. See GERMANY. In addition to the libraries of the several universities there is the Landesbibliothek, formerly the Royal Library, at Berlin. See LIBRARY.

Constitution.—Prussia was an absolute monarchy till the crisis of 1848, when the decided movement in favour of liberal views compelled the king to convoke a national assembly, and submit to the establishment of a constitutional form of government, which was repeatedly modified. A republic was proclaimed 18th November 1918. Under the constitution of 30th November 1920 the Landtag is elected for four years on the principle of proportional representation by equal secret and direct vote of citizens (male and female) of twenty years of age. The Landtag elects the minister-president, and the ministry chosen by him is at the head of the government. The provincial diets elect the Staatsrat. Its veto can be annulled by a two-thirds majority of the Landtag, or by a simple majority of the people voting on the initiative of the Landtag. Initiative of the people may be exercised on demand of one-twentieth of the electors, or, for an amendment of the constitution, one-fifth.

History.—The lands bounded by the Baltic, which now form East Prussia, were early occupied by a people speaking Old Prussian, a tongue belonging not to the Germanic family but to the Baltic, nearly allied to Lettish and Lithuanian. Beyond the fact of their having come into temporary conflict with the Goths and other Teutonic hordes prior to the great exodus of the latter from their northern homes, little is known of the people till the 10th century, when they first appear in history under the name of Borussi, or Prussians. In 997 Bishop Adalbert of Prague suffered martyrdom at their hands while endeavouring to convert them to Christianity. Boleslas, Duke of Poland, succeeded, however, about 1018, in compelling them to submit to baptism and subjection. After many futile attempts on the part of the people

to throw off the yoke of Christianity and foreign domination, they finally made a successful stand against Boleslas IV. of Poland in 1161, and for a time maintained a rude and savage kind of independence, which the disturbed condition of Poland prevented its rulers from breaking down. The fear of losing their freedom if they adopted Christianity made the Prussians obstinately resist every effort for their conversion; and it was not till the middle of the 13th century, when the knights of the Teutonic order began their famous crusade against them (see TEUTONIC KNIGHTS), that the Christian faith was established among them. The inroads of the pagan Prussians on the territories of their Christian neighbours, and their advance into Pomerania, were the exciting causes of this important movement. The knights of the order, when appealed to by Conrad, Duke of Masovia, to aid in the subjection of the heathen, gladly promised their services on condition of being permitted to retain possession of the lands which they might conquer; and, having entered the Prussian territories in considerable numbers, they entrenched themselves in Vogelsang and Nessau in 1230, and at once entered upon the conquest of Prussia. For half a century the belligerent brotherhood were engaged in war with the people—winning lands and souls by hard fighting—until at length in 1283 they found themselves undisputed masters of the country, which they had both civilised and Christianised after a fashion—that is to say, by almost exterminating the pagan population. During this period of struggle the knights founded the cities of Thorn, Kulm, Marienwerder, Memel, and Königsberg, repopled the country with German colonists, encouraged agriculture and trade, and laid the foundation of a well-ordered, prosperous state. The unhappy wars between the knights and the Poles and Lithuanians, together with the moral degeneracy of the order, led, in the 14th and 15th centuries, to the gradual decline of their supremacy. In 1454 the municipal and noble classes, with the co-operation of Poland, rose in open rebellion against the knights, who were finally compelled to seek peace at any cost, and obliged in 1466 to accept the terms offered to them by the treaty of Thorn, by which West Prussia and Ermland were ceded by them unconditionally to Poland, and the remainder of their territories declared to be fiefs of that kingdom. In 1511 the knights elected as their grand-master the Markgraf Albert of Anspach and Baireuth, a kinsman of the king of Poland, and a scion of the Frankish line of the Hohenzollern family. Although his election did not immediately result, as the knights had hoped, in securing them allies powerful enough to aid them in emancipating themselves from Polish domination, it was fraught with important consequences to Germany at large, no less than to the order itself. In 1525 the grand-master was acknowledged Duke of Prussia, which was converted into a secular duchy (afterwards known as East Prussia), and renounced the Roman Catholic religion for Lutheranism, his example being followed by many of the knights. The country made rapid advances under the rule of Albert, who improved the mode of administering the law, restored some order to the finances of the state, established schools, founded the university of Königsberg (1544), and caused the Bible to be translated into Polish, and several books of instruction to be printed in German, Polish, and Lithuanian. His son and successor, Albert Frederick, having become insane, a regency was appointed. Several of his kinsmen in turn enjoyed the dignity of regent, and finally his son-in-law, Johann Sigismund, elector of Brandenburg, after having held the administration of affairs in his hands for some

years, was, on the death of the duke in 1618, recognised as his successor, both by the people and by the king of Poland, from whom he received the investiture of the duchy of Prussia. From that period to 1918, Prussia was governed by the Hohenzollern-Brandenburg House.

Here it will be necessary to retrace our steps in order briefly to consider the political and dynastic relations of the other parts of the Prussian state. In 1134 the North Mark, afterwards called the Altmark, a district west of the Elbe and north-east of the Harz, was bestowed upon Albert the Bear of Luxemburg, who extended his dominion over the marshy region near Brandenburg and Berlin (the Mittelmark), and assumed the title of markgraf of Brandenburg. During the next two or three centuries his immediate descendants advanced still farther eastward, beyond the Oder into Further Pomerania. On the extinction of this line, known as the Ascanian House, in 1319, a century of strife and disorder followed, until finally Frederick VI., count of Hohenzollern, and markgraf of Nürnberg, became possessed, partly by purchase and partly by investiture from the Emperor Sigismund, of the Brandenburg lands, which, in his favour, were constituted into an electorate. This prince, known as the Elector Frederick I., received his investiture in 1417. He united under his rule, in addition to his hereditary Franconian lands of Anspach and Baireuth, a territory of more than 11,000 sq. m. His reign was disturbed by the insubordination of the nobles, and the constant incursions of his Prussian and Polish neighbours, but by his firmness and resolution he restored order at home and enlarged his boundaries. Under Frederick's successors the Brandenburg territory was augmented by the addition of many new acquisitions, although the system of granting appanages to the younger members of the reigning house, common at that time, deprived the electorate of some of its original domains. The *Dispositio Achillea*, however, which came into operation on the death of the Elector Albert Achilles (1470–86), while it separated Anspach and Brandenburg, legally established the principle of primogeniture in both. The most considerable addition to the electorate was the one to which reference has already been made, and which fell to the Elector John Sigismund through his marriage in 1609 with Anne, daughter and heiress of Albert Frederick the Insane, Duke of Prussia. In consequence of this alliance the duchy of Cleves, the countships of Ravensberg, the Mark, and Limburg, and the extensive duchy of Prussia, now known as East Prussia, became incorporated with the Brandenburg territories, which were thus more than doubled in area.

The reign of John Sigismund's successor, George-William (1619–40), was distracted by the miseries of the Thirty Years' War, and the country was alternately the prey of Swedish and imperial armies; and on the accession of George-William's son, Frederick-William (q.v.), the 'Great Elector,' in 1640, the electorate was sunk in the lowest depths of social misery and financial embarrassment. But so wise, prudent, and vigorous was the government of this prince that at his death in 1688 he left a well-filled exchequer, and a fairly-equipped army of 38,000 men; while the electorate, which now possessed a population of one and a half million and an area of 43,000 sq. m., had been raised by his genius to the rank of a great European power. His successors Frederick I. (q.v.; 1688–1713) and Frederick-William I. (1713–40) each in his own way increased the power and credit of Prussia, which had been in 1701 raised to the rank of a kingdom. The latter monarch was distinguished for his rigid economy of the public

money and an extraordinary penchant for tall soldiers, and left to his son Frederick II. (q.v.), Frederick the Great, a compact and prosperous state, a well-disciplined army, and a sum of nearly nine million thalers in his treasury. Frederick II. (1740-86) dexterously availed himself of the extraordinary advantages of his position to raise Prussia to the rank of one of the great political powers of Europe. In the intervals between his great wars he devoted all his energies to the improvement of the state, by encouraging agriculture, trade, and commerce, and reorganising the military, financial, and judicial departments of the state. By his liberal views in regard to religion, science, and government he inaugurated a system whose results reacted on the whole of Europe; and in Germany more especially he gave a new stimulus to thought, and roused the dormant patriotism of the people. Frederick was not over-scrupulous in his means of enlarging his dominions, as he proved by sharing in the first partition of Poland in 1772, when he obtained as his portion nearly all West Prussia and several other districts in East Prussia. His nephew and successor, Frederick-William II. (1786-97), aggrandised his kingdom by the second and third partitions of Poland in 1793 and 1795. Frederick-William III. (q.v.; 1797-1840), who had been educated under the direction of his grand-uncle, Frederick the Great, succeeded his father in 1797, at a time of extreme difficulty, when continental rulers had no choice beyond being the opponents, the tools, or the victims of French republican ambition. By endeavouring to maintain a neutral attitude Prussia lost her political importance, and gained no real friends, but many covert enemies. But the calamities which this line of policy brought upon Prussia roused Frederick-William from his apathy, and, with energy, perseverance, and self-denial worthy of all praise, he devoted himself, with his great minister Stein, seconded by Count Hardenberg, to the reorganisation of the state. In the years 1806-10 Prussia underwent a complete domestic reorganisation; and after the battle of Waterloo, which restored to Prussia much of the territory lost at the peace of Tilsit in 1807, the career of progress was continued. Trade received a new impulse through the various commercial treaties made with the maritime nations of the world, the formation of excellent roads, the establishment of steam and sailing packets on the great rivers, and at a later period through the organisation of the Zollverein (q.v.), and through the formation of railways. The most ample and liberal provision was made for the diffusion of education over every part of the kingdom, and to every class. In like manner, the established Protestant Church was enriched by the newly-inaugurated system of government subvention, churches were built, the emoluments of the clergy were raised, and their dwellings improved; but, not content with that, the king forcibly united the Lutheran and Reformed Churches in 1817, a high-handed act most fruitful in discontent and difficulties. This tendency to over-legislation was long the predominating evil feature of Prussian administration; and the state, without regard to the incongruous elements of which it was composed, was divided and subdivided into governmental departments, which in their turn, under some head or other, brought every individual act under governmental supervision, to the utter annihilation of political independence. The people soon perceived that this administrative machinery made no provision for political and civil liberty, and demanded of the king the fulfilment of the promise he had given in 1815 of establishing a representative constitution for the whole kingdom. This demand was not, acceded to by the king, and its immediate fruits were strenuous

efforts on his part to check the spirit of liberalism. Siding with the pietists of Germany, he introduced a sort of Jesuitical despotism, which was continued by his successor, Frederick-William IV. The Landstände or provincial estates, organised in accordance with the system of the middle ages, were the sole and inadequate mode of representation granted to Prussia in this reign, notwithstanding the pledge made to the nation for a full and general representative government. The accession of Frederick-William IV. (1840-61) seemed to open a better prospect to the friends of constitutional freedom. A political amnesty was proclaimed, religious toleration was announced, and a contest betwixt the crown and the pope, in which the first signs of the coming Kulturkampf may be traced, was brought to a close by concessions on the part of the king. Frederick-William, however, was an enthusiastic upholder of the divine right of kings, and it soon became apparent that he was in no way prepared to follow up his vague promises of political liberty by sharing political power with the people. The bureaucratic spirit of over-governing became daily more and more irksome to the nation, and it was evident that a constitutional struggle was inevitable. The king and his advisers, underrating the importance of the movement of 1848 in Germany, thought they had satisfied the requirements of the hour by granting a few unimportant reforms and by making equivocal promises of future concessions. A collision betwixt the troops and the citizens of Berlin, in which blood was shed, awoke the king to the full gravity of the crisis, and he hastened to allay the general discontent by the nomination of a liberal ministry, the recognition of a civic guard, and the summoning of a representative chamber to discuss the proposed constitution. The conversion of the monarch to liberalism was but temporary; and although, after much obstruction, a constitution, superseding the old Prussian estates by a representative parliament, was promulgated in January 1850, it was repeatedly modified in the following years, until few of its democratic features were left. Frederick-William had early distinguished himself and delighted many Germans, both within and without Prussia, by his patriotic utterances in favour of a new united Germany. He was deeply chagrined when in 1848 the national assembly at Frankfurt, influenced by Austrian jealousy of the military strength of Prussia, declined to accept him as the national leader, and elected instead the Archduke John of Austria as lieutenant-general of Germany. Yet, when in the following year he was offered the imperial crown, he found himself unable to face the responsibility of accepting it. He hesitated to make so important a move in the contest with Austria for the hegemony of Germany. The later years of this reign were characterised by great advances in the material prosperity and internal improvement of the country. Extensive lines of railway and post-roads were opened, the river navigation greatly facilitated, treaties of commerce formed with foreign countries, and great expansion given to the Prussian and North German Zollverein (q.v.), the army put upon a footing of hitherto unprecedented efficiency of arms and artillery, and the educational system of the country still further developed. William I. (1861-88), who became German emperor in 1871, had been regent of the kingdom since 1858, owing to the insanity of his brother, the late king. William was no more a lover of constitutional, or at least of popular, liberty than any of his predecessors; and in his opposition to the progress of the popular movement, in so far as it aimed at interference with the regal power, he was powerfully aided by his great adviser Bismarck (q.v.), who became prime-minister

in 1862 and imperial chancellor in 1871. The successful wars with Austria (1866) and France (1870-71), which so enhanced the prestige of Prussia and which resulted in the united Germany of today, are described at GERMANY. Since the king of Prussia became German emperor the history of Prussia has been practically merged in the history of Germany. After the brief reign of Frederick III. (March 9 to June 15, 1888), his son, William II. (q.v.) ascended the throne. Prince Bismarck resigned all his ministerial functions in March 1890, as well in the kingdom as in the empire; and no subsequent Prussian minister has since exercised his predominant powers. Adhering to the military policy of his grandfather, and cherishing a more or less exalted belief in the divine right of kings, William II., by his unguarded and theatrical speeches, became an embarrassment to his people, and for its adversaries a symbol of militarism. He abdicated in November 1918, and Prussia was declared a republic. The loss of the Great War freed Prussia from the Hohenzollerns and from Junker rule, but it cost her much territory. Except Alsace-Lorraine, all the lands lost to the Reich were Prussian. Posen and West Prussia were almost wholly lost, and their remnants formed into the Grenzmark. For details, see articles on the various provinces. Since the setting-up of the republic there have been movements in favour of separating various provinces from the state, but these have completely failed. On the other hand, Pymont was by plebiscite detached from Waldeck in 1922, and became part of Prussia.

See, besides works cited at GERMANY, BERLIN, FREDERICK II., BISMARCK, &c., H. Tuttle, *History of Prussia* (Boston, 1884-88); Godefroy de Cavaignac, *Les Origines de la Prusse Contemporaine* (1890); Marriott and Robertson, *The Evolution of Prussia* (1915); Frutz, *Preussische Geschichte* (1900 et seq.).

Prussia, EAST, the north-easternmost province of Prussia and of Germany, now separated geographically from the rest of the Reich by the corridor to the Baltic, given to Poland by the Treaty of Versailles. The same treaty detached the north-eastern corner (see LITHUANIA, MEMEL), and a small area around Soldau in the south-west (now Polish). It provided for a plebiscite in the Masurian district of Allenstein, which, by an almost unanimous vote, decided in 1921 to remain German. The adjoining West Prussian districts, cut off by the Polish corridor, have been added to East Prussia. The province thus stretches from the Niemen to the Vistula, and includes the basin of the Pregel. It is low, with many lakes, of which Spirdingsee is the greatest. Two of the great lagoons of the Baltic are mostly within its bounds, Kurisches Haff and Frisches Haff. The capital is Königsberg. For history see PRUSSIA. Pop. (1925) 2,274,152.

Prussia, WEST, till 1919 a province of Prussia, whose expansion had made its name a misnomer. The Treaty of Versailles gave most of it to Poland (see POMORZE); made its capital (Danzig) a free state; and provided for a plebiscite in the Marienwerder district, which voted overwhelmingly for Germany. The eastern remnant (the plebiscite area and the country about Elbing) thereafter became part of East Prussia, and the western was combined with what was left of Posen (see GRENZMARK).

Prussian Blue, the name given to sesquiferrocyanide of iron, used as a colouring matter. It was discovered in 1704 by Diesbach in Berlin (whence it is also called Berlin Blue), and the manufacture was kept a secret till 1724. See BLUE; also DYEING.

Prussic Acid, a name given to Hydrocyanic Acid (q.v.) because it was first obtained from Prussian blue.

Prutenic Tables, astronomical tables compiled in the 16th century, and so called because based on the system of Copernicus, a Prussian. They were corrected by Brahe.

Pruth, a left-hand affluent of the Danube, rises in the south-east of Galicia, on the north-east side of the Carpathian mountains, and flows eastward past Kolomea and Czernowitz; from the point at which it leaves Bukowina to its embouchure in the Danube at Reni, 13 miles below Galatz, it forms the boundary between Bessarabia and Moldavia. Length about 520 miles, navigable from near Jassy, 168 miles.

Prynne, WILLIAM, born in 1600 at Swainswick near Bath, from Bath grammar-school passed in 1616 to Oriel College, Oxford, and took his B.A. in 1621. He entered Lincoln's Inn, and in due time was called to the bar, but was early drawn into the vortex of ecclesiastical controversy, and during 1627-30 published *The Unloveliness of Love-locks, Healths Sicknesses* (against drinking of healths), and three other Puritan and anti-Arminian diatribes. In 1633 appeared his *Histrio-Mastix: the Players Scourge*, in whose index, on page 1104, occur the words 'Women players notorious —'. Six weeks after its publication Henrietta Maria herself took part in a pastoral, so here was a reflection on the queen's own virtue; and on 17th February 1634 Prynne was sentenced by the Star-chamber to a fine of £5000, degradation from the bar, expulsion from Oxford and Lincoln's Inn, the loss of both ears in the pillory, and the shock to his vanity as an author of seeing his book burned in public by the hangman. He was, moreover, condemned to perpetual imprisonment, and immured in the Tower accordingly. Three years later the pertinacious offender found means to publish from his prison two more pamphlets, in which he fiercely assailed the hierarchy, and was unsparing in his personal abuse of Laud. For this he was once more prosecuted; a fresh fine of £5000 was imposed on him; he was a second time pilloried, losing such stumps of ears as the hangman before had spared; and was branded on both cheeks with *S. L.* ('seditious libeller'—rather 'stigmata Laudis' by Prynne's interpretation). He was removed successively to Lancaster, Carnarvon, and Mont Orgueil in Jersey, and remained a close prisoner till in 1640—the Long Parliament then sitting—he was released by a warrant of the House of Commons, and a tumultuous expression of popular sympathy celebrated his restoration to liberty. He acted as Laud's bitter prosecutor, leaving no stone unturned against his old enemy (1644); and in 1647 became recorder of Bath, in 1648 member for Newport in Cornwall. But opposing the Independents and Charles I.'s execution, he was one of those of whom Cromwell 'purged' the House of Commons, and was even imprisoned (1650-52) in Dunster, Taunton and Pendennis castles. On Cromwell's death he returned to his place in parliament, bestirring himself in the royalist interest; and after the Restoration Charles II. proposed to 'keep busy Mr Prynne quiet by letting him write against the Catholics, and pore over the records of the Tower,' of which records accordingly Prynne was appointed keeper. This did keep him fairly quiet until his death, which took place at Lincoln's Inn on 24th October 1669. 'Voluminous Prynne' Wood calls him; and the continuous stream of writings on the perilous topics of the day, which was always bringing him into trouble, represents but a fraction of his literary activity. He was a great compiler of constitutional history, his most valuable works in this field being

the *Calendar of Parliamentary Writs* and his *Records*, both of which contain much that is useful and important.

See vol. iii. of Howell's *State Trials; Documents relating to Prynn*, edited by S. R. Gardiner (Camden Society, 1877); and other works cited at CHARLES I. and LAUD.

Prytaneum, the town-hall of a Greek city, where the fire was kept perpetually burning, where ambassadors were received, where citizens who had deserved especially well of the state were sometimes allowed to live at the public expense; it was in fact the headquarters of the executive of the state. In Athens this body, the *prytaneis*, fifty in number, were chosen from the 500 members of the great council, five for each of the ten tribes. The five representatives of each tribe held office in rotation, one month at a time.

Przemysł, a town of Galicia, on the San, an affluent of the Vistula, 61 miles W. of Lemberg by rail. It is the seat of a Roman Catholic and a United Greek bishop, and a centre of the petroleum industry. Since 1874 it has been strongly fortified. Twice besieged by the Russians in the Great War (September–October 1914, October 1914–March 1915), it surrendered to Ivanov (22d March 1915), and was besieged and retaken by Mackensen (May–June 1915). Pop. 48,000, largely Jewish.

Psalmazar, GEORGE, 'the Formosan,' was born probably in Languedoc, between 1679 and 1685. Educated by monks and Jesuits at Avignon and elsewhere, he at sixteen turned vagabond, and for two or three years wandered through France, Germany, and the Low Countries, by turns an 'Irish pilgrim,' a 'Japanese convert,' a waiter, a 'heathen Formosan,' and a soldier. At last at Sluys he found a ready accomplice in one Innes, chaplain to a Scottish regiment, who baptised him 'George Lauder' after the governor, brought him over to London, and introduced him to Bishop Compton. For that credulous prelate he translated the Church Catechism into the 'Formosan' language; and to him he dedicated his *Historical and Geographical Description of Formosa* (1704, new ed. 1926), which deceived many in spite of its patent absurdities, such as that Formosa belonged, not to China, but Japan, and that the hearts of 18,000 boys were sacrificed every new year. The bishop sent him for six months to Oxford, and for a while he was lionised by the highest in the land. In spite, however, of his eating raw meat and enormous quantities of pepper and opium (an opium-eater he continued to the last), people gradually lost faith in him, or the novelty wore off, or by Law's *Serious Call* (1729) he was converted to a sense of the error of his ways. Anyhow, we find him the alleged importer of a white 'Formosan' enamel, a tutor, a regimental clerk (1715–17), a fan-painter, and lastly, for years a diligent hack-writer for the publishers. The *Universal History* was largely of his compiling; and his, too, a popular *Essay on Miracles*. But in all his strange life there is nothing stranger than the esteem expressed for him by Samuel Johnson. He was the man he 'sought after most,' 'the best man he ever knew,' a man whom 'he would as soon think of contradicting as a bishop,' and whose 'piety, penitence, and virtue exceeded almost what we read of as wonderful even in the lives of the saints.' An old man of fourscore years, he died in London on 3d May 1763.

See the autobiographical *Memoirs of * * * commonly known by the name of George Psalmazar* (1764), and Farrer, *Literary Forgeries* (1907).

Psalms, BOOK OF. This title indicates a collection of songs set to music (for use in the temple and probably sometimes in the synagogue). A more intelligible term, which like 'psalms'

is of Greek origin, and is specially favoured by Philo, is 'hymns'; this corresponds exactly to the Hebrew *thillim*, 'praises,' or 'songs of praise.' The eucharistic element is in fact the most essential one in the book: with the solitary exception of Ps. lxxxviii. there is an undercurrent of thanksgiving even in the most melancholy compositions (cf. Eph. v. 19, 20). There was, however, an earlier stage of psalmody, as a linguistic study of the Hebrew title assures us, when the service of religious song was of a very rough nature, and not under the control of guilds of singers. The ancient Arabs used a term (*tahill*) which corresponds to *thillah* for the shouting of a short consecrated formula, and the common root of both names means 'to call, cry out.' Only by degrees did the Israelitish 'psalmody' rise from a shouting like that of the vintage or the bridal night to the carefully trained singing of later times. Indeed, as late as the fall of Jerusalem the noise of the Babylonian soldiers in the temple is compared to that of the worshippers on one of the olden feast-days (Lam. ii. 7).

The question therefore arises, Can our present psalms, so spiritual in tone and in form comparatively so artistic, really be the very forms of prayer and praise used by the pre-exilic Israelites? Or have they literally driven out earlier and less spiritual compositions? Or lastly, have the older formulæ been greatly expanded and idealised, or even sometimes permitted to become imbedded in later works? For this last conjecture some analogies might perhaps be found in the prophetic literature (see, e.g., Isa. ii. 2–4, and Ewald, *The Prophets*, i. 82, 83), but it can only be admitted to a hearing on proof of the existence in a psalm of really strong inconsistencies of thought and language. Till that proof is given let us accept each psalm as the monument of some particular age, without attempting to extract by analysis fragments of earlier origin than the rest of the poem. To ascertain approximately that age or those ages is the function of criticism. True; but have the critics the means of doing this? 'When once it is admitted, as it must be admitted, that the titles cannot be absolutely relied on,' says an English commentator, 'we are launched upon a sea of uncertainty' (Kirkpatrick). By no means. The question of the origin of the Psalter is of course a complicated one, but we must not say that the student of complicated problems is like a mariner without a compass. There are three conditions upon compliance with which the disagreement of critics will be reduced within very narrow limits. The first is, that no critic should approach the Psalter until he has assimilated a good number of the best critical results which have been reached in other parts of the Old Testament. The second, that he should begin at the end of the Psalter—i.e. with Books iv. and v. (the date of which, as collections, cannot, for various reasons, be later than the accession of Simon the Maccabee), and work his way backwards. The third, that he should break radically with the custom of looking at each psalm by itself, with a view to determining its period. The reason of the first is that there are numerous similarities in language and in tone between the Psalms and other old Hebrew writings; many at least of which afford valid evidence of the date of the poems, the psalmists being in a high degree imitative, and infinitely more prone, for instance, to borrow from the prophets than the prophets to borrow from them. The reason of the second is that, the Psalter being a combination of five 'books' of psalms, it is natural to presume that the two last (which properly form but one book) are later as collections than the three first. These five books are (1) Ps. i–xli., (2) Ps. xlii–lxxii., (3) Ps. lxxiii–lxxxix., (4) Ps. xc–cvi., (5) Ps. cvii–cl.

And that of the third is that within these five 'books' there are certain minor books or psalters, which have certain common characteristics, and may, at any rate at the outset of the inquiry, be presumed to contain works of the same (not too strictly defined) period. These minor psalters are the Davidic (to which the 'Davidic' psalms in Books iv. and v. do not belong), the Korahite, the Asaphite, and the Songs of Ascent (i.e. of pilgrimage), commonly mis-called 'Songs of Degrees,' in addition to which there are various other groups of psalms, not marked by traditional headings, such as the Hallel and the Hallelujah psalms, the deutero-Isaianic (i.e. those which suggest the writer's acquaintance with the exilic portions of Isaiah), and the Jeremianic (i.e. those which from internal evidence were written either by Jeremiah or by a follower of that great prophet).

Thus, the conscious or unconscious object of recent criticism of the Psalms has been the imparting a stricter and more scientific character to the argument from internal evidence. Not the least difficult part of the work is that which relates to the linguistic phenomena, the evidential value of which has often been too much depreciated. This kind of evidence is no doubt rarely conclusive, but even in the case of the highly imitative psalm-literature will lead the critical student to some perhaps unforeseen results, unless indeed his way is barred by the arbitrary assumption that all the evidences of later date in the supposed pre-exilic psalms have been introduced by editors. And what upon the whole are the results of a criticism which does not float 'upon a sea of uncertainty?' Two very definite ones may be mentioned, with a warning, however, to the student that the criticism of the Psalter is so interwoven with that of other Old Testament books that many good Hebraists might hesitate to endorse even these moderately-stated results. First, that there is a considerable number of psalms belonging to the pre-Maccabean and Maccabean Greek portion of the post-exilic period (see especially Ps. xlix., lxxiv., lxxix., cx., cxviii., cxlix.). The possibility of this theory (which was virtually held by Theodore of Mopsuestia) is expressly admitted in the margin of our own 'Geneva Bible.' The objections to it are of various degrees of plausibility; none of them, however, are conclusive. It has been urged, for instance, that the so-called Psalms of Solomon (the composition of which falls between 63 B.C. and 46 B.C.) breathe an entirely different spirit from the psalms which may most plausibly be referred to the period of the Greek rule and of the Maccabean rising. But it can be easily shown that the latter event was a turning-point in Jewish religion, after which we might fairly expect a considerable difference in the tone even of liturgical poetry. Moreover, the phrase 'an entirely different spirit' is an exaggeration. There are certainly the germs of the Law and its praises in Psalms i., xix. 7-14, cxix., and those of later doctrines of immortality and resurrection may (if the late dates of Ps. xvi., xvii., xlix., lxxiii. be granted) be not unreasonably found in parts of the Psalter, while several of the 'Pharisaean' Psalms of Solomon contain passages strikingly parallel to our Ps. xlix. A second result is that none of the extant psalms are the genuine work of David, who was doubtless a gifted musician and poet (the early tradition on this point is clear), but whose hymns were probably too little in accordance with later ideas of art and of religion to escape the great literary as well as political catastrophe of the Exile. Contrast the life of David in the Books of Samuel with the character sketched, evidently from life, in the so-called Davidic psalms. Granting that David lived in the service of an ideal which he sought, but often failed, to realise, could that ideal

have agreed with the picture presented to us in the Psalter? How much is there in the tone or the ideas or the implied circumstances of the psalms which agrees with the tone or ideas of the traditional speeches of David and with his traditional history? Enough perhaps to permit us to regard him as a far-off adumbration of the nobler members of the post-exilic church, and therefore also of Him who was the 'root and offspring of David' (Rev. xxii. 16), but scarcely more than this. Indeed the only doubt is, not so much whether any psalms are Davidic, but whether any are even pre-exilic at all. The fact (which, even without scientific proof, it would be unreasonable to doubt) that David composed some psalms was enough to make collectors call certain psalms, or collections of psalms, by his name, somewhat as the various expansions of the older law in different ages were usually referred to Moses. David was in fact the traditional founder of psalmody and to some extent (see below) a precursor of the religion of the Psalter. Perhaps, too, psalms which David really wrote may have been expanded or added to by later writers. The most plausible instance is Ps. lx.; but there is nowhere any necessity to adopt this view. It is safer to hold provisionally that certain psalms are as old as the epoch-making reign of Josiah. Yet the arguments for this view are seldom, if ever, cogent, and mainly depend for their acceptance on our ideas of historical probability, which ideas again depend on the picture we have formed, on critical grounds, of the Babylonian and Persian periods of the history of the Jews. Psalm xviii. is no doubt the psalm which would, more generally than any other, be pronounced pre-exilic. Some of the older critics were even quite sure that it was Davidic, influenced partly by the admission of the poem into what is called the appendix to Samuel (see 2 Sam. xxiii.), which, however, only proves that the poem was conjecturally ascribed to David (the idealised David of later times) by the editor of Samuel, who lived not long before the Exile. To the present writer an early pre-exilic date for this psalm seems incompatible with the internal evidence. He thinks that, though perhaps written in the reign of Josiah as a literary illustration of the life of David, it was adopted as a temple-hymn only after the return from exile, when it was doubtless interpreted as prophetic of a great future Davidic ruler or line of rulers (see Ps. xviii. 50). The final editing of the Psalter he ascribes to the temple-authorities in the time of Simon the Maccabee. The book would quickly be carried to 'Israel in Egypt,' and soon afterwards translated into Greek for the benefit of the great Jewish community at Alexandria. The date of this event cannot be fixed with precision, but it was at any rate before the Christian era.

Among the arguments for the post-exilic date of the Psalms none perhaps is more cogent than that which is based on their essential unity of tone. They have, in short, such a strong family likeness that it would be rash to spread their composition over too extensive a space. And if they all, or nearly all, belong to one period, can we be in doubt which that period is? Is it not obvious that these temple-songs were written for a community which had absorbed, in some real though still imperfect degree, the high teaching of the pre-exilic and exilic prophets? Now, though it would be absurd to say that there were no psalms before the Exile, the writings of Isaiah and Jeremiah prove that the nation, as a whole, was as yet far from having assimilated the pure and spiritual prophetic religion, and that the priests in particular were unprogressive. How then should there have been temple-songs like those in our Psalter before that spiritual regeneration of which the 'Second

Isaiah' was presumably the chief instrument? The only way to avoid the conclusion that the Psalms are (with the possible exception of Ps. xviii., and, some will add, of Ps. xx., xxi., xlv., lxi., lxiii.) post-exilic is to suppose that certain psalms, especially those which remind us of Jeremiah, were written in the reign of Josiah and during the Exile, with the prophetic hope that they would one day be required by a reorganised church-nation. This position represents perhaps the enlightened conservatism of the future, but cannot here be discussed.

In any case, the ideal character depicted in the Psalms belongs to an advanced period in Israel's history. It is that of a righteous man who, in the face of oppression, clings to his religion and his God, who trusts to be delivered, and for the most part is delivered, and who now and then forms bold anticipations of a world converted to the true God, or, it may be, crushed into reluctant obedience; and in the noblest features of this ideal it is impossible not to trace the influence of the two great prophetic teachers of the later period—Jeremiah and the 'Second Isaiah.' It is such a righteous man who, at least in Books i.-iii., for the most part appears to be the speaker, and the question arises, whether he is more accurately viewed as a personification of Israel, or as simply the typical or representative Israelite, such as every member of the congregation either was or desired to become. In some cases no one can deny that the former theory is alone correct (see, e.g., Ps. liv., lx., lxxxvii., cxvi., cxix.), and there are not a few other psalms where its absolute rejection would involve the interpreter in the greatest psychological difficulties (see, e.g., Ps. vi., xxii., xxx., li., cxxx., cxxxi.). It has indeed been hastily stigmatised as forced and fanciful, but the number of passages elsewhere in the Old Testament which without it are unintelligible (see, besides the sections in second Isaiah relative to the 'servant of Jehovah,' Num. vi. 23-26; Micah, vii. 1, 7-10; Hosea, iv. 4, 5, vii. 8, 9; Lam. i. 3), and the numerous analogies in the Greek choruses, prove the baselessness of the charge. The solidarity of the individual and his tribe was in fact one of the ruling ideas of the ancient peoples. It is, however, *a priori* improbable that the new sense of the duties and privileges of the individual, which was stimulated (but hardly caused) by the preaching of Jeremiah and Ezekiel, should not have left its mark on the Psalter of the second temple. And do we not find such a mark on some or even many of the Psalms? Does not the personality of the psalmist sometimes at least assert itself with distinctness (see, e.g., Ps. xlv. 1, lxxiii. 2, 3, 13-17, 21-28, cvi. 4, 5, cxxxix. 18)? Yes; but it will also be noticed that even in such passages (the first and third of those just referred to are perhaps the only exceptions) the psalmist speaks, not only in his own behalf, but at any rate for a class within the Church-nation. And in some of the psalms in which a reference to the nation may most plausibly be maintained, it is almost equally possible to hold that the speaker is a typical or representative Israelite (in the sense described above), or even that the psalmist himself in the same psalm sometimes has the nation, sometimes himself, or any other pious Israelite, in view as the speaker. Reading the Psalms from this point of view makes them not less prophetic of Christ, but much more edifying and intelligible. 'The psalms,' says the eloquent Adolphe Monod, 'are filled with expressions of an unheard-of sorrow. David there speaks incessantly of his troubles, of his maladies, of his innumerable enemies; as we read them we can hardly understand what he meant.' But when

we see that it is the troubles of the Church-nation, and not those of any individual, however highly placed, which are described, we can account for the strength of the language, and are also stirred up to purge our own religion of its selfishness. It only needs to be added that our conception of the life of the Church-nation must be a truly historical one. We must not rest contented with the perception that there is a strong family likeness in the Psalms. We must seek out not only resemblances but differences, and ascertain, so far as we can, the historical background of each group of psalms. Hitzig and Ewald may have gone too far in this historical 'divination,' but without exercising this faculty to some extent it is impossible fully to enjoy the Psalms. Historical data will not be wanting if we search for them, and the comparative method will here too be found applicable. The period from the Return to the Maccabees was not so monotonous as it is represented in our handbooks, and by judiciously distributing the Psalms over it on grounds of internal evidence we gain so many fresh first-class authorities for the history of the Jewish Church.

For further information the reader is referred, in the first instance, to the articles in the *Ency. Brit.*, *Jew. Ency.*, Hastings's *D. B.*, and Dummelow's commentary, and to the bibliographies there given. Among the many commentaries accessible in English, see J. A. Alexander (New York, 1850), Tholuck (trans. 1856), Ewald (trans. 2 vols. 1880), Delitzsch (trans. 3 vols. 1887-89), Perowne (latest ed. 1889), Cheyne (1888), De Witt (New York, 1891), Kirkpatrick (1891), Briggs (1906-8). Among Jewish commentators may be mentioned David Qimhi (on Bk. I.; ed. Schiller-Szinessy, Camb. 1883), and the usual commentaries contained in the Rabbinic bibles; S. R. Hirsch, *Die Ps. erkl. u. übers.* (Frankfurt, 1924); M. Bittenwieser, *Heb. Union Coll. Jub. Vol.* (Cincin. 1925). Recent German works on the Psalter include H. Wiese and K. Leimbach, *Die Ps.* (Fulda, 1922); B. Duhm, *Die Ps.* (Tüb. 1922); R. Kittel, *Die Ps. übers. u. erkl.* (Leipzig, 1922); J. F. H. Gunkel, *Die Ps. übers. u. erkl.* (4th ed., Göttingen, 1925); Jos. Kley, *Das Buch d. Ps. exeg.-hom. erkl.* (2d ed., Paderborn, 1925); Martin v. Gerlach, *Deutscher Führer durch den hebr. Ps.* (Berl. 1924); Sig. Mowinckel, *Psalmstudien* (Oslo, 1923); Max Löhr, *Psalmstud.* (Stuttgart, 1922); B. Grundl, *Das B. d. Ps.* (Augsburg, 1921); J. Herrmann, *Hebr. Wörterb. z. d. Ps.* (Giessen, 1924); and see also Cheyne, *The Origin and Religious Contents of the Psalms* (1891) and *The Christian Use of the Psalms* (1899); Lord Ernle (R. E. Prothero), *The Psalms in Human Life* (4th ed., Lond. 1920); C. W. Emmet, *Use of the Psalms* (Lond. 1918); J. W. Thirlie, *Titles of the Psalms* (Lond. 1916); F. St. J. Thackeray, *Three Lectures on the Psalms* (Lond. 1917); J. E. McFadyen, *Studies in Psalms* (Lond. 1916); S. R. Driver, *Studies in the Psalms* (Lond. 1919); A. Nairne, *Notes on the Psalter* (Lond. 1920); H. W. Sheppard, *First Book of Psalms in text of G. I.* (Camb. 1920); P. Boylan, *The Psalms (a study of the Vulgate Psalter in the light of the Hebrew text)* (Dublin, 1920); J. M. Harden, *Psalterium iuxta Hebraeos Hieronymi* (Lond. 1922); W. J. Cooke, *Psalms, New Metrical paraphrase* (Preston, 1924); E. H. Askwith, *Psalms rendered into English* (Lond. 1925); J. E. McFadyen, *Psalms in Modern Speech* (Lond. 1916); *Psalter* (proposed amendments) (Lond. 1922); W. M. Furneaux, *Book of Psalms, a revised version* (Lond. 1923). See also BRADY, ROUS, STERNHOLD, TATE.

Psaltery. See DULCIMER.

Psammetichus, or PSAMMITICHUS I. and II. See EGYPT.

Psammitic, in Geology, applied to derivative rocks composed of rounded grains, as ordinary sandstone.

Pseudepigraphy, the ascription to books of false names of authors.

Pseudomorphs, in Mineralogy, applied to minerals which assume the crystalline form of other species. Pseudomorphs result from the action upon minerals of water containing carbonic acid, oxygen, and other reagents in solution. The

internal structure of a pseudomorph has no relation to the external form of the crystal. Two kinds of pseudomorphs are recognised: (a) *alteration* and (b) *substitution* pseudomorphs. Alteration pseudomorphs are the result of the chemical metamorphosis of the original mineral either by loss or gain, or exchange of constituents. Substitution pseudomorphs are minerals formed in the moulds or vacant spaces left by the total removal in solution of previously existing minerals.

Pseudonym (Gr. *pseudēs*, 'false,' and *onoma*, 'a name'), a false name adopted by an author which conceals his identity. Originally 'pseudonymous' was used of works deliberately published under a false name, so as to induce people to believe them the works of those whose names they bore, or of works erroneously attributed to a wrong person. Thus, there were pseudonymous gospels of Thomas and of Bartholomew; and the works circulated under the names of the classical writers, but proved not to be genuine, are pseudonymous works. But the term pseudonym is now most commonly used as an assumed name not

really meant to mislead—what in England is often called by the French words *nom de plume* or 'pen-name,' and nearly corresponding to the genuine French expression *nom de guerre*. There have been periods in history when the acknowledgment of the authorship of certain pamphlets or books might mean death or banishment to the writer. It is common to find books containing attacks on public men, or those consisting of theological controversy, and the literature of satire, appearing under assumed names. In recent times young authors especially have frequently risked a new work under a pseudonym, and have sometimes kept it up afterwards. Once an author is famous it is found advisable to stick to a pen-name. For instance, every one knew the writings of 'George Eliot,' but few would at once have recognised a work by Marian Evans. The present list is not intended to be exhaustive.

See the article ANONYMOUS; Halkett and Laing, *Dictionary of Anonymous and Pseudonymous Literature* (1881-88; enlarged 1926 *et seq.*); Stonehill and others, *Anonyma and Pseudonyma* (1926-27).

Adler, Max Chas. Heber Clark.
A.E. G. W. Russell.
A.L.O.E. (= *A Lady Charlotte Maria of England*) Tucker.
Anstey, F. F. Austey Guthrie.
Ape ('Vanity Fair') Carlo Pellegrini.
Aunt Judy Mrs Alfred Gatty.
Bab Sir W. S. Gilbert.
Bardwell, W. N. P. Bruce Frederick Cummings.
Barine, Arvède Mme. Cécile Vincens.
Barnaby, Drunken Richard Brathwaite.
Belle, Outhbert Rev. Edw. Bradley.
Bell, Acton Anne Brontë.
" Currer Charlotte Brontë.
" Ellis Emily Jane Brontë.
Bettina Eliza von Arnim.
Bibliophile Jacob Paul Lacroix.
Bickerstaff, Isaac Dean Swift, and Steele in *Tatler*.
Biglow, Hosea J. Russell Lovell.
Billings, Josh. Henry W. Shaw.
Bobbins, Tim John Collier.
Bolderwood, Rolf T. A. Browne.
Bon Gaultier Sir Theodore Martin and W. E. Aytoun.
Boylesse, René René Tardivau.
Bos Chas. Dickens.
Breitmann, Huns Chas. G. Leland.
B.V. (Bysshe Vanolis) James Thomson.
Caballero, Fernán Cecilia Bohl von Faber.
Carmen Sylva Queen Elizabeth of Rumania.
Carroll, Lewis C. L. Dodgson.
Cavendish H. Jones.
Cham Amédée de Noé.
Conrad, Joseph J. C. Korzeniowski.
Cornwall, Barry B. W. Procter.
Country Parson Dr A. K. H. Boyd.
Craddock, Charles Rev. H. Moule.
Egbert Mary N. Murree.
Crayon, Geoffrey Washington Irving.
Crotus Rubianus Johannes Jäger.
Crouquill, Alfred A. H. Forrester (artist) and C. R. Forrester (author).
Dagonet G. R. Sims.
Dashi, Comtesse M. de Saint Mars.
Delorme, Joseph C. A. Sainte-Beuve.
Delta (Δ) D. M. Moir.
Democritus Junior Robert Burton.
D'Istria, Dora Helena Ghika.
Dods, Meg Mrs Johnstone.
Douglas, George George D. Brown.
Eastaway, Edward Edward Thomas.
Ella Charles Lamb.
Ellis, George Mrs Cross (née Marian Evans).

Etrick Shepherd James Hogg.
Evel E. V. Knox.
Field, Michael Katharine Harris Bradley and Edith Emma Cooper.
France, Anatole Jacques Anatole Thibaut.
Gottlieb, Jeremias A. Bitzins.
Gorici, Martin Alexis Peshkov.
Gréville, Henry Mme. Durand.
Grin, Anastasius A. A. von Auersperg.
Gyp Comtesse de Martel de Jauville.
Hallburton, Hugh J. L. Robertson.
H.B. John Doyle.
Henry, O. W. S. Porter.
H.I. Mrs Helen Hunt Jackson.
Hobbes, John Oliver Mrs Craigie.
Holbeach, Henry W. B. Rands.
Hope, Antony Sir A. H. Hawkins.
Hyacinthe, Père C. J. M. Loyson.
Ingoldsby, Thomas Rev. R. H. Barham.
Jean Paul J. P. F. Richter.
Junius (see article JUNIUS).
Knickerbocker, Dietrich Washington Irving.
Lee, Vernon Violet Paget.
Lenau, N. N. Niembach von Strehlenau.
Little, Thomas T. Moore.
Loli, Pierre Julien Viaud.
Maartens, Maarten J. M. W. van de Poorten Schwartz.
Maclaren, Ian John Watson.
MacLeod, Fiona William Sharp.
Maitland, Thomas R. Buchanan.
Malet, Lucas Mrs Harrison (née Kingsley).
Markham, Mrs Mrs E. C. Penrose.
Marit, E. Eugénie John.
Mathers, Helen Mrs Reeves (née Matthews).
Meredith, Owen Earl of Lytton.
Miller, Joaquin C. H. Miller.
Molière Jean Baptiste Poquelin.
Morris, Peter J. G. Lockhart.
Muklatul E. Douwes Dekker.
Nerval, Gérard de G. Labrunie.
Nimrod C. F. Apperley.
North, Christopher Prof. John Wilson and others.
Novalis F. L. von Hardenberg.
O'Dowd, Cornelius Charles Lever.
Ogilvy, Gavin Sir J. M. Barrie.
Omnum, Jacob Matt. Jas. Higgins.
Optimus Eater T. De Quincey.
O'Rell, Max Paul Blouet.
Ouida Louise de la Ramée.

Parley, Peter Sam. G. Goodrich; W. Martin; G. Mogridge; W. Tegg; J. Bennett.
Phiz Hablot K. Browne.
Pindar, Peter John Wolcott.
Pymley, Peter Sydney Smith.
Prout, Father F. S. Mahony.
Q. Douglas Jerrold.
" Sir A. T. Quiller Couch.
Rama, Walter Walter de la Mare.
Red Spinner Wm. Senior.
Rob Roy John Macgregor.
Ross, Martin Violet Martin.
Rutherford, Mark W. Hale White.
Saul, George Madame Dudevant (née Dupin).
Scott, Leader Mrs Lucy E. Baxter (née Barnes).
Scotus Viator R. W. Seton-Watson.
Scriblerus, Martinus Swift, Pope, and Arbuthnot.
Selkirk, J. B. James B. Brown.
Shepherd M. Saltykov.
Shirley John Skeilton.
Stick, Sam T. C. Hallburton.
Smeetymanus Thomas Young and others.
Spy Sir Leslie Ward.
Stendhal Marie Henri Beyle.
Stendhal S. M. Krachvinsky.
Stern, Daniel Comtesse d'Agoult.
Stonehenge J. H. Walsh.
Stretton, Hesba Sarah Smith.
Surfiction Alexander Anderson.
Syntar, Dr Wm. Combe.
Talvy T. A. L. von Jacob-Robinson.
Theuriet, André Adhémar They.
Titmarsh, Michael Angelo W. M. Thackeray.
Twain, Mark Samuel L. Clemens.
Tyler, Sarah Miss H. Keddie.
Uncle Remus Joel Chandler Harris.
Urban, Sylvanus Editor of *The Gentleman's Magazine*.
Voltaire François Marie Arouet.
Ward, Artemus Chas. F. Browne.
Warden, Florence Mrs G. James.
Wetherell, Elizabeth Susan Warner.
Whistler, William and Robert John Hookham Frere.
Winter, John Strange Mrs H. E. V. Standnard.
Yendys, Sydney Sydney Dobell.
Yorick Laurence Sterne.
Zadkiel Capt. R. J. Morrison, R.N.

Pseudopodia (Gr., 'false feet'), blunt, irregular processes of protoplasm thrown out and drawn in again by amœbæ and some other animals. See AMŒBA, PROTOPLASM, RHIZOPOD.

Pseudoscope (Gr. *pseudēs*, 'false,' and *skopeō*, 'I see'), an optical instrument through which, by

means of an arrangement of prisms, objects are seen with their relief inverted. What is convex appears concave. It was discovered by Wheatstone when experimenting on the Stereoscope (q.v.).

Pseudotsuga, a genus of conifers differing from Abies in having the cones pendulous with

deciduous scales, from *Picea* in having the needles flattish. *P. Douglasii*, the Douglas fir, the most widely distributed conifer of western America, stretches from British Columbia to Mexico. Its timber is valuable and grows quickly. Other species grow in North America and in Asia.

Psilophyton, a very simple Devonian fossil pteridophyte, with branched rhizome, upright, forked stem, somewhat spiny, and long terminal sporesacs. With it has been grouped *Asteroxylon*, one of the Rhynie fossils; and these (*Psilophytaceæ*) have been joined with the *Rhyniaceæ* (q.v.) as *Psilophytales*.

Psilotaceæ, a family of homosporous pteridophytes of doubtful affinities, sometimes grouped with the fossil *Sphenophyllaceæ*, sometimes regarded as intermediate between horsetails and lycopods. There are two genera, *Psilophytum* (two tropical species) and *Tmesipteris* (one Australian). Roots are wanting. There are simple or scale-like alternate leaves or a dichotomous stem, and deeply forked sporophylls.

Psittacidæ. See PARROT.

Pskov, a decayed town of European Russia, 9 miles SE. of Lake Pskov (50 miles long by 13 broad), by rail 183 miles NE. of Riga and 160 SSW. of St Petersburg. Like Novgorod it was celebrated for its republican institutions after the 12th century. During the 14th and 15th centuries it was one of the Hanse towns, and had then a population three times as large as at present. In 1510 it was annexed to Moscow. During the wars with Lithuania Pskov was a stronghold of great importance. It contains a cathedral and numerous venerable churches and monasteries. Pop. 36,000.

Psophocarpus, a genus of *Leguminosæ*, found in tropical Asia and Africa. *P. tetragonolobus* (Goa bean) is cultivated for its beans and tuberous roots.

Psoralea, a genus of *Leguminosæ* (*Papilionaceæ*), natives mostly of South Africa and North America. The flowers are blue, purple, or white. *P. esculenta*, the *Bread-root* or *Prairie Apple* of North America, is a herbaceous perennial, about a foot high, with a carrot-like edible root, swollen above the middle, and abounding in farinaceous matter. The European *P. bituminosa* resembles red clover, but has blue flowers and an intense bituminous smell.

Psoriasis (Greek *psōra*, a cutaneous eruption, supposed by some to be the itch) now signifies a disease characterised by slight elevations of the surface of the skin covered with whitish scales. The eruption begins in small rounded spots, which may remain small, or may enlarge indefinitely, the centre becoming more normal while the inflamed margin continues to extend. The spots are covered by white silvery scales, not easily detached from the skin, which, however, when they are removed, is seen to be red and dry. The parts most often affected are the fronts of the knees and backs of the elbows; whatever other parts may be attacked, these are rarely free from the eruption, and the distribution is always nearly the same on the two sides of the body. Itching is often absent altogether, and very seldom severe. The disease may occur at any age, but usually first manifests itself in youth, rarely before the age of six. It is extremely apt to recur: it is rare for a person to suffer from it only once.

Numerous causes have been assigned for the disease; it has been attributed to debility, gout, and many other constitutional states; and doubtless it may be associated with them. But, with the exception of heredity, no cause has been satis-

factorily shown to lead to its development. It frequently occurs in persons otherwise in perfect health, and, except in very severe cases, does not interfere in any way with their employments.

If left to itself, the disease generally tends to persist indefinitely. But in the great majority of cases it is very amenable to treatment, both local and constitutional. Locally, ointments containing tar, resorcin, chrysarobin, &c. are most in use; internally, thyroid extract and arsenic are much used. But some cases resist the most varied and persevering efforts for their cure; and nothing has yet been discovered which will prevent the tendency to recurrence of the disease.

Psyché (Gr., 'the soul'), an exquisite creation of the later mythology of Greece. She was the youngest of the three daughters of a king, and so beautiful that mortals mistook her for Aphrodite herself. The jealous goddess sent Eros to inspire her with a passion for the most contemptible of all men; but Eros was himself wounded as deeply by her glances as ever he had wounded others with his darts. He accordingly caused her to be carried to a beautiful palace of pleasure, and there every night he visited her, unseen and unknown, and left her before morning broke, warning her not to seek to know who he was. But her sisters played upon her curiosity, and persuaded her that she was embracing a monster in the darkness of night. Lighting a lamp when Eros was asleep, in her excitement she let a drop of hot oil fall on his shoulder. This awoke Eros, who upbraided her for her mistrust, and vanished. Psyche wandered about from temple to temple, inquiring for her lover. At length she came to the palace of Aphrodite, where she was seized by the goddess, and kept as a slave. Eros, however, invisibly helped and comforted her, reconciled her to his mother, and was finally united to her in immortal wedlock. In works of art Psyche is represented as a beautiful maiden with the wings of a butterfly. Her story was considered as an allegory of the progress of the human soul through earthly passion and misfortune to pure celestial felicity; but it must not be forgotten that it is a version of a widespread folk-tale. Apuleius (q.v.) gave it its most perfect form. It is well told in Walter Pater's *Marius the Epicurean*. See CUPID and Rohde, *Psyche: the Cult of Souls and Belief in Immortality among the Greeks* (trans. 1925).

Psychical Research, SOCIETY FOR. See APPARITIONS.

Psycho-analysis. See HYPNOTISM, FREUD, DREAMS.

Psychology.—It is the aim of psychology, or mental science, to give a systematic account of mind, or, in other words, to analyse mental experience, to state the conditions under which mental processes appear, and to determine the laws which govern their occurrence. Psychology is distinguished from such studies as history and literature, which also deal with mental life, by the fact that it is concerned not with particular detailed facts, but with the general nature of mind and the broad laws which underlie all concrete human activity. Again, it is distinguished from the sciences of organic and inorganic nature in that the mental processes possess a specific character of their own which cannot be explained in the terms of the physical, chemical, or vital processes that are dealt with in natural science. At the same time the connexion between psychology and biological studies, particularly physiology, has become increasingly close and important since it has been more fully recognised that scientific methods can be applied in the investigation of psychical processes, and that these processes as we know them, however distinct

in nature they may be, are yet dependent throughout on bodily conditions. In earlier centuries psychology, or mental philosophy as it was often termed, formed an integral part of general philosophy. It came to be understood, however, that the development of both studies was hampered by this intimate union, and that it was apt to result either in a dominance of the more abstract and general principles of philosophy, or in a misplaced application of empirical procedure and conceptions in the investigation of philosophical problems. It is admitted now that more assured progress is secured when psychology is treated as a special science dealing with mind as a definite form of reality according to the methods of inductive investigation. At the same time it seems plain that philosophy will retain a more direct connexion with psychology than with other branches of science, inasmuch as the problems suggested by the study of mind, such as those regarding the ultimate meaning and destiny of mind, must remain important objects of philosophical consideration.

While it may fairly be said that each one distinguishes with sufficient clearness and certainty between his own inner experience and other forms of existence, the attempt to state with adequate definiteness the characteristics which belong to all forms of mind, and at the same time serve to express its specific nature, is not without difficulty. The most important characteristic would appear to be the property of being conscious. This consciousness belongs to all the mental states which we experience; and since it does not seem possible to frame an intelligible conception of a mental state which should lack this property, we seem to be justified in assuming that it is to be found in all life that is properly mental, however low in the scale of development. It appears to be an ultimate characteristic, incapable of explanation through any other element; and all we can do is to point to it as the universal form in which mental processes appear, however different in detail they may be. Another fundamental characteristic is to be found in the fact of individuality. All mental experience, so far as we know it, is manifested only in private or personal form, such that only indirectly, and at the best imperfectly, can any one enter into the inner life of his companion. While in the physical world there is no such division, but rather continuous unbroken interaction, there does appear a certain individuality of form and life in organic nature. But it seems evident that, apart from the mentality which we may suppose that the higher animals at least possess, the individuality in the world of life is something quite distinct from the fundamental division in the realm of mind. Finally, it may be pointed out that additional definiteness in the delimitation of the psychical sphere is secured through the negative characteristic of lack of extension in mental facts: we cannot intelligibly describe mental processes, such as emotions or desires, in terms of spatial magnitude.

The form of observation which is employed in the ascertainment of mental facts is termed introspection, reflection, or self-observation. In principle the observation which is employed in psychology is the same as that employed in the study of external nature; it is the special character of the subject-matter on which it is exercised which gives it a special form and introduces certain difficulties. The introspective effort involves for most persons an unfamiliar and difficult attitude, and the facts with which it deals—e.g. the train of ideas—have often a vague and transitory character which makes any scrutiny difficult at the moment of their appearance, and which lessens also the value of the memory or retrospection by which the more direct scrutiny may be supplemented. The difficulties in

the way of exact introspection are no doubt great, but with care and adequate training results possessing a high degree of definiteness and trustworthiness can be obtained. It should be remembered that self-observation implies no new activity begun only with the special study of psychology, but is rather the elaboration and refinement of that acquaintance with his own inner life which every one possesses in some measure, and by which alone an intelligent and sympathetic intercourse with other men is rendered possible. One of the principle features of modern experimental work in psychology is to be found in its insistence on the necessity of organising introspection, of replacing casual and undisciplined efforts by systematic work in which there shall be detailed study of definite problems and arrangement of the most favourable conditions for exact introspection. While it is on the data secured by direct introspection that psychology must be based, it should be recognised that these data can be supplemented by the observation and critical study of the signs of mental processes in the minds of others as these are shown in expression, action, and language, and in the spiritual products of human development, such as religion and law and social institutions.

As a result of analytic study three main forms of mental fact are commonly recognised, viz. facts of cognition, of feeling or affection, and of action or creation. The first two forms are now universally recognised as distinct and fundamental; action, on the other hand, which with cognition was formerly regarded as an ultimate division of mind, is now by many psychologists regarded as a complex process which should be explained by reference to more ultimate cognitive and affective processes. Assuming for the present the validity of the threefold division, we may point out that it should be interpreted not as indicating three powers of mind, but rather as stating the chief groups which the psychologist is led to recognise on consideration of the common and the distinguishing features which the concrete processes exhibit. In cognitive processes there appears, as a common if not universal feature, the presence of an object to which the process refers: thus there is some thing or object which we see, remember, imagine, and so forth. In feeling, on the other hand, the reference to object is less essential; a more important feature is found in the relation to the self as being modified or affected in some way; and it may be noted that the moods in which feeling appears are characterised by a fundamental opposition, as, for example, of pleasure and pain. Keeping in view the doubt regarding action which was mentioned above, we may say that in action there appears the process of self-determination, the tendency to pass from the present to some other, dependent state of mind. At the close of this preliminary survey we may remind ourselves that here and in what follows the analytic distinction of different processes is not meant in any way to suggest that these processes exist in isolation and independence. We have, rather, to acknowledge at each point in the study of mind that the only concrete real state is one showing a complexity of elements, and that while one form of process may be dominant, each analysis continually reveals the presence of co-operating factors. In the following account the cognitive processes will be dealt with first, these being divided into the perceptual, ideational, and intellectual groups.

The characteristic feature of perception (sense-perception) is the direct knowledge of objects through sensory qualities which are dependent on processes in receptive or sense organs. Perception is normally a complex and varied activity, and the first aim of investigation is to determine the constituents which enter into the total process. As a

result of analytic study carried on by various methods certain elementary processes are recognised which are termed sensations, or presentative elements. These sensations may be regarded from two points of view: on the one hand, as elements in a cognitive process they involve the function of awareness or apprehension; on the other hand, there is presented in them a content towards which the apprehension is directed, and which possesses the properties of kind, or quality, and intensity. As instances of the former property we may refer to the qualities of colour and smell, of sweet and bitter; differences of intensity, again, are evident in sensations of tone, when, for example, the same pitch or quality is maintained, but the tone varies in loudness or intensity. A full account of sensations involves a study not merely of their nature as elements in the perceptual complex, but also of their relation to physiological and physical conditions. Reference may be made for details to the special articles dealing with each sense: only a very brief account can be given here, which may indicate the general nature and connexions of sensational experience.

Considering first the quality of sensations, we find that they may conveniently be divided into two main groups. The first is the group of sensations connected with the special sense organs: the stimuli are agencies in the external environment which act on receptive organs possessing in several instances a highly elaborate and delicate structure, and give rise to sensations whose characters are distinct, varied, and clearly known. This group includes the sensations which are termed visual, auditory, tactual, thermal, gustatory and olfactory: our knowledge is most extensive in regard to the first two kinds, and least satisfactory in regard to olfactory sensations. Organic sensations which form the second main group are conditioned by processes occurring within the organism; the receptive organs are relatively simple and undifferentiated, while the sensations aroused by their activity do not present such distinct and varied qualities as are met with in the former group, and tend to fuse or coalesce. The sensations aroused in direct connexion with movement of some part of the body are often classed together as kinæsthetic sensations: they include elements derived from contraction of muscle, stretching of tendon, and movement of joint. With them may be mentioned sensations such as dizziness, derived from stimulation of certain end-organs situated in the internal ear. There are in addition obscure sensations, such as those connected with the bodily functions of respiration and digestion; their intensity is normally slight, and when it is increased they tend to become distressing or painful. Pain sensations have relations with both groups, inasmuch as they may be caused by an external stimulus affecting the skin of the hand for example, or by some internal organic process.

It will be observed in studying the qualitative aspect of sensation how varied are its relations to sense organ and to stimulus. When attention is directed to the intensive aspect an important difference is met with; here, in a large range of cases where the conditions of exact investigation can be fulfilled, there is found the same law. This law, which was noted first by Weber, and named by Fechner after its discoverer Weber's Law, has been formulated thus: 'In order that the intensity of a sensation may increase in arithmetical progression the stimulus must increase in geometrical progression.' It should be observed that the law does not hold for the extreme upper and lower regions of the scale of intensity, and that it holds to some extent in other spheres also, for example in the estimation of spatial and temporal magnitudes, though in these cases the possibility has to be reckoned with that the underlying condition of the

judgment is some form of sensational (e.g. kinæsthetic) intensity. Since the publication of Fechner's *Elemente der Psycho-physis* in 1860 there has been prolonged controversy over the precise interpretation of the law and its bearing on the measurement of psychical magnitudes.

In addition to sensations which form so large a part in perceptual process, there are found also representative elements in which the presentative content of former experience is reproduced in altered form. While the nature of such elements can be understood more clearly in connection with the analysis of developed ideational processes, it is important to note here the place which they take in perception. The ordinary experience of the developed mind gives evidence of the truth that only through the retention and utilisation of past experience can advance in perceptual knowledge be achieved. This relation of past to present experience is capable of various interpretations; it is clear that one important form consists in the supplementation of the content which is given through the direct action of the senses by representations associatively aroused which fill out and vitalise the immediate presentative data. Thus for the child with growing experience a visual object, such as an orange, becomes enriched in some measure, even when it is only seen, with the qualities from taste, smell, touch, and movement which have been present on previous occasions. These representative elements exhibit no new sensory quality, and appear normally in perception in an implicit form, bound up with and dependent on what is directly given. As regards their physiological basis, it is recognised that they are conditioned by processes in the central nervous system which continue and on occasion reinstate the nervous processes underlying earlier presentative experience.

We pass next to the spatial and temporal factors in perception. As regards the first factor, it is to be noted that spatial perception is developed in a high degree in only two sensory groups, the visual and tactual, while in others, though in varying degree, it is much less fully elaborated. It has been maintained that all sensations have a certain inherent volume or extensity, forming like intensity an ultimate property of sensory experience: this view, though not definitely established, has much in its favour, and affords a basis for the varying development of spatial perception. One of the most important features is the process of localising impressions in the spatial field, a process which appears in markedly different forms in touch and in vision: in the former the localisation refers predominantly to the surface of the body, while in the latter it refers to positions in the space beyond the body, into which objects are 'projected.' In both touch and vision the varied movements, which are continually being carried out from the earliest infancy in connexion with the sensory activity, are of the utmost importance in helping to render more exact and extensive our knowledge of concrete spatial relations—distance, form, magnitude, and direction. If the presence of a spatial element in our original experience be conceded, as, for example, in the admission of a certain primitive extensity, the general view of space perception would belong to the nativistic type, according to which spatial intuition in some form is an ultimate factor in our mental constitution. Over against this stands the empirical or genetic view, according to which our spatial perception is wholly a product of development, in which motor experiences constitute the most important factor. While the controversy is by no means closed, there is in its modern stage a large amount of agreement as to the importance of development in the explanation of our mature spatial perception.

It is to be remembered that what is in question is not the objective spatial system of geometry, but the varying and imperfect processes through which we come to apprehend spatial relations. How full of variation these processes are could be shown only by a detailed account of the numerous illusions in the perception of space which modern investigation has detected.

The psychological study of temporal perception, which in several respects is analogous with the perception of space, deals among other topics with the distinction in our experience between past, present, and future, with the ability to date or localise events in the past, and with the estimation of intervals of time. The apprehension of temporal relations as it appears in the mature mind is a complex product of mental development. Representative processes would appear to be foremost in importance in this development: together with these there may be recognised the presence of affective processes and active tendencies. As regards the further problem of the ultimate origin of temporal perception, it may be noted that there are two general forms of theory, one which recognises an immediate primitive experience of duration or succession, while the other presents a genetic explanation, according to which the ultimate elements as such are devoid of temporal character.

In the second main group of cognitive processes, that of ideation, the predominant characteristic feature is that objects are apprehended in some form of more or less complex representative process. In perception, as was pointed out, the representative elements are implicit and dependent; in the ideation processes of imagination and memory these elements are explicit and relatively free to follow their own course.

Images, or ideas possessing a concrete sensory character, are normally less distinct and less complete than percepts, and they tend to lack the organic resonance and the feeling that accompany perception. Images of former visual experience are the most prominent and frequent, though reproductions of other forms of sensory experience, especially auditory and kinesthetic images, are also found. It has been maintained that in addition to these forms, which represent particular objects or scenes, generic images are formed in the course of experience which present the common features of a number of objects or examples, and may be compared with composite photographs in which the common elements appear with comparative distinctness. The question whether other non-sensory ideas are to be found will be referred to in connexion with conception. Of the three principles by which ideas have been supposed to be associated, that of contrast is of least importance, since the facts to which it refers can be otherwise explained: the principle of similarity, according to which present experiences 'tend to revive their like among previously occurring states,' while true and significant as a statement of the presence of persistent elements in the train of ideas, does not possess the primary importance as an explanatory principle of the law of contiguity. According to this law, stated in a very general form, those elements in our experience which have been present in consciousness simultaneously or in close succession tend afterwards to revive or suggest each other. Its far-reaching character is seen when we recognise that it lies at the basis of all acquisition in the cognitive sphere, and that it is related most intimately to the law of habit in the active sphere. While contiguity is the general or abstract condition of associative connexion, it is to be noted that special concrete factors, such as the recency, frequency, or vividness of a past

experience, co-operate in determining which one of the various possible lines of association shall be followed on particular occasions.

Considering next the actual concrete forms in which these processes appear, we note that imagination in its undirected or passive form is found where the succession of ideas is determined by the play of associative conditions, general or special, without the presence of an end or governing purpose: examples of this are seen in aimless reverie, day-dreaming, and desultory thought. In directed imagination, on the other hand, while association plays its part, the course of ideas is determined primarily by the controlling thought of some plan or end: the activity may be termed receptive where the effort is made to realise from our own past experience the details of a scene or situation suggested, say, by traveller or poet, and constructive where, a certain more remote and general end being given, we attempt to create such new combinations of ideas as shall serve to solve in concrete form the problems which are set before us by practical, scientific, or other interests. The term memory, which is also used in a wider sense, is used here to indicate those states in which the course of ideas is directed with the view of representing the facts of past experience with truth and completeness. Two main directions of memorial activity may be distinguished. The first refers to definite events in past experience which as such are presented only once. Its full elaboration is dependent on the development of the process of temporal localisation, and the main conditions of its effective realisation are found in the attention given to the original experience and in its affective colouring. The second refers to facts and their connexions, such as the pupil finds in his lessons: the particular incidents of the learning process are a matter of indifference as compared with the final acquisition which is desired. The conditions named above are of importance here also, but repeated effort and the understanding of the connexion between that which is being acquired and elements in the knowledge which is already possessed are perhaps even more important. The relations between such acquisition and the formation of habit in the active sphere will at once be evident. In the process of active recollection the most favourable condition circumstance for the direct appearance of the desired ideas is concentration of attention on the general thought of what is sought: when this by itself fails, it can be supplemented by the voluntary awakening and review of the various associative connexions which may lead to the desired result. In the process of definite recognition, affective and active elements can be more or less clearly recognised: in its more explicit forms an important feature is often found in the presence of a group of ideas associatively aroused which represent the situation and connexions of the recognised object on its former appearance. The processes involved in memory have in recent years been the subject of extensive experimental investigation, in which Ebbinghaus was a distinguished pioneer. Results of much interest and value have been obtained, and it has been shown throughout the range of work that the processes are subject to definite laws.

The final section in the analysis of cognition concerns the intellectual processes through which the data of perception and ideation are elaborated as parts of a connected systematic experience. It must not be supposed that the separate treatment of these processes implies their action in independence or isolation: for the most part they are intimately united with the other processes which have been dealt with already, and are indeed in some measure required for the full realisation of

these processes. Assuming the presence of the function of apprehension which was noted earlier, we recognise the development on this basis of a group of processes which have a common and distinctive character. The awareness or discernment of relations among objects appears in various forms in our experience: it is implicit in simpler perceptual processes, but becomes distinct and explicit in the growth of intelligence. As directed specially towards the relations of likeness and difference in experience it may be termed assimilation and discrimination: these processes, again, enter as essential elements into the complex activity of comparison. The significance of the relating function in the development of knowledge is obvious, whether with regard to the relations already named or to others which are more specific and complex. The term *conception*, as ordinarily understood, refers to the process of grasping distinctly the common elements or features of the objects presented in our experience; the thought of these common elements forms the concept or general idea. According to certain psychologists, a distinct form of mental fact is to be found in the apprehension of the form or mode of combination of elements presented in experience: the perception of a melody, together with its identification when transposed from one part of the scale to another where the constituent tones may be completely different, has been given as an example. It has been urged that these various forms of cognition should be recognised not merely as being receptive in their general character, but also as being in a certain measure constructive or productive, and that by this recognition a more adequate view is secured of the mental activity involved in the organisation and extension of knowledge. The precise analysis of these facts is a matter of much difficulty, and on many points agreement has not yet been reached. In particular, there may be mentioned the prolonged controversy with regard to the Nominalistic and Conceptualistic accounts of the process of conception, the former of which dwells on the continuity between our concrete sensory experiences and the higher life of thought, while the latter emphasises the distinctive character of the conceptual process.

The essential function in the group of reasoning processes is the judgment. Looking at the simpler features of this process in its positive form from the psychological point of view, we seem to find in judgment a distinct intellectual attitude or function. The function is that of affirmation or assertion; what is asserted is in general some relation in one or other of the spheres with which thought deals, the relation being not merely apprehended or comprehended, but definitely accepted or believed. Judgment appears most clearly in connexion with states of doubt and questioning, but these do not appear to be necessary antecedents, and we may consider that it is present in other cases, as when definite steps are taken in the progress of knowledge. More detailed study would have to show, among other things, how as an occurrence in the history of the individual it is subject like the other intellectual processes to definite conditions in its development and exercise. In the main these are to be found no doubt in other cognitive processes; but other conditions, such as affective process and active tendencies, are also operative. Thus, as regards those states which we term conviction and belief, there is ground for assigning an important place to feelings such as hope and fear, to desires and active tendencies, and to the influence of tradition and authority. In explaining the activities of our cognitive life a prominent place is often assigned to *apperception*, the process through which the knowledge which we already possess is brought to bear

in the understanding of new facts and experiences. The underlying processes are largely associative in character: at the same time it would appear that, at least on the higher levels, conception and judgment are also operative.

While attention has relations with other mental processes, its connexion with cognition is so essential that it will be considered here from this point of view. It is instructive to regard it not as a special form of mental activity, but as a mode in which the cognitive processes may appear. It may be said then that the main characteristic of the processes of perception, ideation, or intellection in the state of attention is that they are relatively clear or vivid. The distinction of degrees of clearness is perhaps most obvious when we compare one moment in our experience with another, but it can be applied also to the various processes included in the consciousness of a given moment; some of these are clear and focal, while others are obscure and marginal, or, to use a somewhat ambiguous term, subconscious. Regarded as a characteristic which appears under definite conditions, attention has been termed passive or active, according as its determining conditions are to be found in properties of our immediate experience, such as novelty or intensity, or in the voluntary processes. When its general significance is considered we note that it enables each cognitive process to attain a high degree of effectiveness, and thus may be regarded as an important general condition of cognitive development.

The life of feeling, to which we now turn, appears on the first glance to present much diversity in the character of the states and processes which are included in its sphere. Thus we seem to have sense feelings, aesthetic, intellectual and moral feelings, together with the special states of emotion and sentiment. While the existence of such facts is not doubted, they have been interpreted in different ways. One of the most suggestive of the interpretations is that which maintains, as the result of analytic study, that feelings have the same nature or quality throughout our mental life, from sense to intellect and will, and that the distinctions which are so apparent on the surface arise from the presence in varying degree, and in manifold varying combination with cognitive elements, of two affective qualities alone, viz. the opposed qualities of pleasantness and unpleasantness. According to another form of theory, that of Wundt, there are to be found, in addition to these qualities, other forms of feeling which have likewise to be regarded as showing a fundamental opposition, viz. feelings of excitement and tranquillisation or depression, together with feelings of tension and relaxation, these main 'dimensions' including many subordinate affective shadings. Unquestionably this latter view presents a richer conception of our affective nature than the former. It is not yet possible, however, to determine its permanent contributions to the theory of feeling owing to the obstacles that are met with in the analysis of this form of mental process, among which the difficulty of distinguishing between such new affective forms and obscure qualities of organic sensation is one of the most pressing. But it is important to note how both types of theory have cut themselves loose from traditional classifications, and agree in the interpretation of feelings on quite new principles. The older views, it should be mentioned, still have their adherents. Although owing to such facts the analysis of feeling exhibits a disconcerting lack of agreement in results, it should be kept in mind that a thoroughgoing revision of current conceptions was no doubt necessary to prepare the way for a truer account of its nature, and that the analytic aim and procedure are not in question.

Something of the same revolutionary analysis is found in the theory of James and Lange that the dominant and characteristic components of emotional states are to be found in the mass of organic sensation which is aroused in each case through the operation of the underlying physiological mechanism. The more rational statement, James says, is that 'we feel sorry because we cry, angry because we strike, afraid because we tremble'; in other words, it is the varying complex of organic sensations conditioned by modified activity, or disturbance, of visceral, respiratory, and other functions that constitutes in each case the specific state of emotion which we experience. It may be granted that the completeness of this type of explanation has been exaggerated, and that other elements intervene: that a dominant factor in emotional states from the lowest to the highest has been demonstrated seems to be beyond question. Biological consideration helps us to reach a further insight into the significance of emotion: it may reasonably be supposed that, in view of the immediacy, universality, and uniformity of the emotional response, we are dealing with a mode of reaction which is determined in the main by hereditary racial conditions. In sentiments, on the other hand, such as the ethical and intellectual, while the emotional thrill may in certain cases be observed, the characteristic feature is rather the union between feeling and complex systems of ideas—that is, with higher forms of our individual cognitive life. That these, apart from varieties of individual development, have their main conditions in the social life and stage of civilisation in which the person finds himself seems to be plain.

With regard to the conditions of affective process as these are found in other concomitant psychical activities, it may be noted first that the sensations vary greatly in feeling-tone—in their power to arouse distinct and intense feeling; and that when we consider the relations—spatial, temporal, and other—into which sensations enter in the complex perceptual state, we come upon another set of conditions of pre-eminent importance in the æsthetic sphere, such as colour arrangement, spatial form, auditory harmony, melody, and rhythm. In the ideational and intellectual spheres our feelings are determined not merely by the object—what is imagined, remembered, or thought—but also by the success or failure, the progress or obstruction, of the activities concerned with these objects. Lastly, as regards the active life we readily recognise the direct and universal significance of appetite and instinct as sources of feeling, and the less uniform but equally certain influence which progress and attainment, or thwarting and failure, have in more developed forms of action. With regard to the other aspect—the results which flow from the operation of feeling—we observe that in general the presence of pleasant feeling tends to the furtherance of both cognitive and active processes, and pain to their thwarting or diminution. Were evidence needed of the importance of feeling as a motive to action, we might find it in the place so generally assigned, whether in practical life or ethical theory, to reward and punishment, pleasure and pain.

While a survey of human conscious activity discloses many varieties of conative process, three main types may be distinguished, viz. impulse, desire, and volition. Of these, impulse is the most direct and simple. Its characteristic feature is the immediate, unhesitating realisation in outward activity in which its own strength and its relative isolation from the rest of conscious life are shown. In its explicit conscious form some thought of an end, some idea of what is to be done, is doubtless present, else the actions would form a mere blind succession. A more prominent element in con-

sciousness is the sense of tension or striving immediately related to the particular course of action. Together with these elements some kind of feeling is involved: according to the view which is taken of the ultimate qualities of feeling, we may recognise alone the pleasantness which tends to accompany all rapid unhesitating action, or, with this, a feeling of excitement. A more articulate form of conscious activity appears in desire. In this state, which lacks the tendency to swift realisation, the idea of what is sought is quite distinct: the consciousness of striving, while apt to be less intense and definite at any particular stage than it is in impulse, is more persistent, and may be related to varying and complex series of actions: feeling varies in quality and intensity owing to its complex relations to our thought of present or future and to the mode and degree in which our ends are being realised. Desire in general tends to appear in place of impulse when the latter is obstructed, or when the activity that is required for its satisfaction reaches some degree of complexity. The main sources of impulse and desire are to be found in appetite and instinct: at the same time we must not forget that habit may give rise to impulse, and that rational factors may help to constitute desire. The generally recognised appetites are hunger, thirst, and sex; to these there were added by Bain sleep, exercise, and repose. They tend to appear in consciousness with a certain regularity, the main explanation of this psychical rhythm being found in certain recurrent or periodic alterations in the bodily constitution. Instinct, which in the animal often exhibits prolonged series of definite and complex activities, shows itself in man principally in the shape of more or less general tendencies towards certain forms of behaviour. As instances of these instinctive tendencies there may be mentioned parental care, sociability, rivalry, play. From the physiological point of view the conditions of instinct are to be found in highly complex connexions within the central nervous system, which are hereditarily transmitted, and which tend to determine the form and direction of the activity evoked by a given stimulus or situation. In particular instances their influence may be overlooked or ascribed to other causes: a broad survey of human conduct, together with a comparison of animal and human behaviour, enables us to recognise their importance in our lives. And it is to instinct and appetite, though in different and varying degrees, that much of what is strong, persistent, and universal in conduct and in social institutions is due.

Volitional processes are not separated by any rigid line from those already dealt with: they will be considered as the highest developments of conation, in which a characteristic union of elements is found with full play of attention. A relatively high cognitive elaboration is a distinctive feature: it may take the form of detailed deliberation as to the end and anxious consideration as to means; or, again, it may appear as unhesitating direct intuition or insight. Feeling tends, in the complexity of its nature and course, to follow the complexity of the cognitive process on the one hand, and on the other the variation and fluctuation of the total conative process—its speed or slowness, its progress or delay: at the same time it enters in turn as a condition supplying an element in our motives, modifying the deliberating process, and furthering or hindering onward movement. The stage of choice is that in which a definite end is accepted. The process of choosing or deciding appears most explicitly when alternative courses of action of nearly equal attractiveness have been before us; but we may have the same process where there is no hesitation or balancing, but where fully conscious decisive steps are taken.

Finally, in connexion with the process of choice and the subsequent realisation of our decisions in action, there is found in varying intensity that consciousness of striving or effort which was noted as an ingredient in impulse and desire. Are these factors, choice and striving, to be regarded as specific new facts in which the conative process is expressed, or should they be resolved ultimately into cognitive and affective processes which have the appearance of distinctness because they are present in a unique union or synthesis? Our task will be limited to the statement of opposing views. It may be pointed out, on the one hand, that choice has at least a close analogy with judgment as regards both the central fact of decision, and its appearance with greatest distinctness after the stage of doubt; and that striving may be regarded as a complex experience, constituted by an intimate fusion of affective elements with kinæsthetic sensations, actual or reproduced, whose different groupings would help to explain our consciousness of the varied direction of effort. On the other hand, it may be urged that while such factors are present, they fail to explain the essential onward movement of mind towards its ends, and that an adequate account must recognise the presence of felt tendency as an ultimate process. It may be said that the difficulties involved in this problem and also in the application of the conceptions of freedom and determination are due not merely to the complexity of the mental phenomena—action being in fact in any of its higher forms a synthesis of all our powers—but also to the fact that the strictly psychological inquiry is complicated in different ways by biological considerations and ethical requirements. Returning to the study of the concrete forms of the active life, we note that the volitional process as analysed above requires for its completion the resolution which shall persist until the end which was chosen has been realised. From the analytic point of view the central fact in resolution is the steadily maintained thought of the end together with its persistent attractiveness for the individual: in part, at least, the explanation of the fact is to be found in certain underlying organic properties similar to, if not identical with, those connected with memory, which in their varying degrees are found as innate characteristics of different individuals. Persistence of a different kind is found in those relatively fixed modes of behaviour which are termed habits. Their origin lies in the experience of the individual, the mental states which form their starting-points ranging from volition with repeated effort at the one extreme to indistinct impulse and desire at the other. As they become established attention and conscious control tend to lapse, actions are carried out with marked economy of effort, and the range of possibilities of action becomes more or less decidedly limited.

In the preceding account it has been necessary for analytic purposes to dwell mainly on the distinctions within mental experience rather than on its connexion and unity. It is of interest to consider now the points of view from which the general relation of conscious processes may be regarded. There is found in the first place the principle of the unity of consciousness, which may be formulated thus:—all the mental processes within our experience at any moment, however manifold and however varied in character they may be, unite to form one conscious self or mind. On this, as on a fundamental basis, the other more specific and detailed connexions are established. Again, there should be recognised the principle of the continuity of consciousness, according to which the successive mental states, though continually changing, and though interrupted by what to another person

would appear complete breaks of sequence, do yet for the subject himself form one continuous consciousness without rupture or disconnection. It might be argued that even in the deepest sleep and in fainting there is no absolute cessation of mental life; but it seems fairer to admit the probability that lapses do occur, while at the same time recognising that their existence does not prevent conscious continuity. There is found also in our experience a principle, which may be termed that of the interdependence of conscious processes. Reference has been made in the previous account to the influence which mental processes exert on each other, and further study would have strengthened our conviction of the inevitable mutual modification which occurs in the stream of consciousness. It is not meant in this statement to disregard the connexion between mental and organic processes. In view, however, of the continued controversy with regard to its interpretation as a form of causal interaction or as a non-causal parallelism of the two series—mental and bodily—its ultimate psychological significance is somewhat ambiguous. It has been urged that a complete view of mind should include a consideration of subconscious mental life, the term in this connexion meaning a distinct series of mental processes detached from the main personal stream of consciousness. Evidence for the existence of such processes has been found in such facts as those of automatic writing and the anaesthesia of hysteria. Such evidence is important, and the hypothesis of a secondary consciousness is no doubt legitimate: the phenomena, however, are obscure, and the alternative hypothesis of a physiological interpretation on the lines of unconscious cerebration has much in its favour. The phenomena of pathological alterations of personality are of much significance for the final interpretation of the nature of mind. All these phenomena however are more or less abnormal, and it may be urged that an adequate appreciation of the facts must be based on a study of the stable, systematised personality of normal life. In this normal personality these principles seem to be realised.

In the outline of mental facts which has been given above attention has been paid chiefly to the study of the normal mature mind of the human individual. It is evident that a general study of this kind requires to be supplemented by investigations dealing with the special varied relations of mental life: a brief glance at the range of these investigations will indicate the scope of modern psychology. In recent years the study of childhood and adolescence has been prosecuted with much interest and care, and the lines of growth have been traced by which the developed stage of mind is reached. The term Genetic Psychology, which is sometimes applied to this branch of investigation, has also been employed to designate the study of development wherever it appears. The forms of mind of the lower animals form the subject-matter of Animal Psychology, while these forms and the relations between them and the human mind are dealt with by Comparative Psychology: it is obvious that these relations acquire a profound significance when regarded from the point of view of evolution. The phenomena of mental disorganisation and defect are studied in Abnormal Psychology. Those features of mental life whose significance can be adequately grasped only through a consideration of the mutual influence of human beings are discussed in Social Psychology: the investigation of the products of common mental life, language—both the index and the tool of thought—custom, and myth, which is sometimes treated under this heading, is also designated Folk Psychology. The recognition of the intimate and continual connection of mental experience with bodily processes,

and in particular with those of the central nervous system, lies at the basis of the investigations which are grouped together under Physiological Psychology. Finally, reference may be made to one of the later developments of psychological study, in which the attempt is made to employ the methods and principles of general psychology in the study of concrete problems, especially those which are of practical interest, such as those connected with education, psychiatry, and judicial procedure.

LITERATURE.—Among volumes giving an introductory account of the subject may be mentioned those written by Angell, Calkins, Hoffding, James, Ladd, Mellone and Drummond, Stout, Sully, Titchener, Wundt. The following authors may also be named: *Experimental Psychology*, Myers, Seashore, Sanford; *Psychology of Childhood*, Drummond, Kirkpatrick, *Comparative Psychology*, Lloyd Morgan, Washburn; *Social Psychology*, McDougall, Ross.

For more advanced general study the following works are important: Baldwin, *Handbook of Psychology*, 2 vols.; James, *Principles of Psychology*, 2 vols.; Ladd, *Psychology, Descriptive and Explanatory*; Stout, *Analytic Psychology*, 2 vols.; Sully, *The Human Mind*, 2 vols.

Studies of special subjects will be found in the following volumes: Baldwin, *Mental Development in the Child and the Race*, *Social and Ethical Interpretations*; Stanley Hall, *Adolescence*, 2 vols.; Hobhouse, *Mind in Evolution*; Kulp, *Outlines of Psychology* (experimental); Preyer, *The Mind of the Child*, 2 vols.; Ribot, monographs on *The Psychology of Attention*, *The Diseases of Personality*, &c.; Storring, *Mental Pathology in its relations to Normal Psychology*; Tarde, *The Laws of Imitation*, *Études de psychologie sociale*; Thorndike, *Animal Intelligence*; Titchener, *Experimental Psychology*, 4 vols.; Tylor, *Primitive Culture*, 2 vols.; Wundt, *Grundzüge der Physiologischen Psychologie*, 3 vols. (partly translated), *Völkerpsychologie*, 6 vols.

Detailed articles and references to literature are to be found in Baldwin's *Dictionary of Psychology and Philosophy*, 3 vols.

Among journals partly or wholly devoted to the study of Psychology may be mentioned: *Mind*; *British Journal of Psychology*, *Psychological Review*; *American Journal of Psychology*, *Psychologische Studien* (continuation of *Philosophische Studien*); *Zeitschrift für Psychologie*; *L'Année psychologique*; *Revue philosophique*.

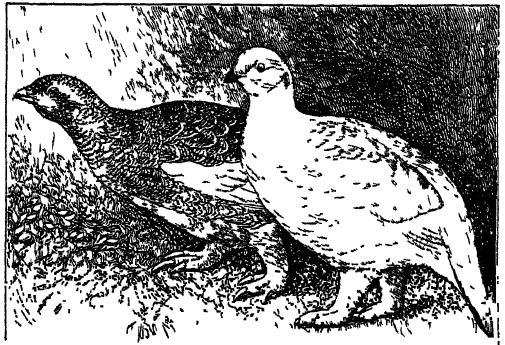
Psychotherapy. See HYPNOTISM, FREUD, DREAMS.

Psychrometer, an instrument for measuring the tension of aqueous vapour in the atmosphere: a wet and dry bulb Hygrometer (q.v.).

Ptah. See EGYPT (*Religion*).

Ptarmigan (*Lagopus mutus*), a northern bird in the same genus as the Red Grouse (*L. scoticus*), but changing to white in winter. The name *Lagopus*, used by Pliny, means hare's-foot, the toes as well as the legs being thickly clothed with short feathers, whereas in Black Grouse and other members of the allied genus *Tetrao*, the toes are bare. The Common Ptarmigan lives on Scottish mountains (especially in the north), and is widespread in Europe. It feeds on shoots, berries, and lichens, has a croaking cry, and is protectively coloured both in summer and winter. Burrows are often made in the snow, and the birds are very gregarious at that season. The ptarmigan moults thrice in the year, in summer, autumn, and winter; whereas the Red Grouse moults only twice, the male in autumn and winter, the female in summer and autumn. Both species moult their claws. The summer plumage of the ptarmigan is blackish-brown with gray and rufous markings, with a good deal of white on the wings, the tail, and underparts. The autumn plumage has more gray; the winter plumage is white, with a little black below the tail and in front of the eyes of the male. From eight to ten buffish-white eggs are laid in May in a mere scraping. Monogamy seems to be the rule. The flesh of the ptarmigan is much esteemed;

most of the 'ptarmigan' exposed for sale in Britain are Willow Grouse (*L. albus*) from Scandinavia. Among other species of *Lagopus*, besides Red Grouse and Willow Grouse, may be noted *L. rupestris* in Northern Asia and North America, the

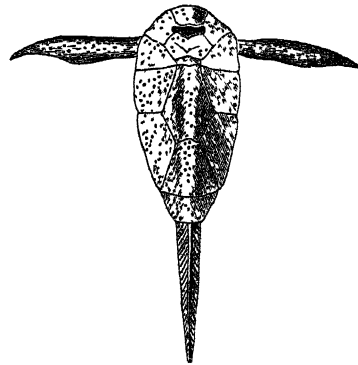


Common Ptarmigan (*Lagopus mutus*), summer and winter plumage.

small *L. leucurus* from the Rocky Mountains, and the large *L. hemileucurus* from Spitsbergen. See GROUSE; Howard Saunders, *British Birds*; Elliot, *Monograph of the Tetraoninae*; Baird, Brewer, and Ridgway, *North American Birds*, vol. iii.

Pteria, or PTERIUM. See BOGHAZ-KEUL.

Pterichthys, a genus of primitive vertebrates (Hypostomes or Ostracoderms) from Devonian



Pterichthys.

strata, without jaws, without vertebrae, without limb-girdles, with sculptured dermal plates, and with strange lateral appendages.

Pteridophyta, one of the four great divisions of the vegetable kingdom. In it, as in the Bryophyta, the alternation of generations is distinct. The sexual or gametophyte generation produces archegonia and antheridia, and from the fertilised egg springs the asexual sporophyte, from whose spores come new gametophytes. In the pteridophytes, however, unlike the bryophytes, it is the asexual generation that we recognise as the plant in the ordinary sense. The sexual generation is small and inconspicuous, often like a simple liverwort, or a mere plate or thread; the asexual approaches the flowering plants, and has leaves, stem, roots, and true vascular bundles. The Pteridophyta are thus classified:

- I. Filicales. See FERNS, MARATTIACEÆ, MOONWORT, WATER-FERNS.
- II. Equisetales. See HORSETAILS.

III. Sphenophyllales: (1) Sphenophyllaceæ (fossil); (2) Psilotaceæ (Psilotum and Tmesipteris; living).

IV. Lycopodiales. See LYCOPODIACEÆ.

V. Pteridospermales. See FOSSIL; also FERNS (Fossil).

VI. Psilophytales. See RHYNIAEÆ, PSILOPHYTON.

Pteridosperms. See FOSSIL; also FERNS (Fossil).

Pterocles. See SAND-GROUSE.

Pterodactyls (Gr., 'wing-finger'), remarkable winged reptiles, the remains of which are met with in the Jurassic and Cretaceous systems. There are numerous forms of Pterodactyl which are included in the extinct order Pterosauria. The head was relatively large and snout-like, the long jaws being furnished with simple and pointed teeth, implanted in separate sockets. The eye-orbit was very large, the sclerotic having generally a ring of bony plates, and the nostrils approximated to the orbits. The neck was long and bird-like, consisting of procelous vertebrae which were longer than the dorsals—the latter varying from twelve to sixteen in number. From four to seven vertebrae are ankylosed to form the sacrum. The tail is generally short, but long-tailed forms are also met with. The scapular arch and keeled sternum in their general characters resemble those of the carinate birds. There are four digits on each manus—the outer digit of the manus (corresponding to the fifth of the typical series) being immensely elongated for the support of a membranous expansion (*patagium*), which was also attached to the sides of the body to embrace the hind limbs and tail. The hind foot has five digits and is characteristically reptilian in structure. Most of the bones are hollow like those of birds. The body was probably naked.

Many forms of Pterodactyl are known, but all agree in possessing skulls which in general form are remarkably bird-like. In Rhamphorhynchus the extremities of the jaws are usually edentulous, and were perhaps sheathed in horn; the base of the jaws, however, was furnished with teeth which were inclined forwards. In the same form the tail was long, and provided at the extremity with a leaf-like steering membrane. In Dimorphodon the jaws are provided with strong teeth in front and much shorter ones behind; and the tail was long.

Some pterodactyls were small—Ptenodracon being not larger than a sparrow. Others were about the size of a woodcock. Yet others, however, were much larger—some having a spread of wing of 5 or 6 feet, and even of 25 feet in the case of certain forms from the Cretaceous rocks of England. The form of its extremities shows that 'the Pterodactyl was capable of perching on trees, of hanging against perpendicular surfaces, and of standing firmly on the ground, when, with its wings folded, it might crawl on all fours, or hop about like a bird.'

Pterosaurians are well represented in the Mesozoic strata of Europe and North America. One of the richest repositories of their remains is the famous lithographic stone of Solenhofen, in which the fossils usually occur in a fine state of preservation—even the impression of the membranous wing being sometimes clearly seen. See Zittel's *Palæontology*, vol. ii. (trans. Eastman).

Pteromys. See FLYING ANIMALS.

Pteropoda (Gr., 'wing-footed'), a group of pelagic molluscs, a sub-order of Gasteropods. They are marked by two lateral lobes of the foot, used in swimming; and they have a superficial and secondary bilateral symmetry. They often swim in shoals and form part of the food of whales. The

popular name 'sea-butterflies' given to some of them refers to the wing-like lobes, the delicate build, and the beautiful coloration. There are two sections, probably of separate derivation, (a) the Thecosomata, e.g. Cavolinia and Cymbulia, with a delicate shell of lime or a gristle-like test, feeding on Protozoa and simple Algæ; and (b) the Gymnosomata, e.g. Pneumoderma and Clione, with no shell in the adult, feeding on open-sea animals, including Thecosomata. Alleged Palæozoic Pteropods are very dubious; the earliest indisputable fossils are in early Tertiary deposits. See Pelseneer, *Challenger Report* (1889).

Pterygotus. See EURYPTERIDA.

Ptolemaic System. See PTOLEMY.

Ptolemaïs. See AGRÆ.

Ptolemy, name of the Macedonian kings of Egypt. The first, a son of Lagos, was called *Soter* ('Saviour') by the Rhodians, whom he defended against Demetrius Poliorcetes. He became one of the greatest of the generals of Alexander the Great (q.v.), and on Alexander's death became ruler of Egypt. For the other Ptolemies, his successors, see EGYPT; and for their patronage of literature, ALEXANDRIAN SCHOOL.

Ptolemy, properly CLAUDIUS PTOLEMEUS, a celebrated astronomer and geographer, was a native of Egypt, though it is uncertain whether he was born at Pelusium or Ptolemais in the Thebaid. Nothing is known of his personal history, except that he flourished in Alexandria in 139 A.D., and there is probable evidence of his having been alive in 161. The chief of his writings are the *Μεγάλη Σύνταξις τῆς Ἀστρονομίας*, which, to distinguish it from the next mentioned, seems to have been denominated by the Greeks and by the Arabs after them *megistê*, 'the greatest,' whence was derived the name *Almagest* (with Arab article *al*, 'the'), by which it is generally known; the *Tetrabiblos Syntaxis*, with which is combined another work called *Karpus* or *Centiloquium*, from its containing a hundred aphorisms—both works treating of astrological subjects, and held by some on this account to be of doubtful genuineness; a treatise on the phenomena of the fixed stars, or a species of almanac; and the *Geographia*, his great geographical work. The rest of his works are of inferior importance, and consist of descriptions of various kinds of Projections (q.v.), the theory of the musical scale, chronological and metaphysical treatises, and a summary of the hypotheses employed in his great work, the *Almagest*.

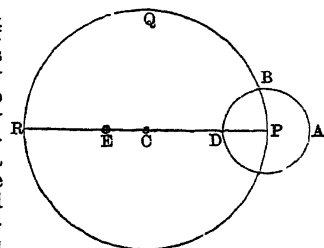
Ptolemy, both as an astronomer and geographer, held supreme sway over the minds of almost all scientific men from his own time down till the 16th–17th century; but, and in astronomy specially, he seems to have been not so much an independent investigator as a corrector and improver of the work of his predecessors. In astronomy he depended almost entirely on the labours of Hipparchus. But, as his works form the only remaining authority on ancient astronomy, the system they expound is called the *Ptolemaic System*, after the author.

As a geographer Ptolemy is the corrector and improver of the works of a predecessor, Marinus of Tyre, about whom, except from Ptolemy's writings, little is known. Ptolemy's improvements and suggestions are at once more valuable and correct; but it is sometimes difficult to separate his data from those of Marinus. His geography is divided into eight books, all of which, with the exception of the first, eighth, and a portion of the seventh, are nothing more than a catalogue of places, with their latitude and longitude (to 12ths of a degree), with a

brief general description prefixed to each continent and country or tribe, and interspersed here and there with remarks of a miscellaneous character on any point of interest. The rest of the work contains details regarding his mode of noting the positions of places—by latitude (*mēkos*) and longitude (*platos*)—with the calculation of the size of the sphere of the earth, and of the extent of surface then known. The longitudes were calculated from Ferro (q.v.) in the Canaries, chosen as the westernmost part of the world; but he counted it only $2\frac{1}{2}$ degrees W. of Cape St Vincent, instead of the real distance, $9^{\circ} 20'$. He took the parallel of Rhodes for his chief line of latitude, thinking it occupied the mean position in the zone of climate into which he divided the earth. He describes the mode adopted by him of projecting the surface of a hemisphere on a flat surface, and shows its superiority over the projections of Eratosthenes, Hipparchus, and Marinus. He also constructed a series of twenty-six maps, together with a general map of the world, in illustration of his work. See MAP.

The PTOLEMAIC SYSTEM of astronomy, so called from Ptolemy, its chief expounder, was really originated long before his time, and was, in fact, merely an attempt to reduce to a scientific form the common and primitive notions concerning the motions of the heavenly bodies. It was implicitly adopted by Plato, Aristotle, Hipparchus, and (with the exception of the Pythagoreans, and probably of Pythagoras himself) all the eminent physicists and philosophers of ancient times; passing from them to the Byzantines and Arabs, who, especially the latter, were the means of disseminating it through western Europe, where it continued to be the universally established doctrine till the 16th century. The primary and fundamental doctrines of this system are that the earth is the centre of the universe, and that the heavenly bodies revolve round it in circles, and at a uniform rate. These notions, which are naturally suggested by the first general aspect of things, having, previous to any accurate observation, established themselves as unquestionable axioms, phenomena which were found on closer examination to be inconsistent with them were explained by the introduction of additional hypotheses. The belief that the earth is the centre of the universe was supported by its accordance with the relation of the primary elements of which the material world was supposed to be composed. Thus, earth, the most stable of the elements, held the lowest place, and supported water, the second in order; above water was placed air, and then fire, ether being supposed to extend indefinitely above the others. In or beyond the ether element were certain zones or heavens, each heaven containing an immense crystalline spherical shell, the smallest enclosing the earth and its superincumbent elements, and the larger spheres enclosing the smaller. To each of these spheres was attached a heavenly body, which, by the revolution of the crystalline, was made to move round the earth. The first or innermost sphere was that of the moon, and after it in order came those of Mercury, Venus, the Sun, Mars, Jupiter, Saturn and the fixed stars, eight in all. To this system later astronomers added a ninth sphere, the motion of which should produce the Precession of the Equinoxes (q.v.), and a tenth to cause the alternation of day and night. This tenth sphere, or *primum mobile*, was supposed to revolve from east to west in twenty-four hours, and to carry the others along with it in its motion; but the Ptolemaic astronomers do not venture to explain how this was done, although, since the axis of motion of the *primum mobile* was that of the equator, its extremities being the poles of the heavens, while that of the ninth sphere was the

axis of the ecliptic, some explanation was certainly necessary. As observations of the heavens increased in accuracy it was found that the heavenly motions were apparently not uniform, and this was explained as follows: The acceleration of the sun on one side, and retardation on the other side of its orbit is only apparent, and results from the earth not being in the centre of the sun's sphere, C (see fig.), but at E, and consequently his motion appears to be slowest at P and quickest at R. The alternate progression and regression of the planets was accounted for by supposing them to move, not directly with their crystalline, but in a small circle, whose centre was a fixed point in the crystalline, and which revolved on its axis



as it was carried round with the latter; thus (fig.) the planet was carried round the small circle ABD, as that circle was carried round PQR (now supposed to represent the planetary crystalline). The planet while in the outer portion of its small circle would thus have a forward, and in the inner portion a backward motion. The larger circle was called an *eccentric*, and the smaller an *epicycle*. This theory of eccentrics and epicycles satisfied the early astronomers; but further investigation showed its incompleteness, and in later times it was found necessary to explain newly-discovered discrepancies by heaping epicycle upon epicycle till a most complex entanglement resulted. As soon as astronomers came to understand and test the Copernican Theory (see COPERNICUS), this venerable and disorderly pile of hypotheses, which had received the papal seal of infallibility, and had in various forms held supreme sway over the minds of men for twenty centuries, at once crumbled to atoms and sunk into oblivion. See ASTRONOMY.

The *Almagest* and the *Geography* were the standard text-books to succeeding ages, the first till the time of Copernicus, the second till the great maritime discoveries of the 15th century showed its deficiencies. Editions are the works by Heiberg (1898-1907); the *Almagest* and the most of the minor works, by Halma (Paris, 4 vols. 1813-28); the German translation of the *Almagest*, by Manitius (1912 *et seq.*); and for the *Geography*, the Latin versions of 1482 and 1490, published at Rome, the *editio princeps* of the Greek text by Erasmus (1533), the Elzevir edition (1619), those of Wilberg and Grashof (1844), Nobbe (1845), Müller (Paris, 1883), and the photographic reproduction of the Mount Athos MS., by Langlois (Paris, 1866). The catalogue of stars has been frequently reprinted separately, the best editions being Francis Baily's in *Mem. Roy. Astr. Soc.*, xiii. (1843); and Peters and Knobel's (Wash. 1915).

Ptomaines. It has been known for a very long time that food which has undergone putrefaction may, in certain circumstances, act as a violent poison, setting up severe catarrh, and producing symptoms of a more general nature. Stale mussels, fish, and sausages have even a popular reputation on account of their poisonous qualities. A ptomaine was first obtained by Marquardt in 1865, and described by him as similar to coniine; in 1869 Sülzer and Sonnenschein isolated a crystallisable ptomaine which resembled in its qualities atropine and hyoscyamine. Of recent years attention has been called to this question from another point of view, and one of special interest to the medical jurist. At a trial at Rome, on the occasion of a supposed murder, a material was extracted

from the body which had markedly poisonous qualities, similar to those of delphinine. It was supposed by those who undertook the prosecution that this poison had been administered to the deceased, but on the side of the defence it was pointed out that the extract, though similar in some respects to delphinine, was in others quite distinct, producing on the frog's heart very different effects.

Attention having been called to the subject, scientific investigators, especially those of Italy and Germany, busied themselves in extracting these poisonous materials, ptomaines (Gr. *ptōma*, 'a corpse'), from putrescent animal matters, and investigating both their chemical and physiological properties. These ptomaines can hardly be said to form a very distinct group of bodies from a chemical point of view, for some, like putrescine and cadaverine, are amines; others are amido-acids, like creatinin; and neurine, which has choline and muscarine closely allied to it, is trimethyl-vinyl-ammonium-hydroxide. It cannot even be said to possess an alkaline reaction, at one time supposed to be a common property of all ptomaines, and one which related them to the vegetable alkaloids, for Salkowski showed that creatinin, a body that has been long known and apparently carefully investigated, when obtained pure gives no reaction with litmus-paper, nor does it possess the power of combining with acids like a base. Bieger, who first showed that alkaloids were formed by bacteria under a variety of conditions, and that some of them were poisonous, subsequently recognised that though organic bases may be formed and may be toxic, the important toxins do not belong to that category; rather was it probable that the extra-cellular toxins of diphtheria, tetanus, and other such diseases were of protein nature.

Neither from a physiological point of view can we look upon the ptomaines as *sui generis*, and in the first case because many of them are produced by the action of organisms during their life. As well-known examples let us instance creatinin and neurine, which are produced every day in our living bodies, showing that during the putrefactive process we cannot be said to find substances which stand alone, and are invariably different from those formed during digestion and assimilation. Finally, in respect to their poisonous properties, not only are some of them perfectly harmless or poisonous only in a minor degree, but it is highly probable that some of the most poisonous products of the action of putrefactive and other organisms are bodies (albumoses) of quite a different chemical constitution. The term Ptomaine is now much restricted in usage.

With regard to harmful effect, much greater stress is now laid upon the presence of the bacteria found in decomposing meat, &c. Some of the most dangerous of these, the bacillus of Gaertner, bacillus of Aerttrycke, &c., belong to the same group as those of dysentery. The poisonous effects are due to the development of the bacilli themselves in the alimentary tract, following upon eating food that has been contaminated by their presence.

Ptoxis (from the Gr. *πτῶ*, 'I fall') signifies a drooping or falling of the upper eyelid, and arises from weakness of the muscle which elevates it, or from palsy of the third or motor oculi nerve. If it is congenital, or occurs without any apparent cause, and resists medical treatment, it may be removed by a surgical operation, by which the eyelid is brought under the action of the occipitofrontal muscle, which receives its nervous power from another source.

Ptyalin, PTYALISM. See SALIVA.

Puberty is the period of life at which the reproductive organs in both sexes begin to be func-

tionally active, and is marked by other important changes in the structure and functions of the body. Among the peoples of northern Europe it begins in girls at from twelve to fourteen, and in boys about two years later. In girls both growth and development are about this period much more rapid than in boys; the breasts enlarge, and the figure becomes full; the temperament changes; and the menstrual flow begins to appear. In boys the most obvious changes are the breaking of the voice and the growth of hair on the face. The changes begun at this time are not fully completed nor the bodily and mental vigour of adult life established for at least eight or ten years after the commencement of puberty. The health during this period is specially liable to be disturbed by adverse influences, particularly in the female sex; and overstrain, both of the physical and mental powers, should be carefully guarded against.

Publicani (from Lat. *publicum*, 'that which is public or belongs to the state'), the name given by the Romans to those persons who farmed the public revenues (*vectigalia*). These revenues were put up to auction by the censors, and were 'sold' for a period of five years. They were derived chiefly from tolls, tithes, harbour-duties, the tax paid for the use of public pasture-lands, mining and salt duties; and from the special taxes they collected, publicani were classified as *decumani*, *pecuarii* or *scriptuarii*, and *conductores portorum*. As the state required them to give security for the sum at which they had purchased the collecting of the taxes, and as this sum was usually much greater than the wealth of any single individual, companies (*societates*) were formed, the members of which took each so many shares and were thus enabled to carry on conjointly undertakings far beyond the capabilities of the separate shareholders. Every *societas* had also a head-manager (*magister*), who resided at Rome, and transacted all foreign correspondence with the inferior officers who directly superintended the collection of the taxes. The publicani belonged to the order of *equites*, and formed from their immense profits a powerful capitalist class. Under the empire the land-tax and poll-tax came to be collected by officers of state—in senatorial provinces, the quaestor; in imperial provinces, an imperial procurator assistant to the governor; while in provinces like Judaea, administered by an equestrian, the governor was himself at the same time procurator. The customs, on the other hand, even in the days of the empire, were still commonly leased out to publicani, and so undoubtedly in Judaea. No doubt territorial princes like Herod Antipas also employed this method of collecting their taxes.

The lessees again had their subordinate officials, who would usually be chosen from the native population. But even the principal lessees in later times were not necessarily Romans. Zaccheus, the tax-gatherer of Jericho (Luke, xix. 1, 2), was a Jew. The tariffs were often very indefinite, opening a door to arbitrariness and rapacity. Hence in New Testament phraseology the terms *publicans* and *sinners* are coupled together, while in the rabbinical literature tax-gatherers appear in a still less favourable light.

Public-houses. See INN, LICENSING LAWS.

Public Schools. The nine great public schools of England are Eton, Harrow, Rugby, Winchester, Westminster, Shrewsbury, Charterhouse, St Paul's, and Merchant Taylors'. See the special articles on each, and EDUCATION.

Public Worship Regulation Act. See ECCLESIASTICAL COURTS.

Publishing. See BOOK-TRADE.

Puccini, GIACOMO, Italian operatic composer, was born at Lucca, 23d December 1858, and received his musical education there and at Milan. He established his fame in 1893, when his *Manon Lescaut* was performed at Turin. It was followed three years later by *La Bohème*, and then by *La Tosca* (1900), *Madama Butterfly* (1904), *La Fanciulla del West* (1910), and *La Rondine* (1917). His last opera was *Turandot*, produced in 1926 with great success. He also composed many smaller works, among which *Gianni Schicchi* is refreshingly felicitous. He died 24th November 1924, at the height of his vogue.

Puccinotti, FRANCESCO (1794-1872), born at Urbino, was already an accomplished classical scholar when in 1811 he repaired to Pavia for a thorough course of mathematics, physics, and natural science. From these studies he passed on to that of medicine at Rome, and graduated with much distinction in 1816. The local malaria first engaged his attention. A work ardently opposing the prevalent Brunonian doctrine, and advocating a return to the rational medicine of Hippocrates, was followed up by able treatises on Pernicious Fever (1821) and on Inductive Pathology (1828). He passed from one medical chair to another, till, compromised in the patriotic movement of 1831, he was deposed from the professorship of Pathology at Macerata. His redoubled literary activity bore fruit in classic treatises on medical jurisprudence and on nervous maladies. In 1835-37 he made a special study of the cholera epidemic at Leghorn, at the same time giving to the world his masterly translation of Aretæus. In 1838 the Tuscan Archduke appointed him professor of Medical Jurisprudence at Pisa, and there he published his *Lezioni Speciali sui Mali Nervosi*, his work on the *Cachexia*, and on the maladies induced by rice-culture, and, above all, his masterpiece, the *Storia della Medicina*, in three volumes, representing the labour of twenty years.

Puck, or ROBIN GOODFELLOW, a familiar figure in the fairy-world of old English folklore, immortalised by Shakespeare in the *Midsummer Night's Dream*. His characterisation here keeps close to popular tradition in the merry tricks and mischievousness attributed to him. The name is really a generic term for a fairy, and we recognise it further in the Icelandic *puki*, the Irish *púca* (*pooca*), the Welsh *pucca*, even the Cornish *pixie*, and the Puk and Niss Puk of the Frisians and Danes. The Pucks occasionally perform kindly domestic functions, are small and dwarf-like in appearance, attach themselves to particular households, and are easily propitiated by offerings of cream and kindly names like the Irish 'good people,' the Scots 'good neighbours.' They may assume the form of a horse, a hound, or the like, and are even confounded with such dancing lights as the Will-o'-the-Wisp or Jack o' Lanthorn. Robin Goodfellow once filled a prominent place in the popular imagination—we meet him at full length in the 1628 black-letter tract, *Robin Goodfellow; his mad pranks, and merry Jests, full of honest mirth, and is a fit medicine for melancholy*. Henslowe's Diary tells us that Chettle wrote a drama on his adventures; we find him again in Drayton's *Nymphidia*, Burton's *Anatomy of Melancholy*, Ben Jonson's *Masque of Love Restored*. As Lob, Hobgoblin, and the Lubber-fiend also the allusions to him in our earlier literature are endless.—The name *Puck* was taken for its title by the well-known New York counterpart to *Punch*.

See J. O. Halliwell's *Illustrations of the Fairy Mythology of A Midsummer Night's Dream* (Shakesp. Soc. 1845); W. J. Thoms's *Three Notelets on Shakespeare* (1865); and W. C. Hazlitt's *Fairy Tales, &c., illustrating Shakespeare and other English Writers* (1875).

Pud, or POOD, a Russian weight which contains 36 lb. avoirdupois (40 lb. Russian).

Pudding-stone. See CONGLOMERATE.

Pudsey, a municipal borough (incorporated 1900) in the West Riding of Yorkshire, 3 miles E. of Bradford, with important woollen and other manufactures. Pop. 14,000.

Puebla, the third city of Mexico, capital of a state of the same name, stands on a fruitful plain, 7120 feet above sea-level, 68 miles SE. of the city of Mexico, and near Orizaba and Popocatepetl. It was founded in 1531, and is one of the handsomest towns in the republic, with broad, straight, clean streets; many of the houses, which are generally three stories high, have quaint fronts of red and white tile-work. The city contains many churches, theological, medical, art, and normal schools, a museum of antiquities which dates from 1728, two large libraries, a number of hospitals, &c. On the great square stands the cathedral, a Doric building with two towers, valuable pictures, and most sumptuous decorations. Puebla has a thriving trade and many factories; the chief products are cottons, marble, and tiles. Pop. 101,000. Puebla was besieged for two months by the French, and then taken by storm, 17th May 1863.

Pueblo, capital of Pueblo county, Colorado, on the Arkansas River, at the mouth of Fountain Creek, 105 miles S. by E. of Denver. Through its iron and steel industry it has rapidly become the second city of the state and an important railway centre; immense quantities of raw materials and fuel abound in the vicinity. There are great smelting works, besides foundries, boiler and machine shops, and other iron and steel industries. Pop. (1880) 3217; (1890) 24,558; (1900) 28,157; (1920) 43,050, or with environs, about 60,000.

Pueblos (Span. *pueblo*, 'village'), a semi-civilised family of American Indians in New Mexico and Arizona, dwelling in large single habitations, which are sometimes capacious enough to contain a whole tribe. These edifices—which are often five or six stories high, and from 130 to 433 yards long, with many rooms (53 to 124) on each floor—are commonly constructed of adobe or sun-dried brick; the ground-floor is invariably without doors or windows, entrance being effected by a ladder leading to the second story; and indoors ladders take the place of staircases everywhere. A somewhat pyramidal aspect is given to the whole building by each successive story receding a few feet from the line of that below it. Each family of the tribe has a separate apartment, and there are also large rooms for general council-chambers and for tribal dances. In New Mexico there are a score of such villages. Their occupants are skilful agriculturists, employing irrigation ditches extensively, and rear horses, cattle, and sheep. Spinning and weaving and the manufacture of pottery also are carried on. The Moquis of Arizona are a related tribe, in villages built on the tops of isolated hills. The Pueblos under Roman Catholic missionaries have grafted on Christianity many old pagan beliefs and customs. They were first visited by the Spaniards about 1530, at which period their habits and their habitations were very much the same as to-day. It is evident, however, from the wide area over which the ruins of old pueblos and remains of ancient pottery have been found, that they were at one time very much more numerous than they are now. See a monograph by J. W. Fewkes (Bur. of Amer. Ethnol., 1920).

Puerperal Fever. In its old and wide sense this term embraced all forms of disease in the puerperal or lying-in woman accompanied by a high temperature. At the present day it is used

in a more restricted sense, being synonymous with the more scientifically correct terms *puerperal infection* or *puerperal sepsis*, and signifying the morbid conditions arising in the puerperium from the introduction of organisms into the genital tract.

It is probable that the disease has existed from the very earliest days, and there are references to it in the oldest medical literature. For centuries the view of Hippocrates was accepted without challenge—that it was due to the suppression of the lochia or discharge from the uterus (a common symptom). Later it came to be regarded as a specific fever peculiar to puerperal women, and its occurrence was regarded as an act of Providence calling for no explanation, and involving no responsibility upon any one. In the last century this comfortable doctrine had to be given up, and with it the term 'puerperal fever,' signifying, as it does, a specific fever, ought also to yield to the more correct synonyms mentioned above.

The beginning of the modern conception of the disease dates back to the published work of Dr Charles White of Manchester in 1773. He taught that the disease was contagious, advocated the washing out of the womb, and the propping up of the patient so as to favour drainage. He urged the importance from the preventive point of view of absolute cleanliness in all the patient's surroundings, her clothing, and her person, and insisted upon the beneficial influence of fresh air. It is not easy at this date to realise how revolutionary such teaching was—nearly a century before the discovery of bacteria by Pasteur, and of antiseptic surgery by Lister! White's work was far in advance of his time, and, although his teaching was followed for some time by British obstetricians, yet it was allowed to drop into disregard. For this reason much of the credit due to White has been given to a Hungarian genius, Ignaz Semmelweis, whose discoveries were certainly epoch-making. In 1847 Semmelweis was assistant in the Maternity Hospital at Vienna, where the mortality from 'puerperal fever' ran at about 10 per cent. or more. A somewhat similar mortality occurred in practically all such institutions throughout the world at this time. Occasionally epidemics broke out, which swept the hospitals like a veritable plague, and sent the mortality up to figures that were appalling. Semmelweis noticed that in one of his wards, which was attended only by midwives, the disease was comparatively rare, while in another, to which medical students also had access, the disease was rife. Since these students came direct from the dissecting rooms and from the surgical wards which were reeking with 'wound fever,' and examined the patients without necessarily washing their hands, he concluded that the disease must be due to the introduction into the genital tract of minute portions of dead and decomposing matter on the fingers of the students. He accordingly insisted upon a simple disinfection of the hands in chlorine water before examining patients, and the result was an immediate and marked drop in the frequency of the disease in that ward. At the same time Semmelweis also pointed out that the condition was essentially similar to the 'wound fever' which raged throughout every surgical ward at that time. Some twenty years later Lister proved the organismal nature of 'wound fever,' and Pasteur demonstrated the presence of organisms in the discharge from a case of 'puerperal fever.' In this way the real nature of puerperal infection was discovered, and it will be observed that if we substitute the word 'organisms' for the words 'minute portions of dead and decomposing matter,' Semmelweis's discovery was accurate.

Others whose names deserve mention in con-

nection with the early recognition of this condition are Dr Gordon of Aberdeen, who, in 1795, pointed out that the condition was contagious, and could be carried from one patient to another by the attendant; and Dr Oliver Wendell Holmes, who, in 1843, emphasised the same points in America with all the eloquence and literary distinction at his command, but with comparatively little result. Even Semmelweis's discoveries were scouted by the obstetricians of his day, and ultimately he died a disappointed and broken man in a Hungarian asylum. As is so often the case, Semmelweis's fame became much greater after his death than during his lifetime.

We now know, then, that puerperal infection is due to the introduction of organisms into the genital tract, and that it is essentially the same as the septic infection of any wound. In some cases the organisms are present in the genital tract before labour (so-called auto-infection), but in the majority of serious cases they are probably introduced during or immediately after the confinement by the employment of hands, instruments, or utensils that are not scrupulously clean in a surgical sense. The condition is therefore a largely preventable one, and any prevalence involves a heavy responsibility upon all associated in attendance upon the patients during labour and in the puerperium.

While the conditions of the genital tract after labour are always favourable to the growth and development of organisms, there are certain circumstances which particularly affect them. Thus the liability to infection is greater after severe labours, owing to the greater wounding of the genital canal, to the greater amount of handling necessitated, and to the exhaustion of the patient. Women debilitated by under-feeding, hæmorrhage, or previous disease are also more prone to infection. The resistance of the individual patient, which may be affected by these conditions, is an all-important factor both in the occurrence of the disease and in the prognosis.

Without entering into the subject of the bacteriology of puerperal infection, it may be said that there are two main types of infection, which may frequently be distinguished clinically. The first type is due to the growth of saprophytic organisms upon pieces of dead tissue, such as blood clots or fragments of the placenta and membranes, which have been retained in the birth canal. The result of the growth of these organisms is the production of toxins or poisons which are rapidly absorbed by the patient, and lead to more or less serious symptoms. The second type is the result of the introduction of parasitic organisms—that is, organisms capable of living upon live tissues. These when conveyed into the genital tract develop in and upon its walls, and readily pass into the patient's blood stream, causing a general blood-poisoning or *septicæmia*.

The symptoms of puerperal infection may set in at any time within a fortnight of labour, but in the vast majority of cases they ensue within the first five days. The first symptom is usually a shivering or 'rigor,' followed by a rise in temperature and pulse rate. The lochia may become fetid, or may be suppressed, and there may be pain in the abdomen and tenderness. The organ most commonly affected in the first place is the uterus, but the infection may spread rapidly to any or all of the pelvic organs and tissues. The result in all cases is to produce an acute inflammation of the organ, rapidly passing on to suppuration. If general septicæmia supervene, all the organs of the body share in the intoxication. Occasionally the infection is of so virulent a character that the patient succumbs before any of the typical

changes in the organs have had time to show themselves.

The outlook in all cases is serious, but where the condition depends upon the growth of saprophytic organisms in some retained dead tissues (*sapremia*), the results of prompt treatment are eminently and almost uniformly satisfactory. If, on the other hand, the symptoms are due to the absorption of organisms themselves (*septicæmia*), the results of treatment are much less satisfactory. In these cases local treatment applied to the genital tract itself is as often as not useless, for the source of danger has already passed into the blood. The upshot of the disease depends almost entirely upon the patient's general strength and powers of resistance. If these are considerable they may in time be able to overcome the organisms; otherwise the result will be rapidly fatal.

The preventive treatment (*prophylaxis*) of puerperal infection is, however, one of the most notable triumphs of modern medicine, and in no other sphere have the beneficent results of Lister's great work been more manifest. This at least applies to hospitals, where antiseptic methods were adopted immediately after their application to ordinary surgery. The result has been that, instead of the constant high mortality of pre-antiseptic days, it is now a very rare thing to find any well-conducted hospital in which the mortality from this disease is more than a fraction of 1 per cent. Unfortunately the same improvement has not taken place in private practice. The disease is still responsible for far more deaths in a year than any of the other diseases and accidents of child-birth, and this is entirely due to the difficulty of carrying out and maintaining in practice, particularly amongst the poorer classes, a sufficiently scrupulous cleanliness in methods and technique. The chief points to be attended to are the cleanliness of the room in which the patient is to be confined; the cleanliness of the bed and bedding; the cleanliness of the patient's person; and the scrupulous cleanliness of the hands of the attendant, and of any instrument or utensil that comes in contact with the birth canal. Special care is required to prevent infection being carried from one patient to another, and it must be remembered that infection may be conveyed not only from a case of a similar nature, but also from any infected wound or sore. The requisite cleanliness of the hands of the attendants can only be attained after prolonged washing and the free use of antiseptic lotions, and preferably the wearing of sterilised rubber gloves, while all instruments should be capable of being boiled before use.

The improbability of obtaining these suitable conditions of cleanliness amongst the poorer classes is obvious, and for all such patients a maternity hospital is much the safest place for confinement. In practice amongst those who are better off the required conditions may with care be attained, although in every case unremitting attention to the details is necessary. Even in such circumstances, however, if there is reason to anticipate that a labour will be difficult, and require operative interference, it is wiser for the patient to arrange to go into a good nursing-home, where hospital conditions of surgical cleanliness can be more thoroughly attained.

A definite improvement in regard to the frequency of the condition in private practice may also be expected to follow legislative effort. In this connection the Midwives Acts have been of great value, forbidding, as they do, the practice of unlicensed midwives, and providing for the better training, examination, and supervision of those who are licensed. The lives of scores of women are being saved every year as a direct result of their wise provisions.

The wider adoption of the Notification of Births Act may also be expected to produce good results, in so far as it prevents any woman being entirely neglected during her puerperium.

Puerperal Insanity. This term is commonly used in a general sense to include the various forms of insanity in women associated with reproduction. Eight per cent. of all cases of insanity in women come under this category, while one out of four hundred pregnant women is likely to be affected with mental disorder.

Insanity of Pregnancy is not common. It usually comes on about the sixth month, and tends to a melancholic type, associated with a revulsion of feelings towards husband and children. Recovery is delayed in most cases until after delivery.

Insanity of the Puerperium usually comes on within the first ten days after labour. It tends to an exalted type, and may be suicidal or infantile. Eighty per cent. of cases recover within a few months.

Insanity of Lactation comes on gradually several months after labour in a woman who is nursing. It is depressed and melancholic in type. Seventy per cent. of cases recover after some months.

In all forms hereditary predisposition plays a large part in the causation. Septic infection is an important factor in puerperal cases, the frequency of this form being much less than in pre-antiseptic days. The mental depression and anxiety associated with unmarried motherhood make insanity peculiarly frequent amongst such patients.

The outlook in all forms is good. Although all cases do not recover, yet the recovery rate is higher than in any other form of insanity.

The treatment is on general lines. The child, if born, should be removed, and nursing stopped. Unless trained attendants can be provided, early recourse to an asylum should be had in the best interests of the patient's speedy recovery.

Puerto Bello. See PORTOBELO.

Puerto Cabello, a seaport of Venezuela, 78 miles W. from Caracas. It stands on a long, low, narrow peninsula on the Caribbean Sea, and has a safe, deep, and roomy harbour, defended by a fort and batteries. It is the port of Valencia, which is 34 miles distant by rail. There is an active foreign trade; the chief exports are coffee, cacao, copra, woods, and hides. Pop. 140,000.

Puerto Cortés, a port of Honduras (q.v.).

Puerto de Santa María, EL, a seaport of Spain, stands at the mouth of the Guadalete, on the Bay of Cadiz, 22 miles by rail (all round the bay) N.E. of Cadiz and 8 SW. of Xeres. It is one of the principal export harbours for sherry, and manufactures silk, soap, hats, leather, spirits, beer, &c. The bull-fights here in May are among the most famous in the country. Pop. 20,000.

Puerto Méjico. See COATZACOALCOS.

Puerto Plata, the chief port of the Dominican Republic, on the north coast of the island of Hayti. Pop. 7000.

Puerto Principe, now called CAMAGÜEY, an important inland town in the east of the island of Cuba, 40 miles SW. of its port, Nuevitas, with which it is connected by railway. It manufactures liquorice and carries on a busy trade. Pop. 93,000.

Puerto Rico. See PORTO RICO.

Puff-adder (*Bitis* or *Echidna arietans*), one of the most venomous and dangerous vipers of South Africa. Its popular name refers to its habit of puffing itself up when irritated. It attains a length of 4 or almost 5 feet, and is often as thick as a man's arm. Its head is very broad; its tail suddenly tapered; its colour brown, chequered with dark brown and gray or white. The puff-

adder is very sluggish, and often lies half buried in the sand of the desert, its head alone being raised above ground. Its poison is used by the Bushmen



Puff-adder (*Bitis arietans*).

for their arrows. The River-jack (*Bitis nasicornis*) of tropical West Africa can erect two or three enlarged scales, like little horns, above the nostrils.

Puffball (*Lycoperdon*), a genus of Fungi (Gasteromycetes). They mostly grow on the ground, and are roundish, generally without a stem, at first firm and fleshy, but afterwards powdery within; the powder consisting of the spores, among which are many fine filaments, loosely filling the interior of the *peridium*, or external membrane. The peridium finally bursts at the top, to allow the escape of the spores, which issue from it as very fine dust. Some of the species are common everywhere. Most of them affect rather dry soils, and some are found only in heaths and sandy soils. The most common British species is *L. gemmatum*, generally from one to two and a half inches in diameter, with a warty and mealy surface. The largest British species, the Giant Puffball (*L. giganteum*), is often many feet in circumference, and filled with a loathsome pulpy mass when young; but in its mature state its contents are so dry and spongy that they have often been used for stanching wounds. Their fumes, when burned, have been used not only for stupefying bees, but even as an anæsthetic. The same properties belong also to other species. Some of them, in a young state, are used in some countries as food, and none of them is known to be poisonous.

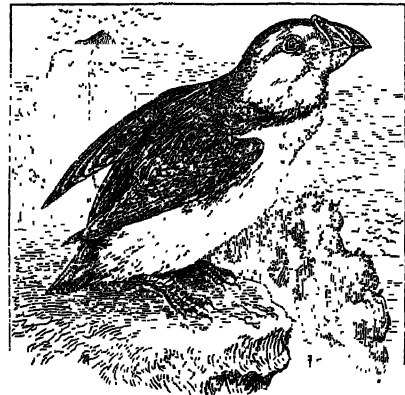
Puff-birds (*Bucconidae*), a family resembling Kingfishers in form, but living on insects like Flycatchers; they also resemble the Bee-eaters, and are found only in South and Central America. See BARBET, and Sclater's *Monograph of the Jacamars and Puff-birds* (1882).

Puffendorf. SAMUEL, BARON VON PUFFENDORF (or Pufendorf), writer on jurisprudence, was born on 8th January 1632, at Chemnitz, in Saxony. He began the study of theology at Leipzig, but in 1656 went to Jena to study national law and mathematics. Whilst acting as tutor to the sons of the Swedish ambassador at Copenhagen war broke out (1658) between Denmark and Sweden, and Puffendorf was thrown into prison. During the eight months he was kept there he thought out his *Elementa Jurisprudentiæ Universalis*. It was dedicated to the Elector Palatine, who appointed Puffendorf to the professorship of the Law of Nature and Nations at Heidelberg. He next exposed the absurdities of the constitution of the Germanic empire in *De Statu Reipublicæ Germanicæ* (1667), which raised a storm of controversy. In 1670 he was called to fill the chair of the Law of Nations at Lund, and there wrote

the work on which his fame now rests, *De Jure Naturæ et Gentium* (1672), a work based upon the system of Grotius (q.v.), but completed and extended in the line of Hobbes's speculations. Some years later the king of Sweden made him his historiographer, with the dignity of a councillor of state. In his official character he published a dry history of Sweden, from the expedition of Gustavus Adolphus into Germany to the death of Queen Christine. In 1688 the Elector of Brandenburg invited him to Berlin to write the history of the life and reign of the Great Elector. He died in that city on 26th October 1694.

See Lorimer, *Institutes of Law of Nations* (vol. i. 1883); H. von Treitschke, in *Preussische Jahrbücher* (1875); and Droysen, *Abhandlungen zur neueren Geschichte* (1876).

Puffin (*Fratercula*), a genus of birds of the Auk family, characterised by a gaily-coloured bill—red, orange-yellow, and bluish gray—with a horny frontal sheath divided by transverse grooves



Puffin (*Fratercula arctica*).

into several distinct pieces. At the end of the breeding season these furrows deepen, and the sheath is shed. There is in fact an annual moult of the bill-sheath and of the horny plates above and below the eyelids. In form, size, and colour the new bill-sheath differs markedly from the old one. The genus *Fratercula* embraces three species, of which only one, the Common Puffin (*F. arctica*), a bird a little larger than a pigeon, frequents the rocky shores of the Atlantic Ocean. It occurs in many parts of England and in Wales, while on the coast and islands of Scotland and Ireland it is often abundant, especially at the breeding season, when the birds congregate in large colonies. The egg, which is of a dull white marked with pale brown or lilac, is laid sometimes in a crevice of a cliff, sometimes in the burrow of a rabbit, or in a cavity made for the purpose. The nestling, which is covered with sooty black down, remains in the nest for three weeks, and is fed on small fishes. The adult birds feed on crustaceans and other marine animals. On land they waddle rather than walk, but they swim and dive well, and their flight is rapid though seldom high. In various localities the puffin is popularly called *Sea-parrot*, *Coulterneb*, and *Tammienorie*. In the Pacific the genus is represented by the Horned Puffin (*F. corniculata*). There also is found the closely allied genus *Lunda*, with bright yellow bill. The eggs of the puffin are much sought after, and the flesh of the young birds is used as food. For details as to the strange moulting and renewal of the bill, see *Zoologist* (July 1878).

Pug-dog. This breed of dog is generally supposed to have been brought over from Holland,

where it is very common. Its origin there is unknown. The pug may be described as a miniature bulldog, though he differs in the shape of his ears, which should fall forward like a terrier's, and of his tail, which should curl tightly against his quarters. The broad under-jaw and wide skull of the bulldog are rarely seen, but should be present in a perfect specimen. Some years prior to 1860, when the pug was fashionable, Mr Morison of London and Lord Willoughby d'Eresby paid great attention to the breeding of pugs, and founded two distinct strains known as the Morison and Willoughby pugs. Large prices were paid for pure specimens of either strain, but when the fashion in ladies' dogs took another direction prices came rapidly down. The two strains have been so often recrossed that it is difficult to obtain a pure specimen now. The pug is only fit for a house-dog, as he is useless for any active work. Beyond a tendency to get very fat he is well fitted for this, as his short, smooth coat is easily cleaned, and he is a handy size.

Puget Sound, a large inland sea in the north-west of Washington State, communicating with the Pacific by the Admiralty Inlet and Juan de Fuca Strait. It is divided into several branches, penetrates far into the interior, and is everywhere navigable for the largest vessels, which in most places can ride close to the shores, and load or unload without wharves. Great quantities of pine and fir are shipped from a country rich in timber. At Bremerton is a United States navy yard.

Pugilism, or **BOXING** (Lat. *pugil*, 'a boxer'; compare 'pugnacity,' from *pugnus*, 'a fist'). 'To box' is almost as old as our language itself: no special explanation is required to show what boxing is; every one knows that it is fighting—real or mimic—with the hands alone, all weapons being foreign to the 'science.' The beginnings of pugilism are lost in the realms of Greek mythology. Apollo and some of the offspring of Zeus and Poseidon were reckoned good fist-fighters. According to Homer and Virgil, Troy was the scene of dire encounters between the heroes. Pugilistic fights, governed by a strict code of rules, became a feature of most of the Greek games. The fighters wore a belt—probably to obviate foul hitting—and a type of leather glove called a cestus. The sport was later introduced into Rome, where the brute tastes of the gladiatorial crowds required that the cestus should be reinforced with rings and studs of lead or iron. From the decline of the Roman Empire little is heard of pugilism till the dawn of the 18th century in England.

As pugilism, in what used to be its generally accepted sense—prize-fighting—is now extinct as a sport, it may be of interest to give a brief sketch of its past, when it played a more important part—or was thought to do so—than boxing does now in the formation of the national character.

Apart from such forms of the sport as were practised in the ancient world, England was emphatically the home of pugilism. In no other country was such a fair, manly, and well-governed system of combat established as that under which the English settled their quarrels, especially after the rules of the prize-ring were issued in 1743 by Broughton, the first recognised champion of England. The rules held good for nearly a century; but in 1838, after a fatal battle, they were revised, entirely in the direction of diminishing the danger of such contests, although it should be remarked that fatal results to prize-fights were extremely rare, and in most instances occurred through what may be termed accidental or secondary causes. In Broughton's rules 'minute time' was allowed between the rounds—each bout of the struggle being

called a 'round,' and lasting until one or both of the men were down; but this was altered in the new rules to half a minute. It was properly decided that if a man could not recover himself sufficiently in that time to face his antagonist he must be so weak or stupefied that further fighting would be dangerous. In Broughton's time, too, the seconds were allowed to carry their principals to the 'scratch'; this was forbidden by the new rules on the same grounds as the previous alteration. The purpose of both sets of rules was to secure fair-play and to foster a kind of rude chivalry, objects not without value when we remember the classes most likely to come under their influence, and the angry quarrels either code was intended to regulate. No man was to be struck while he was down; and no man might be struck below the belt—the belt in practice being a handkerchief tied tightly round the waist. With prize-boxers these handkerchiefs were the 'colours' of the men, chosen by themselves and worn by their partisans. Kicking, biting, and the horrible 'gouging'—once so frequent across the Atlantic—were all 'foul,' and their practice instantly lost a man the battle. There were two seconds, or, as they were sometimes called, bottle-holders, to each man: their duty was to lift their principal when he fell; to carry him to his corner—always selected by tossing a coin, the winner of the toss naturally choosing the side of the ring which placed him with his back to the sun; to sponge or sprinkle him with water; to wipe the perspiration or blood from his face; and, as their second title implies, to refresh him with sips from the water or brandy bottle. They used also to carry in their jacket pockets a supply of powdered resin, which the boxer would rub on his hands to enable him to clench them tightly when he grew tired; but this practice was made 'foul' by the new rules. The 'scratch,' to which allusion has been made, was a mark in the centre of the ring which the combatants had to 'toe,' face to face, before hostilities could commence. It was also an indispensable formality for the men and their seconds to shake hands prior to the first round, all six crossing hands to do so, something like one of the figures in the Caledonian quadrilles; this prevented anything like a sudden rush by either of the men upon his unprepared foe. The 'ring' itself was a square of 24 feet, marked out by four corner and four middle stakes, round which ran two ropes at a height from the ground of 2 and 4 feet respectively. The prize-ring had a dialect of its own, a 'flash lingo.' The fists were 'mauleys,' and when both boxers struck with the same hand at the same time the blow was called, aptly enough, a 'counter-hit,' or only a 'counter.' When one struck with the right and the other with the left at the same time the blow was a 'cross counter.' 'Countering' was the most exciting and the severest mode of inflicting punishment.

For many years prize-fighting maintained an enormous popularity, and an existence which, if not actually legal, was scarcely to be distinguished from it. One of the last—and one of the greatest—prize-fights took place at Farnborough in 1860 between Tom Sayers and J. C. Heenan, an American pugilist. It was a brutal encounter, and public opinion was immediately roused. But the real decadence of the prize-ring dates from the establishment of police in every county of England, which rendered it well-nigh impossible to 'get a fight off'; the leading patrons of the sport withdrew disgusted at the continual disappointment. From the absence of any legal restraint there had always been danger of disorder and riot, to check which no adequate force could be provided; yet latterly such scenes grew more frequent and worse

in character, so that the demand from its opponents for the suppression of the ring gained in strength, while the efforts of those who would preserve it were proportionately weakened. Accordingly it is now a thing of the past, and in its place has sprung up the boxing match of our own day, which is usually a display of 'science,' not mere brute force. 'Boxing' was once equivalent to 'pugilism,' the general term for 'fistic' manoeuvres, but is now reserved for 'sparring' with padded gloves. These, of course, are used to prevent the injuries which the naked knuckles might inflict, although a very respectable amount of punishment can be dealt even with the largest gloves. These fights came to be conducted under the Queensberry rules, so called from the marquis of that name who first drew them up (1890). The characteristic finish of a boxing match is the 'knock-out,' a blow to the chin, heart, or solar plexus which renders the recipient insensible for a period of not less than ten seconds. Otherwise a win may be obtained on 'points' (for blows, style, &c.) awarded during the contest. New rules were issued by the National Sporting Club in 1923, requiring the ring to be from 14 to 20 feet square, the gloves not less than 6 oz. each in weight, the rounds to be of not more than three minutes' duration with one minute interval, and not more than fifteen in number, except in championships, where twenty are allowed. The rules of the Amateur Boxing Association are a modification of the preceding. The number of rounds is usually three, and the size of the ring from 12 to 14 feet square. The maximum weights for championship competitions are as follows: Fly, 8 st.; bantam, 8 st. 6 lb.; feather, 9 st.; light, 9 st. 9 lb.; welter, 10 st. 7 lb.; middle, 11 st. 6 lb.; light-heavy, 12 st. 7 lb.; heavy, any weight.

Broughton was followed by a series of champions, amongst whom the most famous were probably John Jackson (1769-1845)—known as Gentleman Jackson; Jem Belcher; Tom Cribb (1781-1848), the most fearless, honest, and simple-minded of gladiators; Spring (1795-1851); Tom Sayers (1826-65); and Jem Mace, with whom the series practically closed. Another pugilist, John Gully (1783-1863), who began life as a journeyman butcher, might have been champion, but he retired from the ring and became M.P. for Pontefract (1832-37), an owner of extensive coal-mines, and, what to many of his admirers was a fact of much greater importance, his racers thrice won the Derby. The popular idol at one time was Jack Shaw (1789-1815), the life-guard-man, a pugilist of herculean strength, who is said to have killed, or placed *hors de combat*, ten French cuirassiers at Waterloo before he was himself slain. The most outstanding boxing champions have been Jim Jeffries (world champion, 1899-1904), Tommy Burns (1906-8), Jack Johnson (1908-15), Jack Dempsey (1919-27), and Gene Tunney. Other boxers worthy of mention are Georges Carpentier, Bombardier Wells, Jimmy Wilde. The biggest matches have taken place in the United States, where championship aspirants reap fabulous rewards for winning—and even for losing—a single match.

Many men of the highest standing took a keen interest in the prize-ring. The great Duke of Wellington was its firm supporter; Sir Robert Peel and Lord Palmerston lent their influence to it; and Lord Byron, who was a pupil of Jackson, refers to him in really a respectful style in the notes to *Don Juan*. George Borrow's fight with the 'Flaming Tinman' is truly Homeric; and he lauds boxing as he lauds all things English. Thackeray, too, whose nose is said to have been broken in a school fight with a future church dignitary, devoted one of his *Roundabout Papers* to the fight between Sayers

and Heenan. When the allied sovereigns visited London after the peace of 1814, it was deemed fitting by the highest authorities to show them a display of boxing, supported by the best pugilists of the day—a display greatly admired by the visitors. Boxing in its modern sense appeals to and is supported by all social grades, an effect largely due to the activities of amateur clubs.

See Egan's *Boxiana* (5 vols. 1818); *Fistiana* (1863); *American Fistiana* (New York, 1876); Pollock and Groves, *Fencing, Boxing, and Wrestling* (Badminton Library, 1889); H. D. Miles, *Pugilistica* (2 vols. 1901); T. G. Wignall, *The Story of Boxing* (1923); B. Lynch, *Knuckles and Gloves* (1922), *Complete Amateur Boxer* (1924); and books by R. G. Allanson-Winn, Driscoll, Wilde, and Carpentier.

Pugin, AUGUSTUS WELBY, architect, was born in London on 1st March 1812, the son of a French architect, Augustin Pugin (1762-1832), in whose office, after schooling at Christ's Hospital, he was trained, chiefly by making drawings for his father's books on Gothic buildings. Whilst working with Sir C. Barry he designed and modelled a large part of the decorations and sculpture for the new Houses of Parliament (1836-37). Early in life he became a convert to Roman Catholicism; and most of his plans were made for churches and other ecclesiastical edifices belonging to that communion, the most successful being perhaps a church at Ramsgate, Killarney Cathedral, Adare Hall in Ireland, and the Benedictine chapel at Douai. He died insane at Ramsgate, on 14th September 1852. He enriched the literature of his profession by *Contrasts . . . between the Architecture of the 15th and 19th Centuries* (1836), a *Treatise on Chancel Screens* (1851), and *The True Principles of Christian Architecture* (1841). See B. Ferrey's *Recollections of A. W. Pugin and his Father* (1861).

His son, EDWARD WELBY PUGIN (1834-75), succeeded to his father's practice, and was the architect of many Roman Catholic churches, &c.

Pug-mill. See BRICK.

Puisne Judges. See COMMON LAW.

Pulaski, CASIMIR, a Polish count who fell in the American revolution, was born in Podolia, 4th March 1748, took an active part in the war against Russia, and lost his estates and was outlawed at the partition of Poland in 1772. In 1777 he went to America, and for his conduct at the Brandywine was given a brigade of cavalry, which he commanded until March 1778. He then organised 'Pulaski's legion,' a corps of lancers and light infantry, in which he enlisted even prisoners of war and deserters. In May 1779 he entered Charleston, and held it until the place was relieved; a furious assault which he had made on the British was repelled, but he afterwards followed and harassed them until they left South Carolina. At the siege of Savannah on the 9th of October he fell in the assault at the head of the cavalry, and died on board the brig *Wasp* two days later.

Pulcheria (399-453), sister of Theodosius II., was Byzantine empress from 450. See EUDOCIA, and Miss Teetgen's *Life* (1907).

Pulci, LUIGI, an Italian poet, born at Florence, 3d December 1432, was an intimate friend of Lorenzo de' Medici and of Politian. He is the author of a celebrated poem, *Il Morgante Maggiore* ('Morgante the Giant'), a burlesque epic of which Roland is the hero. This poem is one of the most valuable sources for the early Tuscan dialect, the niceties and idioms of which have been employed by Pulci with great skill (see ITALY, *Language and Literature*). The first edition appeared at Venice in 1481. Pulci wrote further a humorous novel and several humorous sonnets. He died in 1484 (or 1487).—His brother BERNARDO (born circa 1430) wrote

an elegy on the death of Simonetta, mistress of Giuliano de' Medici, and the first translation of the *Eclogues* of Virgil.—LUCA, another brother (born 1431), wrote a poem in honour of Lorenzo de' Medici's success in a tournament; *Il Ciriffo Calvaneo*, a metrical romance of chivalry; *Driadeo d'Amore*, a pastoral poem; and *Epistole Eroiche*.

Pulex. See FLEA.

Pulicat, a town of British India, 25 miles N. of Madras, the first settlement of the Dutch in India; pop. 4000. It stands on an island in a large inlet of the sea called the Lake of Pulicat.

Pulkova, a village of Russia, 10 miles S. of St Petersburg, the site of a magnificent observatory ($59^{\circ} 46' 18''$ N. lat. and $30^{\circ} 19' 40''$ E. long.), built by the Tsar Nicholas in 1838-39. In 1882 one of the largest telescopes in the world was erected here.

Pulley, one of the mechanical powers, consists of a wheel, with a groove cut all round its circumference, and movable on an axis; the wheel, which is commonly called a *sheave*, is often placed inside a hollow oblong mass of wood called a *block*, and by the sides of this block the extremities of the axle of the sheave are supported; the cord which passes over the circumference of the sheave is called the *tackle*. Pulleys may be used either singly or in combination; in the former case they are either *fixed* or

movable. The *fixed pulley* (fig. 1) gives no mechanical advantage; it merely changes the direction in which a force would naturally be applied to one more convenient: thus, W can be raised without lifting it directly by merely pulling P down. The *single movable pulley*, with parallel cords, gives a mechanical advantage = 2 (fig. 2); for a little consideration will show that, as the weight, W, is supported by two strings, the stress on each string is $\frac{1}{2}W$, and the stress on the one being supported by the hook, A, the power, P, requires merely to support the stress on the other string, which passes round C. The fixed pulley, C, is only of service in changing the naturally upward direction of the power into a downward one. If the strings in the single movable pulley are not parallel there is a diminution of mechanical advantage—i.e. P must be more than half of W to produce an exact counterpoise; if the angle made by the strings AB and BC is 120° , P must be equal to W; and if the angle be greater than this there is a mechanical disadvantage, or P must be greater than W. The following are examples of different combinations of pulleys, generally known as the first, second, and third systems of pulleys. In the first system one end of each cord is fastened to a fixed support above; each cord descends, passes round a pulley (to the lowest of which the weight, W, is fastened), and is fastened to the block of the next pulley, with the exception of the last cord, which passes round a fixed pulley above, and is attached to the counterpoise, P. The tension of a string being the same in all its parts, the tension of every part of the string marked (1) in fig. 3 is that which is produced by the weight of P; consequently, as the last movable pulley is supported on both sides by a string having a tension, P, the tension applied in its support is 2P. The tension of the string marked (2)

is therefore 2P, and the second movable pulley is supported by a force equal to 4P. It may similarly be shown that the force applied by the strings marked (4) in support of the last pulley (which

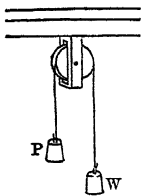


Fig. 1.

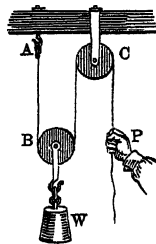


Fig. 2.

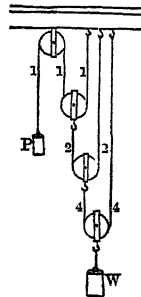


Fig. 3.

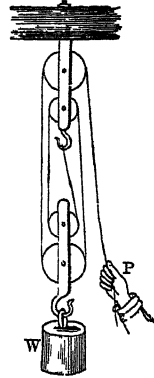


Fig. 4.

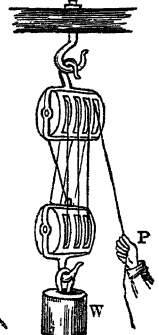


Fig. 5.

is attached to W) is 8P. Hence we see that, according to this arrangement, 1 lb. can support 4 lb. if two movable pulleys are used; 8 lb. if there are three movable pulleys; 16 lb. if there are four movable pulleys; and if there are n movable pulleys 1 lb. can support 2^n lb. It must be noticed, however, that in practice the weight of the cords, and of the pulleys, and the friction of the cord on the pulleys must be allowed for; and the fact that in this system all of these resist the action of the power, P, and that to a large extent, has rendered it of little use in practice.—The second system is much inferior in producing a mechanical advantage, but it is found to be much more convenient in practice, and is modified according to the purpose for which it is to be used; two prevalent forms are given in figs. 4 and 5. In this system one string passes round all the pulleys, and, as the tension in every part of it is that produced by the weight of P, the whole force applied to elevate the lower block with its attached weight, W, is the weight P multiplied by the number of strings attached to the lower block; in fig. 4 $W = 4P$, and in fig. 5 $W = 6P$, the pulleys in the upper block being only of use in changing the direction of the pulling force. This system is the one in common use in architecture, in dockyards, and on board ship, and various modifications of it—such as White's pulley, Smeaton's pulley, &c.—have been introduced; but the simpler forms shown above have been found to answer best.—The third system (fig. 6) is merely the first system inverted, and it is a little more powerful, besides having the weight of the pulleys to support the power, instead of acting in opposition to it, as in the former case.—The mechanical advantage can be traced out by finding from the form of the combination the ratio between the run of the tackle over the last sheave and the vertical ascent of W, when motion is set up. Theoretically, the larger the number of movable pulleys in any one combination the greater is the mechanical advantage

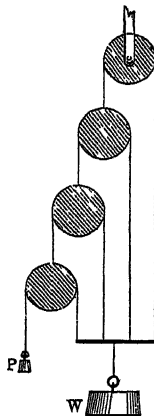


Fig. 6.

afforded by it; but the enormous friction produced, and the want of perfect flexibility in the ropes, prevent any great increase in the number of pulleys.

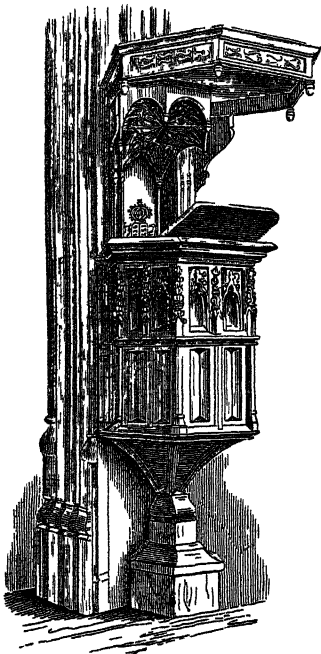
Pullman, GEORGE MORTIMER (1831-97), the inventor of the well-known 'cars,' was born in New York state, engaged in the business of moving and raising buildings, and as early as 1859 made his first sleeping-cars, and in 1863 the first on the model with which his name is now associated (see RAILWAYS). The Pullman Palace-car Company was formed in 1867 under his presidency. In 1880 he founded an industrial town, since absorbed by Chicago.

Pulmonaria. See LUNGWORT.

Pulmonates. See GASTEROPODA.

Pulo-Penang. See PENANG.

Pulpit (Lat. *pulpitum*), an elevated tribune or desk, from which sermons, lectures, and other solemn religious addresses are delivered. In great churches the pulpit is commonly placed on the north side of the nave against the wall, or in juxtaposition with a pillar or buttress (see also AMBO). The pulpits of the Low Countries and of Germany are often masterpieces of elaborate carving in wood and stone, frequent subjects for treatment being the Conversion of St Paul, the Call of Peter and Andrew, and Adam and Eve (as in the wood-carved pulpit by Verbruggen in St Gudule at Brussels). Sometimes the canopy or sounding-board is the part most elaborately adorned by carving in wood or stone, as in the pulpit at Fotheringhay, Northamptonshire, 1440.



Pulpit (Fotheringhay, Northamptonshire, 1440).

Niccola Pisano are the beautifully wrought marble pulpits of the baptistery at Pisa, and of the cathedral at Siena. Some are adorned by bronze-work. The pulpit (in Arabic, *mimbar*) forms one of the scanty appliances of Mohammedan worship.

Pulque, a favourite beverage of the Mexicans and of the inhabitants of Central America; made from the fermented juice of different species of Agave (q.v.).

Pulsatilla, or PASQUE FLOWER. See ANEMONE.

Pulse (Lat. *puls*), a name for the edible seeds of leguminous plants, as *corn* is the name for the edible seeds of grasses. Peas and beans are the most common and important of all kinds of pulse; next to them may be ranked kidney-beans, lentils, chick-peas, pigeon-peas, &c. The best kinds of

pulse are very nutritious, but not easy of digestion, and are very apt to produce flatulence.

Pulse (Lat. *pulsus*, 'a pushing or beating'). The phenomenon known as the arterial pulse or arterial pulsation is due to the distension of the arteries consequent upon the intermittent injection of blood into their trunks, and the subsequent contraction which results from the elasticity of their walls. It is perceptible to the touch in all excepting very minute arteries, and, in exposed positions, is visible to the eye. The pulse is usually examined at the radial artery at the wrist, the advantages of that position being that the artery is very superficial, and that it is easily compressed against the bone. It is usual and convenient, though not quite accurate, to include under the term the conditions observed between the beats, as well as those produced by them. The condition of the pulse depends mainly on two factors, each of which may vary independently of the other: *first*, the contraction of the heart, which propels the stream of blood along the artery; and *second*, the resistance in the small arteries and capillaries, which controls the rate at which it leaves the artery. The first determines the frequency and rhythm of the pulse and the force of the beats; but the tension of the artery between them and their apparent duration depend mainly upon the peripheral resistance. 'Feeling the pulse,' therefore, gives important information besides the rate of the heart's action, and implies much more than the mere counting of pulsations. Dr Broadbent says, 'A complete account of the pulse should specify (1) the frequency—i.e. the number of beats per minute, with a note of any irregularity or intermission or instability of the rhythm; (2) the size of the vessel; (3) the degree of distension of the artery between the beats; (4) the character of the pulsation—whether its access is sudden or gradual, its duration short or long, its subsidence abrupt or slow, note being taken of diastole when present; (5) the force or strength of both the constant and variable pressure within the artery, as measured by its compressibility; (6) the state of the arterial walls.'

The frequency of the pulse varies with age, from 130 to 140 per minute at birth to 70 to 75 in adult males, and with sex, being six or eight beats more in adult females. In some individuals it deviates considerably from this standard, and may even be habitually below forty or above ninety without any signs of disease. It is increased by exertion or excitement, by food or stimulants, diminished in a lying posture or during sleep. In disease (pneumonia, for example) the pulse may reach 150 or even 200 beats; or, on the other hand (as in apoplexy and in the affection known as heart-block), it may be as slow as thirty or twenty or less.

The normal regular rhythm of the pulse may be interfered with either by the occasional dropping of a beat (intermission), or by variations in the force of successive beats, and in the length of the intervals separating them (extra-systoles). These varieties often occur in the same person, but they may exist independently of each other. Irregularity of the pulse is natural to some persons; in others it is the mere result of debility; but it may be caused by the most serious disorders, as by disease of the brain, or especially by the disorder of the heart known as auricular fibrillation.

The other qualities of the pulse are much more difficult to recognise, though of no less importance. The degree of tension or resistance to compression by the fingers varies greatly: in a soft or 'low-tension' pulse the artery may be almost imperceptible between the beats; in a hard or 'high-tension' pulse it may be almost incompressible. An unduly soft pulse is usually an indication of

debility; an unduly hard one is most characteristic of arterial sclerosis associated with Kidney Disease (q.v.). The usual pressure required to obliterate the pulse in an adult is equal to about 120 mm. of mercury. In weakening illnesses it may fall below 100 mm., and in kidney disease may greatly exceed 200 mm. It is also raised by temporary causes like over-eating, and lowered similarly by a hot bath.

The *force* of the beats is a measure of the vigour and efficiency of the heart's action. A strong pulse is correctly regarded as a sign of a vigorous state of the system; it may, however, arise from hypertrophy of the left ventricle of the heart, and remain as a persistent symptom even when the general powers are failing. As strength of the pulse usually indicates vigour, so *weakness* of the pulse indicates debility. Various expressive adjectives have been attached to special conditions of the pulse, into the consideration of which our space will not permit us to enter. A pulse may be found in the veins of the neck and elsewhere when the right side of the heart is dilated, and valuable indications are got from it as to the state of this organ. See MEDICINE, CIRCULATION, HEART, PALPITATION; and especially *The Pulse*, by Dr Broadbent (1890).

Pulsometer. See PUMPS.

Pulszky, FRANCIS AURELIUS (1814-97), Hungarian politician and author, was born at Eperies, studied law, and travelled, publishing (1837) a successful book on England. In 1848 he held various government posts of importance, but, suspected of sharing in the revolution, fled to London, where he wrote for the papers. When Kossuth came to England Pulszky became his companion, and went with him to America (described in *White, Red, and Black*, 1852). His wife wrote *Memoirs of a Hungarian Lady* (Lond. 1850), and *Tales and Traditions of Hungary* (1851). He was condemned to death by the Austrian government in 1852, but, after living in Italy from 1852 to 1866, was pardoned in 1867. He sat in parliament, and was director of museums and libraries. His autobiographic memoirs (4 vols. 1879-82) were translated into German. See F. W. Newman, *Reminiscences of Two Exiles* (1889).

Pulteney, WILLIAM, Earl of Bath. This statesman, descended from a Whig family, was born in 1684, the son of Sir William Pulteney, member of parliament for Westminster. He was a student of Christ Church College, Oxford, where his oratorical power was early displayed. He entered parliament as member for Heydon, Yorkshire, and was a most graceful and brilliant speaker, full of epigram, and a master of all the arts of parliamentary attack. At first, and for many years, the friend and colleague of Walpole, he finally became so disgusted with that minister's indifference to his claims that in 1728 he placed himself at the head of a small group of malcontent Whigs styled the 'Patriots,' and was henceforth Walpole's bitterest and perhaps most formidable opponent, being the leader of the coalition against him in the Commons as Carteret was in the House of Lords. He was Bolingbroke's chief assistant in the paper called the *Craftsman*, which involved him in many political controversies, and called forth some of his finest pamphlets. In 1731 he wrongly ascribed to Lord Hervey the authorship of a scurrilous pamphlet; a duel was the consequence, fought with swords in St James's Park, when both combatants were slightly wounded. On the resignation of Walpole in 1741 Pulteney was sworn of the Privy-council, and soon afterwards created Earl of Bath; and from that time his popularity was gone. Horace Walpole places him amongst his *Royal*

and Noble Authors, but though his prose was effective and his verse graceful, he was probably still better known as the author of a once popular political song, 'The Honest Jury, or Caleb Triumphant,' than by his more serious writings. He died in 1764, a wealthy but disappointed man.

Pultowa, or POLTA'VA, a town of Ukraine situated on a tributary of the Dnieper, by rail 88 miles SW. of Kharkov and 449 NE. of Odessa. It manufactures tobacco and leather, and has important fairs. Pop. 88,000. The town is a bishop's seat, and is famous as the scene of Charles XII.'s defeat by Peter the Great on 8th July 1709.

Pułtusk, a town of Poland, 32 miles N. of Warsaw. Here Charles XII. of Sweden defeated the Saxons in 1703, and here, too, on 26th December 1806, was fought a fierce battle between the Russians and the French, the latter being ultimately victorious. The town was destroyed by fire in 1875. Pop. 14,000.

Pulvermacher's Chains. See ELECTRICITY (MEDICAL).

Puma, or COUGAR (*Felis concolor*), a large Carnivore distributed in North and South America between 60° N. and 50° S. lat., but rare in those parts which have been long settled. It is sometimes called the American 'lion,' 'panther,' ('painter'), or 'catamount,' and is about the size of a leopard. The fur is thick and close, dark yellowish red above, lighter on the sides, and reddish white on the belly; the muzzle, chin, throat, breast, and insides of the legs are more or less white. But the colouring varies a little in different localities. Young pumas have dark-brown spots in three rows on the back, and scattered markings elsewhere. The long tail is covered with thick fur, and is slightly coiled. The pumas have very diverse haunts—the forest, the bush, and the grassy pampas; they have no fixed lairs, but roam about by night from place to place in search of prey. They are agile in their movements, and can leap and spring well, but swim only under compulsion. Many kinds of mammals fall victims to the pumas, and they are the more disastrous to flocks and herds because of their habit of killing many more than they devour. To the booty which they have secured but merely tasted they will afterwards return. They rarely attack man, but one puma has been known to kill fifty sheep in a night, drinking a little of the blood of each; hence their extermination in many regions. The two sexes live apart, but pair in winter and summer. Two or three young are born at once, and are left a good deal to themselves, though after the first birth the mothers are certainly affectionate. In spite of its restless and voracious instincts the puma may be readily tamed, and is said to become gentle. For a fine study of the puma, see W. H. Hudson, *Naturalist in La Plata* (1892).

Pumice, a general term for the cellular, spongy-form, filamentous, or froth-like parts of lavas. This highly porous and froth-like structure is due to the abundant escape of vapours through the rock while it was in a state of fusion. Under the microscope the rock is seen to be a glass, crowded with minute gas or vapour cavities and abundant crystallites. Owing to its porous structure pumice readily floats in water. It is usually a form of some highly acid lava, such as obsidian; but now and again basic lavas give rise to pumice (Canary Islands, Hawaii). The latter is dark brown or black, and often shows metallic tarnish; the former, which is much the more common, is white or gray, and sometimes yellow. It is a hard but brittle rock, and is much used for polishing wood, ivory, metals, glass, slates, marble, lithographic

stones, &c., in preparing vellum and parchment, and for rubbing away coins and callosities. Great quantities are exported from the Lipari Isles; and that from the quarries in the Peak of Teneriffe, 2000 feet above sea-level, is better and cheaper. Pumice occurs as the crust of some kinds of lava, and is often ejected in the form of loose cinders during volcanic eruptions. Sometimes immense quantities are thrown into the sea and are often floated for great distances. Eventually the cinders get water-logged and sink to the bottom. Abundant fragments were dredged up from abyssal depths by the *Challenger* expedition. After the eruption and earthquake in the Straits of Sunda in 1883, the seaport of Polok Batoung was closed with a barrier of pumice 19 miles long, two-thirds of a mile broad, and from 13 to 16 feet deep.

Pumpernickel, a kind of rye-bread (made of unbolted flour), much used in Westphalia. The etymology is disputed.

Pumpkin. See GOURD.

Pumps, machines for lifting liquids to a higher level, include (1) the Lift or Suction Pump, (2) the Lift and Force Pump, (3) the Pulsometer, (4) the Chain-pump, (5) Spiral Pumps, (6) the Centrifugal Pump, (7) the Jet-pump, (8) the Persian Wheel, (9) Scoop-wheels.

(1) *The Lift or Suction Pump* (fig. 1).—A is the cylinder (the 'barrel'), closed or open at the top; B is a pipe (the 'suction-pipe') communicating with the water to be raised; C is a 'discharge-pipe,' which may be reduced to a mere spout; D is a valve, opening upwards only; E is another valve, also opening upwards only, and borne by F; F is the 'bucket,' a hollow cylindrical piece of wood or metal which is made, by leather or by hemp or other packing, to fit the barrel just so closely that water cannot travel between the bucket and the barrel; G is the piston-rod, driven by hand, steam, windmill, or animal power, and moving the bucket up and down in the barrel. Each upward stroke of the piston at first lifts air, of which none can travel back past the bucket; a partial vacuum is produced in B; water ascends in B until the external atmospheric pressure is balanced by the partial atmospheric pressure below D plus the weight of the water column in B; as F now descends, air gets to the upper side of the valve, and is lifted on the upstroke, and so on; so that, if the valve D be not more than at most 33 feet above the water below (in practice 25 feet or less), water will be, step by step, pushed up B by the external atmospheric pressure until the valve D is under water; thereafter the succeeding strokes of the pump operate on the water above D and force it into the discharge-pipe, C, the external atmospheric pressure keeping the space below D filled with water. The power expended is applied (1) in lifting water; (2) in overcoming the pump-friction; (3) in overcoming the water-friction; and, (4) where the pump is ill-shaped, in producing

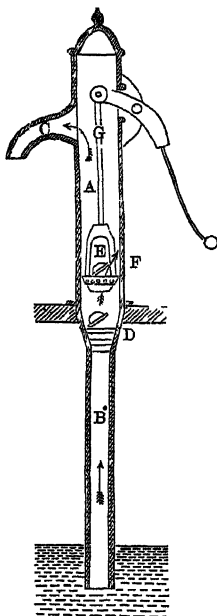


Fig. 1.

eddies and broken water. A lift-pump must be very carefully proportioned and constructed in order to utilise, in water-lifting, one-half of the whole power expended in working it. Such pumps must work slowly, so that the valves may close properly; and an air-vessel is, if C be not a mere spout, required on C so as to minimise shock and render the outflow less intermittent, by the compression and elastic expansion of the air contained in it. The outflow is also regulated by driving two or three pumps off the same shaft and properly timing their relative motions.

(2) *The Lift and Force Pump* (fig. 2).—The piston is solid, and the valve E, instead of being carried by the piston, is fitted in the discharge-pipe. During the downward motion of the piston water is forced past the valve E; it cannot return;

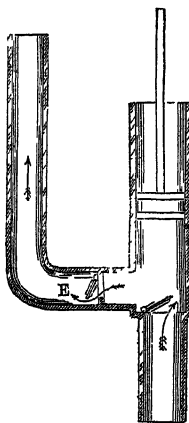


Fig. 2.

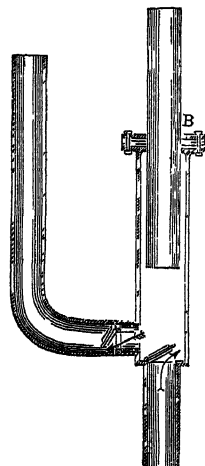


Fig. 3.

and water may thus be forced to considerable heights. Sometimes (fig. 3) the piston is made to fit, not the barrel, but the stuffing-box, B, which can be tightened down on it so as to make the fit good. An air-vessel, or a loaded hydraulic press called an 'accumulator,' is fitted on the discharge-pipe so as to minimise shock and intermittence; and double pumps are very generally employed, either directly driven by steam-engine pistons or driven by a flywheel. Force-pumps are used for deep wells and mines, hydraulic presses, boiler feeds, creosoting timber, hydraulic lifts, steam fire-engines both land and marine, and hydraulic power supply.

(3) *The Pulsometer*.—Two chambers, A and B, converge above and communicate with a single steam-pipe; a ball-valve shuts off either A or B, but not both at the same time, from the steam; A and B each have a discharge outlet and a suction inlet, both these having valves. The whole is filled with water; the steam drives water from, say, A into the discharge-pipe: condensation takes place and the ball-valve is pulled over, so as to shut off the steam from A: the steam then acts in B in the same way as it had done in A, while in the meantime A, where there is a partial vacuum, is being filled with water from the suction-pipe. The two chambers thus act alternately. The whole contrivance can be hung by chains and let down to the required position; and it is greatly in use in contractors' work.

(4) *The Chain-pump*.—This pump is formed of plates called lifts or buckets, fastened, now generally by their centres, to an endless chain and moving upwards, in a case or 'barrel' which is in

places constricted so as just to let the buckets pass. Chain-pumps are noisy and somewhat apt to break down; but they can lift very gritty or muddy material. The Dredge (q.v.) with its buckets is a variety of this device.

(5) *Spiral Pumps*.—An Archimedes' Screw (q.v.) is rotated round its axis so as to make water slip up the inclined plane of the screw. They are very economical in power, and they work so regularly that they act as meters.

(6) *Centrifugal Pumps* (figs. 4 and 5).—The water enters by the supply-pipes, A, A, which lead to the central orifices of the fan, B, B; it then traverses the passages, C, C, formed by the vanes and the side covering-plates, D, of the fan. The fan is made to rotate from the shaft, E. The water acquires a rotatory motion while passing through the passages of the rotating fan; it then enters the whirlpool-chamber, F, and is discharged by the pipe, G, at the circumference of F; and the velocity of

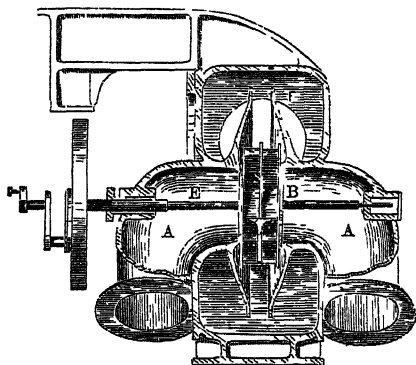


Fig. 4.

rotation of the fan determines the height to which the water will rise in the discharge-pipe. This velocity cannot conveniently be made to exceed a certain limit; hence the utility of centrifugal pumps is practically limited to low lifts; but as they can be made very large they can deal with enormous quantities of water; and they are much used for pumping

in docks, canals, marsh and polder draining, land-reclaiming, and the like. As they have no valves they are little liable to become choked. In nearly all modern centrifugal pumps the whirlpool-chamber, F, the purpose of which was to reduce the ultimate velocity of outflow and correspondingly to increase the pressure, is dispensed with; and the same end is attained without wasting energy through friction in the vortex, F, by shaping the vanes of the fan so as to reduce the velocity. See Cotteill's *Applied Mechanics*.

(7) *The Jet-pump*, now not much used, is practically a Giffard's Injector (q.v.) worked by water from a height instead of by steam.

(8) *The Persian Wheel*.—An under-shot wheel

(mill-wheel in which the water flows under the wheel) in which little buckets are carried by the rim of the wheel so as to pick up water from the stream and deliver it at the top of the wheel.

(9) *Scoop-wheels* or flash wheels: equivalent to breast water-wheels with reversed action; driven by windmills or by steam, they raise water in their buckets and deliver it a few feet higher up; in some cases they have curved blades, and the water is delivered at the centre of the wheel.

See *Pumps and Pumping Machinery*, by Frederick Colyer, C.E. (Lond. 1886); also see *AIR-PUMP*.

Pun, the name given to a play upon words that agree or resemble each other in sound but differ in sense, a verbal quibble by means of which an incongruous and therefore ludicrous idea is unexpectedly shot into the sentence—as, for example, in the answer to the grave question, 'Is life worth living?'—'That depends on the liver.' We find this form of witticism in Aristophanes and Cicero, and in old England it was not unknown even in the pulpit. The sermons of Bishop Andrewes and the *Church History* and other works of Thomas Fuller abound in puns of all degrees of goodness and badness; they meet us strangely enough even in the gravest situations in the tragedies of Shakespeare, and there is at least one in Liddell and Scott's *Greek Lexicon*. Dr Johnson said that the man who would make a pun would pick a pocket; but this sentence bears too hard upon the best beloved of English writers, Charles Lamb, a hardened punster, not to speak of Sydney Smith, Hook, Hood, the prince of punsters, and Bishop Wilberforce. Boswell, while relating Dr Johnson's dislike to puns, ventures his own opinion that 'a good pun may be admitted among the smaller excellencies of conversation.' But a pun of the best kind has a value infinitely higher than this: there is tenderness as well as wit in Fuller's phrase of the Holy Innocents of Bethlehem—'the *infantry* in the noble army of martyrs.'

See *Spectator*, No. 61, L. Larchey's *Les Joueurs des Mots* (1866), and Holmes's *Autocrat of the Breakfast Table*. The Hon. Hugh Rowley's *Puniana* (1867) and *More Puniana* (1875) contain many hundred examples, among them a few good puns.

Puna. See POONA; also ANDES, PERU, WIND.

Punch, a beverage introduced into England from India, possibly so called from being usually made of five (Hindi, *panch*) ingredients—arrack, tea, sugar, water, and lemon-juice. As now prepared, punch is a drink the basis of which is alcohol of one or more kinds (especially rum), diluted with water, flavoured with lemon or lime-juice and spices, and sweetened with sugar; sometimes other ingredients are added according to taste, especially wine, ale, and tea. 'Rack-punch' takes its name from Arrack (q.v.). Milk-punch is prepared beforehand (of rum and brandy with milk), bottled, and served cold—even iced. Whisky-toddy, made with whisky, hot water, and sugar, is a kind of punch, the name *toddy* being Hindustani.

Punch, with his wife Judy (earlier Joan) and dog Toby, the chief character in a popular comic puppet-show of Italian origin, the name being a contraction of Punchinello, for Pulcinello, the droll clown in Neapolitan comedy. The word is perhaps from Neapolitan *pollecenella*, 'a young turkey-cock.' Some believe the modern Punch to have originated in a survival of the Maccois, the fool or clown of the ancient Atellanæ (q.v.), as Arlecchino and Brighetta of other Oscan characters. The line of descent is certainly obscure enough, but possibly some trace of the old *Ludi Osci*, transmitted through the Vice of the mystery plays, may lurk in the modern drama of the hook-nosed lurchback and his unfortunate wife. The full-grown modern drama,

which can scarcely be looked on as a school of the domestic virtues, seems to belong to the end of the 18th century. The older *Punch and Judy* shows were not confined to one story. The exhibition soon found its way from Italy into other countries, and was very popular in England during the 17th century. Its popularity seems to have reached its height in the time of Queen Anne, and Addison has given in the *Spectator* a regular criticism of one of the performances. The movements of the puppets are managed simply by putting the hands under the dress, making the second finger and thumb serve for the arms, while the forefinger works the head. Formerly wires were sometimes used. See MARIONETTES.

Punch, or the LONDON CHARIVARI, the English comic journal *par excellence*, is a weekly magazine of wit, humour, and satire in prose and verse, copiously illustrated by sketches, caricatures, and emblematical devices. It draws its materials as freely from the most exalted spheres of foreign politics as from the provincial nursery; and, dealing with every side of life, is not less observant of the follies of Belgravia than of the peculiarities of Whitechapel. *Punch* gives due place to Irish bulls and dry Scotch humour, and does its best to present them in the raciest vernacular. Stern in the exposure of sham and vice, *Punch* is yet kindly when it makes merry over innocent foibles. Usually a *censor morum* in the guise of Joe Miller, a genial English Democritus who laughs and provokes to laughter, *Punch* at times weeps with those that weep, and, *jocis remotis*, pays a poetical tribute to the memory of the departed great. The wittiest of serial prints was founded in 1841, the first number appearing on the 17th July of that year, and, under the joint editorship of Henry Mayhew and Mark Lemon, soon became a household word, while ere long its satirical cuts and witty rhymes were admittedly a power in the land. *Punch* is recognised as an English institution, and in corners of Europe where an Englishman rarely comes the frequenters of the café may be seen puzzling over the esoteric wit and wisdom of Cockayne. Their contributions to *Punch* helped to make Douglas Jerrold, Gilbert à Beckett, Tom Hood, Albert Smith, Thackeray, Shirley Brooks, Tom Taylor, F. C. Burnand, Owen Seaman, E. V. Knox, and A. A. Milne famous; as their illustrations did H. K. Browne, Doyle, Leech, Tenniel, Du Maurier, Keene, Linley Sambourne, Furniss, and Partridge. It should be noted that this genial comic paper has done memorable service in purifying the moral standard of current wit in England.

See CHARIVARI, CARICATURE, the articles on the chief contributors, &c.; *A Forum of Punch*, by Athol Mayhew, rather unduly magnifying Mayhew's share (1895); and *The History of Punch*, by M. H. Spielmann (1895).

Punctuation is the art of marking the divisions of a sentence by means of conventional signs—the full stop or period (.), colon (:), semicolon (;), comma (,), dash (—), mark of exclamation (!), mark of interrogation (?), inverted commas (" "), and brackets—(), []. Broadly speaking, there are two principal systems of punctuation, the grammatical and the logical, but practical experience is the best teacher. In theory little more can be done than to lay down a few general maxims for guidance.

Use commas and semicolons sparingly, especially commas; use them, indeed, only where they are absolutely necessary. The sentence should stand on its own feet, not rest upon a long array of comma crutches. It is not as a general rule necessary to set commas to fence or adorn every adverbial clause. Especial care is required in punctuating sentences that contain relative clauses. If the relative clause gives additional information, separate it by a

comma or commas; if it belongs essentially to the structure of the thought expressed by the main clause, put no comma. For example, in 'the man who had an impediment in his speech,' written without the comma, the relative clause points out this particular man and distinguishes him from some other or others who have been also spoken of: it fulfils in fact the function of an article or demonstrative pronoun. In the same sentence printed with the comma, 'the man, who had,' &c., the relative clause gives an entirely new piece of information, and is no longer demonstrative. The colon is generally put before a long quotation. Some would confine the use of it to this and to one other case—namely, to part a general statement from the immediately following particular application of it or exemplification of it in detail. Dashes are commonly employed to indicate a sudden break or change in the grammatical structure or the logical development of the sentence. A dash may precede an enumeration of mere names or dates or objects expressed in very brief terms. One dash may also be put before and one after a short clause that merely explains in other words or makes clearer a statement that has just been made; both dashes, and not one dash and some other stop, should be used, except where the second would fall at the end of a sentence. But for this purpose, especially where the parenthetical nature of the added explanatory clause is more prominent, brackets are frequently employed. Semicolons are most appropriately used in compound sentences or sentences that embrace antithetical statements. In the former class of sentence they should mark off the subordinate sentences from the main sentence or co-ordinate sentences from one another; in the latter class they should separate the antithetical sentences, which generally begin with 'but' or some equivalent. The mark of exclamation has another besides its legitimate use: it is frequently put after absurd or highly improbable statements. The mark of interrogation too has a secondary use: placed in brackets immediately after a word it throws doubt upon its correctness, either as according with fact or as being philologically or grammatically correct.

Pundit (Hindi, *pandit*; Skr. *pandita*, 'a learned man'), in India a teacher, especially a Brahman learned in Sanskrit and in Hindu literature, law, and religion. Of late native pundits have done good service as geographical explorers in districts, such as Tibet, not accessible to Europeans.

Pungwe, a river of Portuguese East Africa, forming the principal waterway to Manicaland and Mashonaland; its mouth is situated some 25 miles NE. of Sofala and 130 SW. of the Zambezi delta. After some diplomatic difficulties between Britain and Portugal, it was agreed (1891) by Portugal that British commerce should have unimpeded access by this route to the British sphere in the interior, the Pungwe being made freely navigable. In 1899 the railway from Beira (q.v.) at its mouth reached Salisbury (375 miles), and in 1902 Bulawayo.

Punic Wars. See CARTHAGE.

Punishment will be found described in the articles in this work on Criminal Law, Imprisonment, Prisons, Flogging, Execution, Pillory, &c., See also the description of Tortures, Boot, Guillotine, Thumb-screw, Branks, Jongs, Ducking-stool, Stocks, &c.; the articles on the several crimes; Andrews, *Old-time Punishments* (1891); and Ives, *History of Penal Methods* (1914). Future punishment is treated in the article HELL.

Punjab, or PANJAB (*pánj-ab*, 'five rivers'; the *Pentapotamia* of the Greeks), a province of north-

west India, is watered by the Indus and its five great affluents—the Jhelum, Chenab, Ravi, Beas, and Sutlej. It lies between the North-west Frontier Province and the United Provinces of Agra and Oudh and between Kashmir and Agra. Before the formation—largely out of the Punjab—of the North-west Frontier Province, it had an area of 148,966 sq. m. and a pop. (1891) of 25,130,127; (1901) 26,888,300. These totals were reduced by the exsection of the Frontier Province, and in 1912 of Delhi (not entirely separated for administrative purposes) to 136,332 sq. m. and 25,101,060 inhabitants, 4,416,036 being in the numerous Indian states. The capital is Lahore. Amritsar is the religious capital of the Sikhs. The whole of the northern parts are traversed by spurs from the Himalayas, which enclose deep valleys. On the west the Sulaiman Mountains run parallel to the Indus. In the south the surface is not broken by any important eminence, except the Salt Range, varying from 2000 to 5000 feet high, between the Indus and the Jhelum. The country, divided into six doabs, or interfluvial tracts, and frequently spoken of as the plains of the Indus, has a general slope towards the south-west. The climate in the plains is most oppressively hot and dry in summer, reaching in May 87°4' to 116°6' F. in the shade at several stations; but is cool, and sometimes frosty, in winter. Little rain falls except in the districts along the base of the Himalayas. The soil varies from stiff clay and loam to sand; but, in general, is sandy and barren, intermixed with fertile spots. Rivers and canals afford ample means of irrigation. The indigenous vegetation is meagre. Trees are few and small, and fuel is so scarce that cow-dung is much used. Wheat of excellent quality is produced in considerable quantities, and indigo, sugar, cotton, tobacco, opium, tea, rice, barley, millet, maize, and numerous vegetables and fruits are grown. The manufacturing industry—cottons, wood-work, iron, leather, gold and silver lace, silk, and shawls—is very considerable, and is carried on for the most part in the great towns, as Amritsar, Lahore, Multan. Punjab exports indigo, grain, salt, metals, spices, tea, tobacco, manufactured cottons, hides, and leather to Kabul, Kashmir, Turkestan, and Tibet; and imports furs, goats' wool, raw silk, fruits, ghi, horses, dyer, timber, and shawl cloth. The inhabitants are of various races, chiefly Sikhs, Jats, Rajputs, and Pathans. Of the whole population, about 50 per cent. are Mohammedans; Hindus constitute above 35 per cent.; and Sikhs about 12 per cent. The Jats are the most prominent race, and are said to have formed the 'core and nucleus' of the Sikh nation and military force. For the history of the Punjab, see SIKHS. Remains of a great prehistoric culture (about the 3rd millennium B.C.) have been found in the Punjab and in Sind.

Punkah, a gigantic fan for ventilating apartments, used in India and tropical climates. It consists of a light frame of wood, covered with calico, from which a short curtain depends, and is suspended by ropes from the ceiling; another rope from it passes over a pulley in the wall to a servant stationed without; the servant pulls the punkah backwards and forwards, maintaining a constant current of air in the chamber.

Puno. See PERU.

Punt, a heavy, oblong, flat-bottomed boat, useful where stability and not speed is needed. Punts are much used for fishing and wild-fowling. Some are fitted for oars; but the more usual mode of propulsion is by poles operating on the bottom.

Punta Arenas, (1) the chief port of Costa Rica on the Pacific, stands on a 'sandy point'

jutting into the Gulf of Nicoya, and is connected by railway with Esparza, 14 miles east-north-east. The principal export is coffee, and after that india-rubber, hides, dye-woods, and tortoiseshell. Pop. 6000.—(2) A town in Chilean Patagonia (q.v.), once a convict station, with trade in wool and frozen meat. Pop. 20,000.

Pupa (Lat., 'a doll'), the stage which intervenes between the larva and the adult in the life of insects with complete metamorphosis. *Chrysalis*, *aurelia*, *nymph* are almost synonymous terms, but pupa is more general and is sometimes applied to stages in the metamorphosis of other animals besides Insects (q.v.).

Pupil. See INFANT, and EYE.

Puppet. See MARIONETTES, PUNCH.

Purāṇa, 'of olden time,' occurs in the later Vedic literature as the name of a form of legendary lore, but no text of an early date has been preserved. In Sanskrit literature there are a large number of works, styled either Purāṇas, a list of eighteen being often given, or Upapurāṇas, which may contain some of the matter of the older texts, but which in their present shape are probably none of them older than 500 A.D.; moreover, the text in many cases is much interpolated and uncertain. Their contents are miscellaneous, but legends of creation, of the deeds of the gods, of holy places, and of pious sages, and directions for divine worship, pilgrimages, &c., predominate. It is probable that in their present form the Purāṇas, and still more the Upapurāṇas, represent the work of temple priests eager to glorify the god whom they served, and to attract worshippers to his shrine. While they are catholic in their recognition of the whole pantheon of Hindu gods, each is usually devoted to extolling the pre-eminence of some special deity—Śiva or his consort Devī, Vishnu, Krishna, Ganeśa, Śūrya, &c. Together with the Tantras they represent the foundations on which modern Hindu religion is based, having superseded the Vedas (q.v.), and being regarded by tradition as the composition of the sage Vyāsa, the supposed arranger of the Vedas. Some of them contain, under the guise of prophecy, a limited amount of historical matter in a very inaccurate form. They show many points of contact with the *Mahābhārata* (q.v.) and its appendix the *Harivaṃśa*, and are doubtless later than both. Among the best known are the *Vāyu*, the *Vishnu*, the *Bhāgavata*, the *Mārkaṇḍeya*, and the *Matsya*, while the *Skanda* is remarkable for the large number of independent sectarian tracts attributed to it.

See VISHNU, SANSKRIT LITERATURE; J. Muir, *Original Sanskrit Texts* (1858-84); the *Vishnu Purāṇa*, trans. by H. H. Wilson (2d ed. by F. Hall, 1864-77); the *Bhāgavata Purāṇa*, ed. with French trans. by E. Burnouf and M. Hauvette-Besnault, 1840-98; the *Mārkaṇḍeya Purāṇa*, trans. by F. E. Pargiter, 1888-99; M. Winternitz, *Geschichte der indischen Litteratur*, Vol. I. (1908).

Purbeck, ISLE OF, a peninsular district of Dorsetshire, 12 miles long and 5 to 9 broad, is bounded N. by the river Frome and Poole Harbour, E. and S. by the English Channel, and W. by the little stream of Luckford Lake, which runs from Lulworth Park to the Frome. The coast is bold and precipitous, with St Albans Head, 360 feet high; inland a range of chalk downs curves east and west, attaining a maximum height of 655 feet. The geology of the 'isle' is very interesting. The Purbeck Beds are a group of strata forming the upper members of the Jurassic System (q.v.); the Purbeck Marble, belonging to the upper section of these, is an impure fresh-water limestone, composed almost wholly of the shells of *Paludina carinifera* (see DIET-BEDS). Nearly a hundred quarries are worked; and the quarrymen still form

a curious kind of trades' guild. Of old the 'isle' was a royal deer-forest. Swanage and Corfe Castle are the chief places.

Purcell, HENRY, the most eminent of English musicians, was born at Westminster in 1658, and was son of Henry Purcell, one of the gentlemen of the Chapel Royal appointed at the Restoration. He lost his father at the age of six, and was indebted for his musical training to Cooke, Humfrey, and Dr Blow. His compositions at a very early age gave evidence of talent. In 1680 he was chosen to succeed Dr Christopher Gibbons as organist of Westminster Abbey; and in 1682 he was made organist of the Chapel Royal. He wrote numerous anthems and other compositions for the church, which were eagerly sought after for the use of the various cathedrals, and have retained their place to the present day. Purcell's dramatic and chamber compositions are even more remarkable. Among the former may be mentioned his opera *Dido and Æneas*, written at the age of seventeen, his music to the *Tempest*, his songs in Dryden's *King Arthur*, his music to Howard's and Dryden's *Indian Queen*, to D'Urfey's *Don Quixote*, &c. A great many of his cantatas, odes, glees, catches, and rounds are yet familiar to lovers of vocal music. In 1683 he composed twelve sonatas for two violins and a bass. Purcell studied the Italian masters deeply, and often made reference to his obligations to them. In originality and vigour, as well as richness of harmony and variety of expression, he far surpassed both his predecessors and his contemporaries. His style foreshadows that of Handel. His church music was collected and edited from the original MSS. by Vincent Novello, in a folio work which appeared in 1829-32, with a portrait and essay on his life and works. A complete edition of his works, many of which are still in MS., was undertaken by the Purcell Society, instituted in 1876. Purcell died of consumption in 1695. See J. F. Runciman, *Purcell* (1909).

Purchas, SAMUEL, was born at Thaxted in Essex in 1577, and educated at St John's College, Cambridge. He was presented by the king in 1604 to the vicarage of Eastwood, which he soon resigned to his brother, as the chosen labour of his life required residence in London. Later he became rector of St Martin's, Ludgate, and chaplain to Archbishop Abbot, and died in September 1626, if not in a debtor's cell, yet in difficulties. His great works were *Purchas his Pilgrimage, or Relations of the World and the Religions observed in all ages* (1613; 4th ed. much enlarged, 1626), and *Hakluytus Posthumus, or Purchas his Pilgrimes: containing a History of the World, in Sea Voyages and Land Travels by Englishmen and others* (4 vols. folio, 1625). The fourth edition of the former usually accompanies the latter as if a fifth volume, although a quite distinct work. Purchas himself thus describes the two books: 'These brethren holding much resemblance in name, nature, and feature, yet differ in both the object and the subject. This [*the Pilgrimage*] being mine own in matter, though borrowed, and in form of words and method; whereas my Pilgrimes are the authors themselves, acting their own parts in their own words, only furnished by me with such necessities as that stage further required, and ordered according to my rules.' Another work is *Purchas his Pilgrim: Microcosmus, or the History of Man; relating the wonders of his Generation, vanities in his Degeneration, and necessity of his Regeneration* (1619).

Purchase-system. See COMMISSIONS.

Purfleet, a village of Essex, on the north bank of the Thames, 15 miles by rail E. by S. of London and 8 miles E. of Woolwich, contains government powder-magazines, built in 1781.

Purgation. See ORDEAL.

Purgatives. See APERIENTS, CONSTIPATION.

Purgatory (Lat. *purgatorium*, from *purgo*, 'I cleanse') is the name given to a place of purgation, in which, according to the Roman Catholic and Oriental churches, souls after death either are purified from venial sins (*peccata venalia*) or undergo the temporal punishment which, after the guilt of mortal sin (*peccata mortalia*) has been remitted, still remains to be endured by the sinner (see ATONEMENT). The ultimate eternal happiness of their souls is supposed to be secured; but they are detained for a time in a state of purgation, in order to be fitted to appear in that Presence into which nothing imperfect can enter. Catholics hold as articles of their faith (1) that there is a purgatory in the sense explained above, and (2) that the souls there detained derive relief from the prayers of the faithful and from the sacrifice of the mass. The scriptural grounds alleged by them in support of this view are 2 Macc. xii. 43-46, Matt. xii. 32, Luke, xii. 48, 1 Cor. iii. 11-15, 1 Cor. xv. 29; as well as certain less decisive indications contained in the language of some of the Psalms. And in all these passages they argue not alone from the words themselves, but from the interpretation of them by the Fathers. The direct testimonies cited by Catholic writers from the Fathers are very numerous, from the days of Clement and Origen down; amongst the Latins Augustine being one of the most important (though at times he speaks doubtfully); in Gregory the Great the doctrine is found in all the fullness of its modern detail. The epigraphs of the catacombs, too, supply Catholic controversialists with some testimonies to the belief of a purgatory, and of the value of the intercessory prayers of the living in obtaining not merely repose, but relief from suffering, for the deceased; and the liturgies of the various rites are still more decisive and circumstantial. Beyond these two points Catholic faith, as defined by the Council of Trent, does not go; and the council expressly prohibits the popular discussion of the 'more difficult and subtle questions, and everything that tends to curiosity, or superstition, or savours of filthy lucre.' As to the existence of purgatory Greek and Latin churches are agreed; and they are further agreed that it is a place of suffering; but, while the Latins commonly hold that this suffering is 'by fire,' the Greeks do not determine the manner of the suffering, but are content to regard it as 'through tribulation.' The decree of union in the Council of Florence (1439) left this point free for discussion. Equally free are the questions as to the situation of purgatory; as to the duration of the purgatorial suffering; as to the probable number of its inmates; as to whether they have, while there detained, a *certainity* of their ultimate salvation; and whether a 'particular judgment' is passed on every one immediately after death. For Patrick's Purgatory, see DRUG (LOUGH).

The mediæval doctrine and practice regarding purgatory were among the leading grounds of the protest of the Waldenses and other sects of that age. The Reformers as a body rejected the doctrine. Protestants generally reply to the arguments of Roman Catholics on the subject of purgatory by refusing to admit the authority of tradition or the testimonies of the Fathers, and at the same time by alleging that most of the passages quoted from the Fathers, as in favour of purgatory, are insufficient to prove that they held any such doctrine as that now held by the Roman Catholic Church, some of them properly relating only to the subject of prayer for the dead (see PRAYER), and others to the doctrine of Limbus (q.v.). That the doctrine of purgatory is the fair

development of that which maintains that prayer ought to be made for the dead, Protestants generally acknowledge. As to the alleged evidences from Scripture, they are commonly set aside by Protestants as irrelevant or wholly insufficient to support such an inference. The doctrine of purgatory in its historical connection with other eschatological doctrines is touched on in the article **HELL**.

Purging Nut. See **PHYSIC NUT**.

Purgstall. See **HAMMER-PURGSTALL**.

Puri. See **JAGANNATH**.

Purification. See **ABLUTION**, **CHURCHING OF WOMEN**, **FIRE**, **HOLY WATER**, **LUTRUM**, **TABU**.

Purification of the Blessed Virgin Mary, **FEAST OF**, a festival in commemoration of the 'purification' of the Blessed Virgin Mary, in accordance with the ceremonial law of Lev. xii. 2. This ceremony was appointed for the fortieth day after childbirth, which, reckoning from 25th December (the nativity), falls upon 2d February, on which day the purification is celebrated. The history of Mary's compliance with the law is related in Luke, ii. 22-24. The date of the introduction of this festival is uncertain. The first trace of it is about the middle of the 5th century, and in the Church of Jerusalem. In the Western Church it was known to Bede. Its introduction in the Roman Church in 494 was made by Pope Gelasius the occasion of transferring to a Christian use the festivities which at that season were annexed to the pagan festival of the Luperalia. See **CHURCHING OF WOMEN**.

Purim, a Jewish secular rather than religious feast, in honour of the deliverance of the nation, recorded in the Book of Esther, held on 14th to 15th Adar. Apparently it spread but slowly; still Josephus tells us that by his time it was observed over all the Jewish world. Its origin is still disputed. See especially Frazer, *Golden Bough*, pt. vi. (the Scapegoat, pp. 361 *seq.*), and the commentaries on Esther (q.v.).

Puritans, a name first given, according to Fuller, in 1564, and according to Strype in 1569, to those clergymen of the Church of England who refused to conform to its liturgy, ceremonies, and discipline as arranged by Archbishop Parker and his coadjutors. The history of Puritanism within the Church of England is sketched at **ENGLAND (CHURCH OF)**. In spite of the sharpest repressive measures, the principles of the party amongst the clergy who believed that the church did not separate itself markedly enough from Roman Catholicism and needed further reformation gradually spread among the serious portion of the laity, who were also called Puritans. But the name appears not to have been confined to those who wished for certain radical changes in the forms of the church. The character that generally accompanied this wish led naturally enough to a wider use of the term; hence, according to Sylvester, 'the vicious multitude of the ungodly called all Puritans that were strict and serious in a holy life were they ever so conformable.' This is the sense in which the Elizabethan dramatists use the word. From this very breadth of usage one sees that there were different degrees of Puritanism. Some would have been content with a moderate reform in the rites, discipline, and liturgy of the church; others (like Cartwright of Cambridge) wished to abolish Episcopacy altogether, and to substitute Presbyterianism; while a third party, the Brownists or Independents, were out-and-out dissenters, opposed alike to Presbyterianism and Episcopacy. During the reigns of James I. and Charles I. the spirit of Puritanism continued more and more to leaven

English society and the English parliament, although the most violent efforts were made by both monarchs to extirpate it. Up till the time of the Synod of Dort (1618-19) both the Puritans and their opponents in the church had been substantially Calvinist; the strong tendency towards Arminianism amongst churchmen raised a new ground of controversy between the Puritans and the other sections of the church, both Laudian and Latitudinarian. The policy of Laud and the outrages practised by Charles on the English constitution led many who were not at all Genevan in their ideas to oppose both church and king for the sake of the national liberties. In the memorable 'Westminster Assembly of Divines' (1643) the great majority of the ministers were Presbyterians. But the more advanced Puritans, who were predominant in the army and the parliament, ultimately triumphed in the person of Cromwell (q.v.). The Restoration (1660) brought back Episcopacy, and the Act of Uniformity (1662) threw the Puritans of the church into the position of dissenters. Their subsequent history is treated under the different forms of dissent. Before the Civil War broke out so great were the hardships to which the Puritans were exposed that many of them emigrated to America, to seek liberty and peace on the solitary shores of the New World. There they became the founders of the New England states, and cultivated unmolested that form of Christianity to which they were attached. Nowhere did the spirit of Puritanism in its evil as well as its good more thoroughly express itself than in Massachusetts. In Scotland Puritanism dates rather from the 'Second Reformation' of 1638 than from the Reformation of 1560.

See Neal's *History of the Puritans* (ed. Toulmin, 1822); the histories by Stowell (1849; new ed. 1878) and Marsden (1850); H. W. Clark, *The History of English Nonconformity* (1911 *et seq.*); J. Gregory, *Puritanism in the Old World and the New* (1896); Ellis, *Puritan Age in Massachusetts* (Boston, 1888); several of the works cited under S. R. GARDINER; Professor Dowden's *Puritan and Anglican* (1901); A. MacPhail, *Essays in Puritanism* (1905); J. Crouch, *Puritanism and Art* (1910); G. B. Tatham, *Puritans in Power, 1640-60* (1913); A. P. Newton, *Colonising Activities of the English Puritans* (1914); J. S. Flynn, *Influence of Puritanism on Political and Religious Thought* (1920); St J. D. Seymour, *Puritanism in Ireland, 1647-61* (1921); the articles in this work on INDEPENDENTS, BROWN, PRESBYTERIANISM, WESTMINSTER ASSEMBLY, PRYNNE, MARPRELATE, HAMPTON COURT, SMOCTYNNUS; on ELIZABETH, JAMES I., CHARLES I., CROMWELL, MILTON; on LAUD, PARKER, GRINDAL, WHITGIFT; and on the Puritans HOWE, BAXTER, OWEN. In Nichol's edition of the *Puritan divines* (26 vols. 1861 *et seq.*) other names included are those of Manton, Adams, Goodwin, and Clarkson.

Purkinje's Figure, named after the physiologist J. E. Purkinje (1787-1869), professor at Breslau and at Prague; see **EYE**.

Puri, a beverage made by warming a pint of ale with a quarter of a pint of milk, and adding sugar and a wine-glassful of gin, rum, or brandy.

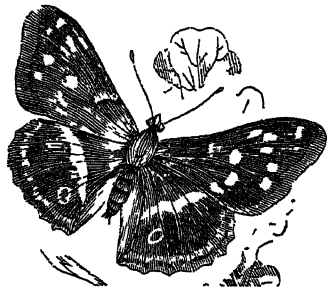
Purniah, a town of British India, in the province (Bihar and Orissa), 230 miles NNW. of Calcutta, has a trade in jute. Pop. 14,000.

Purple Colours. Painters in oil and water colours produce various shades of purple by mixing certain red and blue pigments. For work in oil French ultramarine, often called French blue, is mixed with vermilion or some madder red (madder carmine is best), or one of these reds with cobalt blue if a pale purple is wanted. For permanent purples in water-colours the same blues are used; but one of the madder reds, not vermilion, should be mixed with them. A much richer purple than any of the above mixtures will give is pro-

duced by Prussian blue and one of the lakes from cochineal—viz. carmine or crimson lake—but it is not permanent. This purple, as well as that obtained by mixing Indian red with indigo, also fugitive, was much used by water-colour painters in past years. Purple madder is the only simple purple pigment available for the artist which is durable, and it is unfortunately costly. All purples are changed to neutral and gray tints by the addition of any yellow pigment. For house-painting moroon lake with a little French blue gives a useful purple; but some of the above mixtures also are occasionally used.

There are several ways of dyeing textile fabrics of a purple colour. The most famous of all ancient dyes was the Tyrian purple, which is said to have been discovered at Tyre many centuries before the Christian era. Among the Romans this colour was exclusively employed for dyeing the imperial robe. It was obtained from shellfish belonging to the genera *Murex*, *Purpura*, and *Buccinum*; at least it has been supposed that it was prepared from one or more species of each of these. The colour was so costly that in the time of Augustus one pound of it sold for what would amount to £36 sterling. About the year 1851 what is believed to be the same or a closely similar purple was obtained from uric acid by a peculiar treatment (see *MUREX*, *DYEING*, and *PHŒNICIA*). Archil (q.v.) seems to have been the only simple purple dye known in the middle ages. Purple of Cassius is a compound of gold and tin used in colouring Glass (q.v.), and in porcelain and enamel painting. It was discovered at Leyden by Andrew Cassius about 1683. A preparation of this colour was formerly used for painting miniatures in water-colour.

Purple Emperor (*Apatura ivis*), one of the largest of British butterflies, and one of the most richly coloured.



Purple Emperor.

The expanse of wings is from 2½ to 3½ inches. The wings are strong and thick, and the flight is very vigorous. The male flies especially high, and will perch on lofty trees. The caterpillar is green and feeds on sallow.

Purples.

See WHEAT, PURPURA.

Purple Wood, or **PURPLE HEART**, the heart-wood of *Copaifera pubiflora* and *C. bracteata*, a very handsome wood of a rich plum colour. The trees are natives of British Guiana.

Purpura, a genus of marine Gasteropods, from some species of which (e.g. *P. patula*), as well as from *Murex*, the famous Tyrian purple dye was derived. *P. lapillus* (the Dog Whelk) is common on most British coasts, and from it also the dye is procurable. See WHELK.

Purpura, or **THE PURPLES**, is a malady which is often erroneously placed amongst the diseases of the skin. It is in reality a blood disease, and is characterised by the appearance of small round spots, of a deep purple colour, which are seen first and most abundantly on the legs, and afterwards extend to the arms and trunk. They are accompanied by no local pain, are not effaced by pressure (being due to a drop of blood extravasated beneath the cuticle or in the structure of the skin itself), do not rise above the surrounding surface, and are sometimes intermixed with livid patches resem-

bling bruises; and, before disappearing, both the round spots and the patches undergo the same change of colour which a bruise undergoes. These spots are not peculiar to the skin, but occasionally occur upon internal surfaces and in the tissues of viscera. Passive hæmorrhages from the mucous membranes frequently accompany the external symptoms. There is usually much debility, and often a great tendency to faintness. The duration of the disease varies from a few days to a year or more. Slight cases are devoid of danger, and even the hæmorrhagic cases usually recover, unless the bleeding has been excessive or the blood has been extravasated into a vital organ.

Precisely similar appearances occur in the course of other diseases, especially scurvy, severe anæmia, scarlet fever, cerebro-spinal fever, and smallpox. But the name purpura should be restricted to the cases in which no such disease is discoverable.

The causes of purpura are obscure. The treatment which succeeds best varies in different cases, but the main indication always is to correct the condition of the blood. Arsenic, turpentine, and various hæmostatic sera are the drugs which are generally most beneficial; rest in bed, light diet, and laxatives are desirable at the commencement. When there is reason to believe that the disease is dependent upon depressing influences a nutritious diet, tonics, and stimulants are required; but chalybeates should be avoided. If the hæmorrhage proceeds from accessible parts, local measures, such as the use of strong astringents like lead and opium lotion, should also be had recourse to.

Purser, the name formerly given to the officer in the navy who had the charge and issue of the provisions, slops, soap, tobacco, &c., and who also kept the ship's books; the title was one of the oldest in the service, but the holders of it for long only ranked as warrant-officers, and their duties and responsibilities were in many respects very ill-defined. In the old war-days they were looked upon with great dislike by the seamen, as they were credited with enriching themselves at the expense of the men. In 1844 this branch of the service was completely reorganised, Paymaster (q.v.) being substituted for the title purser. Purser is now the title of the officer in the Mercantile Marine on board mail steamers who deals with the cabin accommodation, food-supply of passengers and crew, and office work connected with mails, cargo, &c.; he is the representative of the company's office on board, and has general charge of stewards, &c.

Purslane (*Portulaca*), a genus of plants of the family Portulacaceæ, having a bifid calyx, four or six petals, eight or sixteen stamens, and a capsule dividing around the middle. Common Purslane (*P. oleracea*) grows in cultivated and waste grounds on the seashore in almost all tropical and subtropical parts of the world. It is cultivated as a pot-herb. It is a short-lived annual, with spreading and rather procumbent stems, and obovate fleshy leaves, which, as well as the young shoots, are frequently used in salads. The young and tender shoots are pickled in France like gherkins. Purslane is not so common in British gardens as it once was. Some species of *Portulaca*, such as *P. grandiflora*, of which there are several brilliant varieties, and *P. Gilliesii*, are choice half-hardy annuals occasionally cultivated in British gardens. They are reared in hotbeds in spring and planted out in the flower-garden in the end of May, or they are grown in pots exclusively for the purpose of decorating the greenhouse.

Pursuivant. See HERALD.

Pus is a well-known product of inflammation, and occurs as a thick yellow creamy fluid, differing

from all other morbid exudations in containing a large number of corpuscles, having a soft and fatty feeling when rubbed between the fingers, a peculiar odour, usually an alkaline reaction, and a specific gravity of about 1.032. Like the blood, it consists of certain definite microscopic elements, and of an intercellular fluid or serum in which they swim.

Of microscopic elements we have (1) the pus-corpuscles, which, both in their microscopical and chemical characters are identical with the white blood-cells from which they are derived; in diameter they range from .004 to .005 of a line, and each corpuscle appears granular, and has one or more nuclei, which can be rendered much more apparent by the addition of acetic acid or by various aniline stains. The other elements are (2) molecular granules and (3) fat-globules. The serum of pus is perfectly clear, of a slightly yellow colour, closely resembling blood-serum, and coagulates on heating into a thick white mass.

The chemical constituents of pus are water (varying from 769 to 907 in 1000 parts), albumen (from 44 to 180), fats (from 9 to 25), extractive matter (from 19 to 29), and inorganic salts (from 6 to 13), in addition to which mucin, pyin, glycin, urea, &c. are occasionally present. Of the inorganic or mineral constituents the soluble salts are to the insoluble in the ratio of 8 to 1, and the chloride of sodium (the chief of the soluble salts) is three times as abundant as in the serum of the blood. The mode of formation of pus is described in the article SUPPURATION.

Pusey, EDWARD BOUVERIE, was born in the year 1800 at Pusey in Berkshire. He was descended from a family of Flemish refugees; his father was the youngest son of the first Viscount Folkestone, and had assumed the name of Pusey when the estates in Berkshire were bequeathed to him by the last representatives of the Pusey family. He was educated at Eton and Christ Church, Oxford, and was elected a Fellow of Oriel College in 1823. As soon as he had completed his studies at Oxford he passed to Germany, partly to study German, which was in the Oxford of those days practically an unknown tongue, partly to study oriental languages, and partly to become acquainted with the latest forms of German theological teaching. In 1827 he returned to England, and in the following year the Duke of Wellington appointed him regius professor of Hebrew at Oxford, a position which he retained until his death. Although his fame in other respects has caused his Hebrew lecturing to be forgotten, he laboured most unweariedly in the duties of his chair, and attracted a great number of pupils. His first work was an essay in which he sketched the causes that contributed to the Rationalistic character of recent German theology. He acknowledges his indebtedness to Professor Tholuck for some portions of this essay, but the elaborate proof of his position was his own work executed with characteristic thoroughness. It was severely commented on as leaning very decidedly in the direction of the Rationalistic teaching with which it dealt: the charge was greatly exaggerated, besides being caused in part by vagueness of expression throughout the volume. His main position was unassailable: German Rationalism he maintained was the consequence of the spiritual deadness of the orthodox Lutheranism of the day. He was misunderstood as if he had attacked the creed of the Lutherans in its orthodox portions: as a matter of fact he only wished to attribute Rationalism to the want of life in the Lutheran body. But many of his statements were in later years very unsatisfactory to himself, and he withdrew the work from circulation. The whole aim of his life was to prevent the spread in England of Rationalism such as that with which he had become familiar in Germany.

Hence, when in 1833 John Henry Newman with the same object began the issue of the *Tracts for the Times*, Pusey very soon joined him; and they, with Keble, were the leaders of this eventful effort. Their object was not to attack the statements of Rationalistic teachers; there was as yet no call for that in England; but they desired to stir up in the Church of England a spiritual vitality and power which would be of itself the best preservative against the infection of the Rationalistic spirit. For this purpose they attempted not to reform, but to restore; they appealed to the idea of the church, to its divine institution, to its services, to its sacraments, to its formulas of faith, to its history, and to the examples of the holiest lives in former generations. They endeavoured to make the church live again before the eyes and minds of men as it had lived in times past. In this connection Pusey wrote his contributions to the *Tracts for the Times*, especially those on Baptism and the Holy Eucharist. His sermons also were vigorous appeals to live the Christian life, and careful expositions of the doctrines which the church from the first had taught. With a similar purpose also in 1836 he commenced the translation of the writings of the ancient fathers of the Christian church under the title of the *Oxford Library of the Fathers*. Dr Pusey's chief contributions to it were a translation of St Augustine's Confessions and of several of the works of Tertullian. The result of these efforts—to which, with the exception of his professorial duties, Dr Pusey entirely devoted himself—was most conspicuous, and extended far beyond the ranks of those who were called by their opponents either Newmanites or Puseyites. But the work was checked by the action of the authorities at Oxford. First Newman's celebrated Tract 90 was condemned in 1841, and in 1843 Pusey was suspended for three years from his office of preaching in Oxford. The occasion of this suspension was a sermon on the Holy Eucharist which he preached before the University, and which a board of six doctors of divinity, without allowing Pusey a hearing, or specifying the points on which he was supposed to be in the wrong, pronounced to be contrary to the teaching of the Church of England. As soon as an opportunity offered Pusey reiterated his teaching, and this time he was unmolested. But before his suspension was over Newman had joined the Roman Catholic communion, and with him went several of his leading disciples. All rumours pointed to the certainty of Pusey soon following; but those who knew him best were assured that never for one moment did he entertain any thought of leaving the Church of England. With Keble he at once set himself to reassure those who were reeling under the blow of Newman's departure; and it was mainly the moral weight of Pusey's work and character which prevented the powerful efforts of Newman between 1833 and 1841 from resulting in a catastrophe greater than any which the English Church has ever experienced. Pusey's unflinching loyalty to the church and deep conviction of God's presence with it, his buoyant hopefulness even in the darkest days, and his great patience cheered and settled many anxious hearts, and stopped others who were on the point of following Newman. His attitude would have had a yet wider result, except for the sad events which followed in rapid succession in the ten years subsequent to Newman's secession. The new power which a civil court had acquired over doctrinal suits—which was exhibited in the judgment in the Gorham case—the constant attacks of bishops and others upon the Oxford movement, the practical inhibition of Pusey from all ministerial work in the diocese of Oxford by Bishop Wilberforce, whereby it was made to appear that the church

disowned his teaching—these and other less important but significant events caused the departure to the Roman Church of another band of distinguished men, including Archdeacon (Cardinal) Manning and Archdeacon Wilberforce. But still Pusey laboured on, carefully defining the exact position of the English Church, as against Roman claims on the one hand and against Zwinglianism and Erastianism on the other.

Only the chief of his numerous writings during this period can be alluded to. They included a lengthy letter on the practice of confession, *The Church of England leaves her children free to whom to open their griefs* (1850), a treatise the form of which makes it appear to belong to a moment of controversy, although the matter is really of permanent value; a general defence of his own position in *A Letter to the Bishop of London* in 1851; a work on *The Royal Supremacy not an arbitrary authority, but limited by the laws of the Church of which Kings are members*, in 1850; a larger book on *The Doctrine of the Real Presence*, as contained in the Fathers (1855), and as taught in the Church of England (1857). In this class of writings may be included also Dr Pusey's *Eirenicon* (part i. in 1865, ii. in 1869, iii. in 1870). The object of these volumes was to clear the way for reunion between the Church of England and the Church of Rome on the basis of Catholic, as distinct from Roman Catholic, doctrine and practice.

The reform of Oxford University, which was undertaken after the report of the first Royal Commission on the Universities, and which destroyed for ever the integrity of the originally most intimate bond between the University and the Church, greatly occupied Pusey's mind. His evidence before the commission, his remarkable pamphlet on the comparative advantages of *Collegiate and Professorial Teaching and Discipline*, and his assiduous work on the Hebdomadal Council for many years are proofs of the interest that he took in the welfare of his university, and of the importance that he attached to a close connection between education and religion.

From 1860 onwards the tide had turned. The teaching for which the Tractarians had laboured and suffered was at that time beginning to be recognised, and those disciples of the Oxford movement who had survived the shock of the events of the last twenty years were spreading its principles throughout the country. But the fruits of the intolerance and persecution of which Oxford had been the scene were also ripening in the form of the spread of religious indifference, based on Rationalistic views of revelation. This was the enemy which from the first Pusey had dreaded. He had at least the satisfaction of knowing that, as a result of the movement in which he had taken so prominent a part, the inner life of the English Church was far better able to bear the onset of such a foe, and to estimate the moral and spiritual ravages which it would make, than was the Lutheran body of the 18th century, or even the Church of England in 1830. Against such teaching he contended for the rest of his life. All his later sermons before the university and most of his later books deal with it. It was with this purpose that he prosecuted Professor Jowett for his statements in his commentary on St Paul's Epistles, and that he took so prominent a part in the later controversy about the Athanasian Creed. His chief works in this connection are the *Lectures on the Book of Daniel*, and *What is of Faith as to Everlasting Punishment?* The former, delivered in 1863, vigorously attacked those writers who would assign to the Book of Daniel a date as late as the 2d century B.C. Apart from the marks which the lectures bear of the

heated controversy of the time when they were delivered, they are a monument of the author's intellectual power, wide reading, and solid learning. The other book is against the denial of everlasting punishment: its sobriety and fullness, the familiarity which it shows with all the issues raised in the controversy, its deep religious feeling, its calm and calming tone make it one of the most remarkable of Pusey's works. Of a kindred character, although in a different field, are the last two university sermons which he wrote—on the relation of science to faith and on the nature of prophecy.

Two other works must be noticed. Pusey inherited from his predecessor in the Hebrew chair the task of completing *A Catalogue of the Arabic Manuscripts in the Bodleian Library* (1835). It was a most toilsome duty, and occupied his time for six years. Pusey's *Commentary on the Minor Prophets* (1860-77) was his contribution to a commentary on the whole Bible which he had in his mind for many years, and on which he enlisted the labours of Keble and many others. Pusey alone completed his task; death, advancing years, or the claims of other duties prevented the others from contributing their share.

In private life Pusey was a man of warm affection, and widely known for his gentleness, sincerity, and humility. He rarely went into society in early life; at first he withdrew from it for purposes of study and to save more money to give to the poor, but from the time of his wife's death in 1839 he avoided all social amusements. But he was always accessible to any one who wished his advice on religious questions; in fact, he was constantly sought as a spiritual guide by persons of every station. His charity was bounded only by his income; besides abundant gifts to poor people, he spent large sums of money in helping to provide churches in East London, in building St Saviour's, Leeds, and in founding and supporting sisterhoods. His capacity for study and for literary work was immense. He worked only at what it was his duty to study, but within that line he spared neither time nor pains in thoroughly mastering every detail. His power of keeping his main object before his mind without being confused by its details, and of grouping the details in their due position, can be seen in almost any of his works. Opponents of all schools gave him the credit of being confused; but an occasional confusion in his manner of expressing his thoughts did not prevent him from knowing his own mind with singular clearness. He died on 16th September 1882.

The *Life of Pusey* by Liddon, left unfinished at his death, was completed by J. O. Johnston, and R. J. Wilson, the Canon's literary executors (5 vols. 1893-99). See also G. W. E. Russell's book (1907).

Pushkin, ALEXANDER SERGEEVICH, was born at Moscow, 26th May 1799, and educated at Tsarskoe Selo. In 1817 he entered the service of the government, but on account of his liberal opinions was for some time transferred to Bessarabia. In 1820 he published a romantic poem, *Ruslan and Liudmila*. Next came his *Prisoner of the Caucasus* (1822), his *Fountain of Bakhchisarai* (1826), *Tzigani* ('The Gypsies', 1827), and *Eugene Onegin* (1828; Eng. trans. 1881), a clever novel in verse somewhat after the style of Byron's *Beppo*. In 1829 he published *Poltava*, which has Mazeppa for its hero. About the same time he wrote his fine tragedy *Boris Godunov*. Besides these works of considerable length, he was the author of many graceful lyrical poems, deservedly popular throughout Russia. He also left some prose writings, consisting of a *History of the Revolt of Pugachev* (in the reign of Catharine), several tales, and miscellaneous essays. He was appointed Russian

historiographer with a pension of 6000 roubles. He was mortally wounded in a duel, and expired at St Petersburg, 29th January (10th February) 1837. Pushkin is considered the greatest poet whom Russia has yet produced. His writings show versatility, a powerful imagination with vigour of expression. In his *Eugene Onegin*, a Don-Juanesque poem, he is both humorous and pathetic, and many of his smaller pieces display wonderful elegance and finish. See a book by Prince D. S. Minsky (1926).

Pushtu, or PUKHTU. See PASHTO.

Pustule, a circumscribed elevation of the cuticle, containing pus; in fact, a small abscess in the skin. Pustules occur in many skin diseases—eczema, acne, scabies, ethymia, boils, &c.; also very prominently in smallpox. For Malignant Pustule, see ANTHRAX.

Puteaux, a town adjoining Paris to the west, on the left bank of the Seine, opposite to the Bois de Boulogne. Many Parisians have fine villas here. Pop. 33,500.

Pute'oli. See POZZUOLI.

Putnam, a town of Connecticut, on the Quinebang River, 56 miles by rail ENE. of Hartford, with textile and other industries. Pop. 8000.

Putnam, ISRAEL, a general of the American Revolution, was born in what is now Danvers, Massachusetts, 7th January 1718. In 1739 he bought a farm between Pomfret and Brooklyn, Connecticut, and for many years devoted himself to its cultivation, gaining meanwhile a high reputation for courage by such personal exploits as following a she-wolf into her lair and killing her single-handed. In 1755 he left as a captain in a contingent of 1000 men which Connecticut sent to repel a threatened French invasion of New York, and was present at the battle of Lake George. In 1758 he was captured by the savages, tortured, and then bound to a tree, and was about to be burned to death when a French officer scattered the firebrands and rescued him. In 1759 he received a regiment, in 1762 he went on the dreadful West India campaign which resulted in the capture of Havana, and in 1764 he helped to relieve Detroit, then besieged by Pontiac (q.v.). Ten years of quiet at home succeeded, during which he made his farmhouse into an inn, and was conspicuous among the 'Sons of Liberty.' In 1775, after Concord, he was given the command of the forces of Connecticut, and was ranking officer on the day of Bunker Hill, though not in actual command at either the redoubt or the rail-fence. He was next appointed by congress one of the four major-generals, and held the command at New York and in August 1776 at Brooklyn Heights, where he was defeated by General Howe on the 27th. He afterwards held various commands, and in 1777 was appointed to the defence of the Highlands of the Hudson. While at Peekskill a lieutenant in a loyalist regiment was captured as a spy and condemned to death; and, on Sir Henry Clinton's sending a flag of truce threatening vengeance if the sentence should be carried out, Putnam wrote a brief and characteristic reply: 'Headquarters, 7th August 1777.—Edmund Palmer, an officer in the enemy's service, was taken as a spy lurking within our lines; he has been tried as a spy, condemned as a spy, and shall be executed as a spy, and the flag is ordered to depart immediately.—Israel Putnam.—P.S.—He has accordingly been executed.' In 1778, in western Connecticut, Putnam made his famous escape from Governor Tryon's dragoons by riding down the stone steps at Horseneck. The next year he had a stroke of paralysis, and the rest of his life was spent at

home. He died 19th May 1790. See *Life* by Increase N. Tarbox (1876), and article by Professor John Fiske in Appleton's *Cyclopaedia of Amer. Biog.* (1888).

His cousin, RUFUS PUTNAM, born 9th April 1738, served against the French from 1757 to 1760, and then settled as a farmer and millwright. On the outbreak of the war he received a lieutenant-colonel's commission, and rendered good service as an engineer. In 1778 he helped his cousin to fortify West Point. Afterwards he commanded a regiment till the end of the war, and in 1783 he was promoted to brigadier-general. In 1788 he founded Marietta, Ohio; in 1789 he was appointed a judge of the supreme court of the North-west Territory; and from 1793 to 1803 he was surveyor-general of the United States. He died in Marietta, 1st May 1824.—Israel's grand-nephew, GEORGE PALMER PUTNAM, born in Brunswick, Maine, 7th February 1814, in 1840 became partner in the book-firm of Wiley and Putnam, New York, established a branch in London in 1841, and in 1848 returned to the United States and started business alone. In 1852 he founded *Putnam's Magazine*. In 1863 he retired from business, but in 1866 he established the firm of G. P. Putnam & Sons (now G. P. Putnam's Sons). He died 20th December 1872. He wrote and compiled several books, and was the author of the first *Plea for International Copyright* (1837) printed in America.

Putney, a suburb of London, since 1885 a district of the borough of Wandsworth, 6 miles WSW. of Waterloo, on the south side of the tidal Thames, which, 300 yards broad, is crossed by a granite bridge (1884-86), leading to Fulham. It is the starting-point of the Oxford and Cambridge boat-race. The parish church, with a 15th-century tower and the chantry of Bishop West of Ely, was mainly rebuilt in 1836. Putney is the birthplace of Thomas Cromwell and Gibbon, and the deathplace of Pitt and Leigh Hunt, and of Swinburne, who lived there with Watts-Dunton. From Putney's old bridge Mary Wollstonecraft tried to drown herself; and on Putney Heath Pitt fought his duel with Tierney (1798), Castlereagh his with Canning (1809).

Putrefaction is the decomposition, accompanied by an unpleasant odour, which all albuminous matter undergoes when kept for some time at the ordinary temperature. It is due, in all cases, to the action of Bacteria (q.v.), with which the material has become infected. When the protein is finely divided and freely exposed to the air the decomposition is largely one of oxidation, and the characteristic smell is not observed. This is probably what occurs with the protein of the vegetable débris in the soil. In the absence or only limited presence of air, typical putrefaction ensues. The protein is in all cases first more or less completely broken down by hydrolysis into its constituents, the amino-acids (see FERMENTATION), this process taking place both within and outside the bacterial cells. In the absence of air these products are further attacked by anaerobic bacteria, and converted partly into bases and partly into acids and other non-nitrogenous substances. At the same time carbon dioxide hydrogen and frequently marsh gas are evolved together with sulphuretted hydrogen derived from the sulphur present in the protein. The characteristic putrid smell is due in part to volatile sulphur compounds, in part to indole and skatole, derived from tryptophan, one of the constituent amino-acids of most proteins, and in part to butyric acid and other similar substances. In a mass of putrefying material, such as the body of an animal, a large number of different species of bacteria are active, as well as many

higher organisms. On the surface aerobic bacteria carry out processes of oxidation, thereby removing the oxygen, so that in the lower layers a suitable atmosphere is provided for the anaerobic bacteria (such as *B. putrificus*), which are the chief agents of typical putrefaction. Ultimately the non-gaseous products reach the soil, and are there further oxidised, the carbon being converted into carbon dioxide and the nitrogen largely into ammonia and finally into nitrates; the sulphur and phosphorus are at the same time converted into sulphates and phosphates. Practically the whole of the material is thus rendered available for assimilation by plants. Putrefaction can be prevented by any means which prevents the infection of the material or the growth of the bacteria (see BACTERIA, DISINFECTANTS, GERM THEORY).

Putrid Fever. See JAIL FEVER.

Putty, a composition of whiting and drying oil worked into a thick paste, used by painters and glaziers, which in time becomes very hard.

Putty-powder, the dioxide of tin, prepared from the scum or crude oxide which forms on the surface of melted tin, is used for polishing stone and glass, for making white enamel, and for giving glass an opaque colour.

Putumayo, or IÇA, a tributary of the Amazon, rises in Colombia, and flows SE. for 950 miles. Rubber-collecting under Peruvian auspices was in 1910-12 proved to be carried on with atrocious cruelty to the Putumayo Indians.

Puvīs de Chavannes, PIERRE (1824-98), was born and educated at Lyons, but after studying with Scheffer and Couture, spent most of his life in Paris. A decorative painter of the very first rank, he produced mural decorations for the Panthéon (illustrating the legend of Ste. Geneviève), the Hôtel de Ville, and the Sorbonne in Paris, and also for buildings in Rouen, Lyons, Amiens, Marseilles, and Boston (Mass.). Though Puvīs de Chavannes must be called a symbolist, yet he always remained content to work from nature, sublimating ordinary and familiar characters, gestures, and expressions. His colouring, simple and harmonious, is admirably calculated to retain the greatest possible amount of light, while his drawing is always dignified and majestic. See works by A. Michel, Vachon (1900), and R. Jean (1914).

Puy, LE, or LE PUY-EN-VELAY, a town of France (dept. Haute-Loire), 70 miles SW. of Lyons by rail, consists of the new town in a valley and the old town, this latter one of the most picturesque in France. Puy (Berry, *pui* or *peu*, 'a hill'; Ital. *poggio*; Lat. *podium*; Gr. *podion*) is the name commonly given in the highlands of Auvergne and the Cevennes to the truncated conical peaks of extinct volcanoes. The town of Le Puy stands on the steep slopes of Mnt Anis (2050 feet), from the summit of which starts up precipitously the basaltic mass called Mont Corneille, crowned by a colossal figure (53 feet) of the Virgin, made of Russian cannon brought from Sebastopol. The most notable building is the Romanesque cathedral (6th-12th century), with a venerated image of the Virgin and ancient cloisters; it is situated in the highest part of the town. There are other ancient and interesting churches and a museum. Lace and thread work are manufactured. Pop. 18,000.

Puya, a genus of Bromeliaceæ of which about fifty species are known, each inhabiting a comparatively small area, of pronounced ecological diversity, from Roraima to Colombia and Chile. One species will be found only on the edge of eternal snow, another will prefer a dry warm valley, a third a fog-swathed mountain moor. They have

long leaves, mostly provided with thorny teeth, sometimes forming a rosette on the ground, sometimes a tuft at the end of a thick tree-like stem, upright or trailing, simple or branched. One gigantic Peruvian species stands 30 feet high. The inflorescence, mounted on a peduncle a yard long, rising out of the crown of leaves on the top of the trunk, accounts for half of its height. In habit Puya shows a remarkable resemblance to the huge Lobelias of the mountains of Central Africa.

Puy-de-Dôme, a central department of France, containing an area of 3070 sq. m. and a pop. (1891) of 564,266; (1921) 490,560. The western part is an elevated volcanic region, studded with numerous extinct cones, and greatly broken by corries, erosion valleys, crater lakes, &c. (see FRANCE). The highest cones are Puy-de-Sancy (6188 feet) and Puy-de-Dôme (4806); on the east side the Forez Mountains (5380) march with the frontier. The principal rivers are the Allier, a tributary of the Loire, and the Dordogne. The soil is, in general, thin and poor; but its volcanic character fosters vegetation, especially in the valley of Limagne. Agriculture and cattle-breeding are the chief occupations. The climate is uncertain, and severe in the mountains. The principle minerals are coal and lead. Hot and cold mineral springs are abundant, among the most frequented being those of Mount Dore (q.v.), Châteauneuf, St Nectaire, Royat, Châtelon, &c. The department is subdivided into the arrondissements of Ambert, Clermont-Ferrand, Issoire, Riom, and Thiers. Capital, Clermont-Ferrand.

Puzzolana. See CEMENTS.

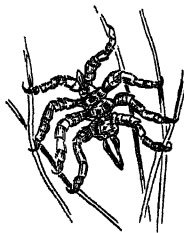
Pwllheli, a Welsh fishing port and popular watering-place, on Cardigan Bay, 22 m. by rail SW. of Carnarvon. It has a 14th-century charter, is a municipal borough, and unites with Carnarvon, &c. to return one member. Pop. 3800.

Pyæmia (from the Gr. *pyon*, 'pus,' and *haima*, 'blood'), or purulent infection of the blood, is a disease whose exciting cause is the introduction of decomposing pus or wound discharges, or the products of decomposition of animal fluids, into the circulation, through an ulcer or a wound, or an imperfectly closed vein (see PHLEBITIS and PURPERAL FEVER). The term *Septicæmia* is applied by some to the same disease, by others only to very grave cases of pyæmia. The bacteria (most frequently streptococci) are absorbed, multiply in the blood, and by it are disseminated into other parts of the body (see GERM). Within twenty-four hours, in very acute cases, there are severe shiverings, headache, and giddiness followed by heat, perspiration, and accelerated circulation. In twenty-four hours more the patient may be in a hopeless condition, delirious, and rapidly sinking. In less acute cases the symptoms closely resemble those of typhoid fever, and in this form the disease is a common cause of death after surgical operations; such cases are invariably characterised by the formation of secondary abscesses in the lungs, liver, kidneys, and other internal organs, in various glands, in the joints, and in the tissues immediately under the skin. The pus of such abscesses always contains bacteria. There is usually more or less delirium. The patient generally dies of exhaustion. Recovery is rare. It is chiefly, however, in the presence of *predisposing causes*, such as previous illness, prostration from organic disease or surgical complaints, or from difficult parturition, unhealthy occupations, &c., that the bacteria act so severely; these, with the occurrence of putrefaction in a wound, may convert a comparatively slight local mischief into infection of the whole mass of the blood.

Bearing in mind the manner in which pyæmia originates, it is clear that this disease is one to be prevented rather than cured. Until about 1865, when it was acknowledged that pyæmia was the cause of death in 10 per cent. of all cases of amputation, and of 43 per cent. of all fatal primary amputations, the careful preparation of a patient before operation was, with justice, most strenuously insisted on. But the really essential matter in the prevention of pyæmia is the prevention of putrefaction in the wound discharges. This was clearly proved by the results achieved by Lister and other surgeons, when operations came to be performed under antiseptic or aseptic conditions (see ANTISEPTIC SURGERY). For several years Lister's wards in Glasgow Royal Infirmary, formerly ravaged by pyæmia, remained free of the disease after the adoption of the antiseptic system; after two years' practice of this treatment purulent infection disappeared from the wards of the hospital at Lyons, where it formerly had a permanent home; and similar testimony might be quoted from every quarter and to any extent. The recognition of organisms as the cause of putrefaction in wounds, and the means adopted to prevent their development, have practically abolished the risk of pyæmia, except in very much devitalised people and in the case of severe war wounds and similar conditions. In such cases asepsis is often impossible. When pyæmia has developed, it may be combated by local irrigation with and intravenous injection of hypochlorous acid in what is known as the Carrel Dakin treatment and by various forms of serum.

Pyatigorsk. See PIATIGORSK.

Pycnogonida, or SEA-SPIDERS, a class of marine Arthropods of unknown affinities. Some climb about on seaweeds and hydroids near shore, others live in deep water. The body consists of an anterior cephalothorax, coalescent or segmented, and a rudimentary unsegmented abdomen. The first



Pycnogonum litorale.

appendages are chelate, the second palpiform, the third carry the eggs in the males; but some of these are subject to suppression. Then follow four (or rarely five) pairs of walking legs, usually slender and long. The creeping movements of Pycnogons are very deliberate, but some swim well. Lost limbs are readily regenerated. The food consists largely of pieces of hydroids, which are squeezed in a suctorial proboscis. The eggs are fertilised as they are laid, and then they are fixed in a ball on the ovigerous legs of the male. In most cases the larva has only the first three pairs of appendages. See D'Arcy W. Thompson, 'Pycnogonida,' in *Cambridge Natural History*, vol. iv. 1909.

Pye, HENRY JAMES, poet-laureate, was born in London, 10th July 1745, and educated at Magdalene College, Oxford, in 1772 being made a D.C.L. He held a commission in the Berkshire Militia, in 1784 was elected member for that county, in 1790 succeeded Warton as laureate, and in 1792 was appointed a London police magistrate. He died at Pinner, near Harrow, 13th August 1813. The works of 'poetical Pye' (in Scott's phrase), who, as the editor of Byron's *Vision of Judgment* remarked, was 'eminently respectable in everything but his poetry,' are nearly twenty in number, and include *Alfred* (1801), besides birthday and new-year odes.

Pygmalion, grandson of the king of Cyprus, in love with an ivory statue of a maiden he had made, prayed to Aphrodite to give it life; and, his prayer being granted, married the maiden. There is no classical authority for calling her Galatea. In his *Pygmalion and Galatea* W. S. Gilbert followed a German play.

Pygmies. See DWARF, NEGRITOS.

Pylades. See ORESTES.

Pym, JOHN, was born of a good old Somersetshire stock at Brymore, near Bridgwater, in 1584. He entered Broadgates Hall (now Pembroke College), Oxford, in 1599, as a gentleman-commoner, left in 1602 without a degree, and entered the Middle Temple. He was returned to parliament for Calne and married in 1614, but in 1620 was left a widower with five young children, and next year was again returned to parliament by Calne. This seat he exchanged in 1625 for Tavistock. He at once attached himself to the Country party, and proceeded to war against monopolies, papistry, the Spanish match, and absolutism with a vigour that brought him three months' durance. In 1626, the year after the accession of Charles I., he took a prominent part in the impeachment of the Duke of Buckingham. In the parliament of 1628 he stood second only to Sir John Eliot, whom he ably supported in the debate on the Petition of Right, but whom he opposed in the matter of tonnage and poundage, deeming the privileges of parliament inferior to the liberties of the kingdom. In the Short Parliament (1640), when, in Clarendon's words, 'men gazed on each other, looking who should begin, much the greater part having never sat before,' Pym on 17th April 'brake the ice by a two hours' discourse, in which he summed up shortly and sharply all that most reflected upon the prudence and justice of the government, that they might see how much work they had to do to satisfy their country.' And lastly, in the Long Parliament, having meanwhile joined hands with the Scots, and ridden with Hampden through England, urging the voters to their duty, Pym on 11th November named Strafford, twelve years earlier his friend and ally, as the 'principal author and promoter of all those counsels which had exposed the kingdom to so much ruin.' In the impeachment of Strafford which followed, resulting in his execution under a bill of attainder, Pym took the leading part; and Pym's is the chief credit of this masterstroke of policy, which deprived the king of the one man of resolute temper and powerful genius who supported his cause. In the proceedings against Land Pym was also conspicuous, as in the carrying of the Grand Remonstrance and in every other crisis of moment up to the time when war became inevitable; he was the one of the 'Five Members' whom Charles singled out by name. On the breaking out of hostilities he remained at his post in London, and there, in the exercise of the functions of the executive, rendered services to the cause not less valuable and essential than those of a general in the field. While the strife was yet pending he died, through the breaking of an internal abscess, at Derby House on 8th December 1643, having only the month before been appointed to the important post of Lieutenant of the Ordnance. 'King Pym' was buried in Westminster Abbey with great pomp and magnificence, but at the Restoration his remains were cast out into a pit in St Margaret's churchyard.

'The most popular man,' says Clarendon, 'and the most able to do hurt that hath lived in any time.' And such Pym was, only emphasis ought to be laid upon the 'able.' He was no demagogue, no revolutionist, as neither was he a narrow precisian. His intellect, on the contrary, was 'in-

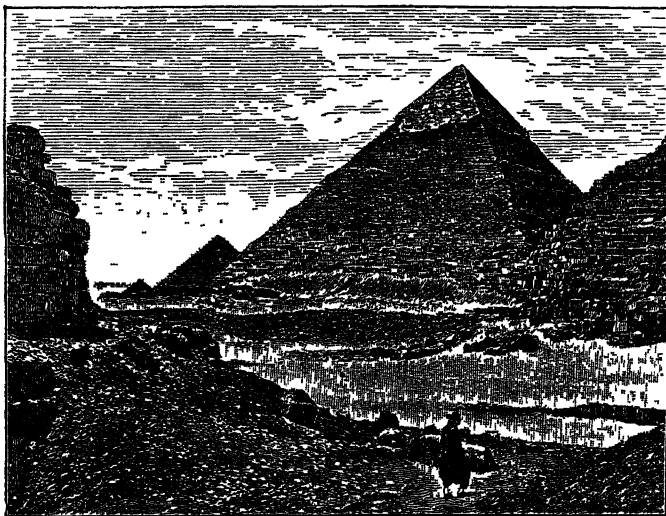
in the solid rock, and was reached by a passage, 320 feet long, which descended to it from the entrance at the foot of the pyramid. The excavations in this direction were subsequently abandoned, and a second chamber, with a triangular roof, was constructed in the masonry of the pyramid, 17 feet by 19 feet, and 20 feet high. This was reached by a passage rising at an inclination of $26^{\circ} 18'$, terminating in a horizontal passage. It is now called the Queen's Chamber, and occupies a position nearly in the centre. A third chamber, now called the King's, was then constructed by prolonging the ascending passage of the Queen's Chamber for 150 feet further into the very centre of the pyramid, and after a short horizontal passage, making a room 17 by 34 feet, and 19 feet high. To diminish the pressure of the superincumbent masonry on the flat roof five small chambers (E in fig.) were made vertically in succession above the roof, the apex of the pointed uppermost chamber (in which the name of Khufu is scrawled) being rather more than 69 feet above the roof of the King's Chamber. The end of the horizontal passage was carefully finished, and cased with slabs of red syenitic granite exquisitely fitted together; and in the King's Chamber is the broken red granite sarcophagus of King Khufu, 7 feet $6\frac{1}{2}$ inches long, 3 feet 3 inches broad, and 3 feet 5 inches high, to contain

which the pyramid was built. Piazzi Smyth fancied (for it is nothing more than fancy) that this coffer was not a sarcophagus, but a standard measure of capacity, of which the British quarter is the fourth part! As the heat of this chamber was stifling, two small air-channels, or chimneys, about eight inches square, were made, ascending to the north and south sides of the pyramid, which perfectly ventilate it. After the mummy was deposited in the King's Chamber, the entrance was closed with granite portcullises, and a well made at the junction of the upward-inclined and horizontal passages, by which the workmen descended into the downward-inclined passage. In its internal arrangements, it should be noted, the pyramid of Cheops is unique, and has no parallel. According to Herodotus, this pyramid took a long time in construction—100,000 men being employed on it for thirty years. The facing-stones were said to be inscribed with writing, but no evidence of this has been found. The internal scrawls are more recent than the pyramid itself. The Great Pyramid was opened by the Abbasside Khalif El Mamûn in the 9th century.

The Second Pyramid is situated on a higher elevation than the first, and was built by Khufu's successor, Khafra or Khefren (died 3845 B.C.). It is 450 feet high, on a base of 700 feet, and has two sepulchral chambers, which were opened by Belzoni in 1816. The masonry is inferior to the first, but it was anciently cased below with polished stones, some of which remain, while the top still retains its original casing.

The Third Pyramid, built by Menkaura, or Mycerinus (3633 B.C.), next king of the fourth dynasty, is much smaller than the other two, being only 215 feet high by 350 feet at the base. It has three chambers, the lowest of which, granite lined, held a sarcophagus of whinstone and a wooden coffin. The inscription on the coffin reads: 'Osiris, King of the North and South, Men-Kau-Ra, living

for ever! The heavens have produced thee, thou wast engendered by Nut (the sky), thou art the offspring of Geb (the earth). Thy mother Nut spreads herself over thee in her form as a divine mystery. She has granted thee to be a god. Thou shalt never more have enemies, O King of the North and South, Men-Kau-Ra, living for ever' (Budge, *The Nile*, 141-142). From this we may conclude that the Egyptian religion and the doctrine of immortality were fixed as early as 3700 B.C. Amongst the debris of the coffin and in the chambers were found the legs and part of the trunk of a body with linen wrapper, supposed by some to be that of the monarch, but by others to be that of an Arab. This body and fragments of the coffin were removed to the British Museum; but the stone sarcophagus was unfortunately lost off Carthage by the sinking (1838) of the vessel in which it was being transported to England. The masonry of this pyramid is most excellent, and it was anciently cased half-way up with granite, the remains of which are still visible. It was wantonly damaged by Saladin's nephew, El-Kâmil, in the 12th century, in the absurd desire of destroying it. The Third Pyramid is regarded with superstitious dread by the natives, on account of a supposed lady's ghost, and there is a curious legend connecting it with the courtesan Rhodopé.



The Second Pyramid.

There are six other pyramids of inferior size and interest at Gizeh, believed to be the tombs of the families of Khufu and Khefren; others at Abou Roash, six miles to the north-west of the same spot; and four (originally fourteen) at Abusir (Busiris), of the fifth and sixth dynasties. A group of eleven pyramids remains at Sakkara, some of which were explored in 1880-81 by M. Maspero, such as those of Unas, Teta, and Pepi, all of the fifth and sixth dynasties, or about 3500 B.C. The so-called Step Pyramid at Sakkara was built by Neter-Khet of the third dynasty. Six pyramids still stand at Dahshûr; and that at Meydûm, with a peculiar construction in three stages, is the tomb of Seneferu (4000 B.C.), Khufu's predecessor, and, according to Petrie, is the first example of the true pyramid construction. There are also pyramids in the Fayyûm, and some small quasi-pyramids of brick at Thebes. In Nubia, the ancient Ethiopia, are several of these quasi-pyramids, the tombs of the monarchs of Meroë from 600 to 100 B.C. and of some of the Ethiopian conquerors of Egypt. They

are taller in proportion to their base than the Egyptian pyramids, and do not preserve the true pyramidal form, and generally have a sepulchral hall, or propylon, with sculptures, which faces the east.

In Assyria the Birs Nimrûd, or Tower of Belus, was a kind of step-shaped pyramid of seven different-coloured bricks, dedicated to the planets by Nebuchadnezzar. The Mujelliba, another mound, was of pyramidal shape. The pyramid also entered into the architecture of the tomb of Sardanapalus at Tarsus, and of the Mausoleum of Artemisia at Halicarnassus. A small pyramid, the sepulchre of C. Cestius, imitated from the Egyptian in the days of Augustus, still exists within the wall of Aurelian at Rome. Temples and other monuments of pyramidal shape are found in India, China, Cambodia, Java, the Polynesian Islands, and elsewhere. The Toltecs and Aztecs erected temples in Mexico, called *Teocalli* (q.v.), or abodes of gods, of pyramidal shape, with steps or terraces by which to ascend and reach an altar, generally placed on the summit, where human sacrifices and other rites were performed. These, however, are not true pyramids, the pure and simple form of which is restricted to Egypt and there to the period from the fourth to the twelfth dynasty. The pyramidal form entered extensively into the architecture of the Egyptians, and appears on the tops of obelisks and tombs as a kind of roof. Small models of pyramids, with inscribed adorations to the sun, or having royal names, were also placed in the tombs.

See Lepsius, *Ueber den Bau der Pyramiden* (1843); Vyse, *Operations carried on at Gizeh in 1837* (1840); W. Flinders Petrie, *The Pyramids and Temples of Gizeh* (1883). Ingenious fancies about the supposed metrological and astrological purport of the pyramids are given in Piazzi Smyth's *Our Inheritance in the Great Pyramid* (1864), and R. A. Proctor's *The Great Pyramid* (1882). The astronomical data afforded by the orientation of temples and pyramids were in 1891 subjected to investigation by Sir J. Norman Lockyer.

Pyramids, a game played on a billiard-table. Fifteen red balls are placed on the table in the form of a pyramid, the apex of the pyramid being on the *winning spot*, with the base nearer to the top of the table. There is also a sixteenth white ball, which is used by both players when striking. The object of the players is to hole the pyramid balls. The first stroke is from hand; the succeeding strokes are played from where the white ball stops, unless the striker runs in, when his adversary plays from hand. Also, when only two balls remain on the table, the white and the red are played with alternately. When a player holes a pyramid ball he scores one, and plays again on any ball he likes. If a player runs in or gives a miss, one is deducted from his score, and a red ball is replaced on the table on the winning spot, or as near in a straight line beyond it as it will go without touching another ball; if the player has made no score, he owes one, and the first red ball he holes is placed on the table. When all the red balls are holed, the lower score is deducted from the higher, and the difference is the number of lives won. The game is generally played for so much a life, with a stake on the pool equal to the value of three lives. The lives are not paid for when taken (as at pool), but the difference in the scores is recorded on a slate marking-board at the conclusion of each game.

The principal varieties of pyramids are *shell out* and *snooker*. Shell out is pyramids played by more than two persons. The only differences are that, if a player runs in or misses, one is deducted from his score, but no ball is replaced on the table, and that the last ball scores two. At snooker, in addition to the pyramid balls, some of the pool balls

(beginning with the yellow) are placed on various spots on the table. A red pyramid ball must first be played on, and, if it is holed, the striker must then play on a pool ball. The pool balls score two, three, four, five, and six respectively, according to the order of their colours on the marking-board; running in or missing when playing on a pool ball scores correspondingly against, the amount being added to the opponent's score. When a pool ball is holed, it is replaced on its original spot, and the striker must next play on a pyramid ball. When all the pyramid balls have been holed, the pool balls are played on in the order of their colours, but are not then replaced when holed.

A great point is to avoid being *snookered*—i.e. to play on a pyramid ball so that if holed a pool ball is left open, and *vice versa*. If a player is snookered, his adversary adds to his score the value of the nearest pool ball. Some rules compel the striker to name the ball played at, when, if he fails to hit it, he is snookered off that. The rules of snooker vary much in different rooms.

Pyramus and Thisbe. The tragical history of these two lovers is told by Ovid in the 4th book of his *Metamorphoses*. They were natives of Babylon, and tenderly attached to each other, but, as their parents would not hear of their marriage, they had to content themselves with clandestine interviews by night. On one occasion they arranged to meet at the tomb of Ninus, where Thisbe, who was first at the trysting-spot, was startled to discover a lioness. She immediately ran off, but in her terror and haste dropped her garment, which the fierce animal, that had just torn an ox in pieces, covered with blood. Soon after Pyramus appeared, and, seeing his mistress's robe, came to the conclusion she had been murdered, whereupon he killed himself. Thisbe now returned, and, beholding her lover lying dead on the ground, put an end to her own life. The story was a favourite one during the middle ages. Bottom pronounces it 'a very good piece of work and a merry' in *A Midsummer Night's Dream*.

Pyrenees, the mountain-chain that divides France from Spain, stretches across from the Mediterranean to the south-east corner of the Bay of Biscay, a distance of 270 miles; the breadth of the system varies between 15 and 70 miles, and the area it covers measures 13,000 sq. m. The Pyrenees form a regular and continuous chain, divisible into three portions, the Western, the Central, and the Eastern Pyrenees. The first-named division extends eastwards from the Bay of Biscay to the Port de Canfranc (or Col de Somport), a road that crosses the chain at an elevation of 5380 feet, and leads from Oloron to Saragossa. This division is the lowest in the entire chain, its average height being 3300 to 4300 feet. Here two passes give access to Spain, that of St Jean Pied de Port (or Roncesvalles) and that between Bayonne and Elizondo; the railway from Bayonne to San Sebastián passes the end of the chain close to the sea. The Central Pyrenees, extending from the Port de Canfranc to the Col de la Perche—which connects the valley of the French Tet (dept. Pyrénées-Orientales) with the valley of the Spanish Segre (prov. Lérida)—contain the highest peaks and the most imposing mountain-masses of the entire system, as Pic de Néthou (in Maladetta), 11,168 feet; Mont Perdu, 10,998; Vignemale, 10,794; Marboré, 10,673; and Pic du Midi, 9466. The summits of the Eastern Pyrenees, which extend eastwards from the Col de la Perche (5300 feet), the second pass over the lofty chain, range between 6500 and 7500 feet (Puigmal, 9545; Canigou, 9138); and, although the altitude decreases as they approach the Mediterranean, they still reach 2100

feet in the Albères close to the sea. This portion is crossed at the Col de Perthus by the old Roman road from Perpignan to Figueras and pierced at the coast end by the tunnel for the railway between the same two towns. The frontier between France and Spain or Andorra coincides generally with the line of highest summits in the main chain; the principal exception is that at Maladetta the frontier strikes north so as to include within the boundaries of Spain the valley of Arán, which geographically belongs to France. On both north and south the mountains sink down to the plains in a series of terraces, with precipitous faces, the general slope on the Spanish side being somewhat steeper than that on the French side. The valleys cut into the mountain-mass on both sides almost directly at right angles, in the form of deep ravines, and with the regularity of the spines of a fish's backbone. Very many of them terminate in caldron-shaped basins, called *cirques*, or by the native mountaineers *oules* (= pots), the sides of which are precipitous and seamed with waterfalls; the most celebrated is the Cirque of Gavarnie, at the head of Gave de Pau, with a waterfall 1515 feet high. Of the numerous streams that have their origin in the mountains, those on the Spanish side are for the most part feeders of the Ebro, whilst the French streams—generally called *gaves*—feed the Adour, the Garonne, and certain little rivers that reach the Mediterranean. The lower Pyrenean valleys through which these streams flow are in many cases covered with grass or forest, or even vineyards and olive-groves. Snow lies on the highest pinnacles, the snow-line being put at 9200 feet on the south side and at 8300 on the north. A narrow belt of glaciers runs from east to west just below the peaks of the Central Pyrenees, but almost wholly on the French side. Vegetation is most developed in the Western division, where the rainfall is heaviest; but, whilst it is there central European in its characteristics, the vegetation of the Eastern division is allied to that of the Mediterranean coasts. The Pyrenees were heaved up during Tertiary times. The nucleus is granite, which comes to the surface in most of the highest peaks. But above the granite lie strata of nearly all ages, especially Silurian deposits, Cretaceous limestones (hippurite), and limestones (nummulite) of the Eocene period. Economic minerals are not generally abundant, though Pyrenean marbles were famous, and iron is worked in the French departments of Basses-Pyrénées, Ariège, and Pyrénées-Orientales; coal exists on the Spanish side and lignite on the French. There are numerous mineral springs (several being hot), those of Eaux-Bonnes, Cauterets, Eaux-Chaudes, Bagnères de Bigorre and de Luchon, and Barèges being the best known. Three railways are destined to cross the range by tunnels. One will connect Bordeaux with Saragossa, following the Somport route, a second passing under Mont Vallier will connect Toulouse with Valencia; and the third with a tunnel between Ax-les-Termes and Ripoll will give a route from Toulouse to Barcelona. Except the passes already mentioned, the Pyrenees are crossed only by mountain-paths, that none but foot-passengers can use, and they only in the summer; the most remarkable is Roland's Gap (9318 feet), on the west side of Mont Perdu. A great number of caves exist amongst the limestone formations, and in them valuable remains of prehistoric man have been found.

See works by Perret (1884), Prarond (1877), Taine (13th ed. 1893), Camena d'Almeida (1893), Trutat (1894), Spont (1914); guide-books by Gsell-Fels, Joanne, and Murray; and Count Henry Russell, *Pau, Biarritz, and the Pyrenees* (new ed. 1891).

Pyrénées, BASSES, a department in the south-west corner of France between the Landes and Spain, and having the Bay of Biscay on the west. Area, 2977 sq. m.; pop. (1921) 402,981. It is divided into the arrondissements of Pau, Oloron, Orthez, Bayonne, and Mauléon. Chief town, Pau. The department occupies the northern slopes of the Western Pyrenees (3000–9800 feet), offshoots from which divide the department into a number of valleys, traversed by mountain-streams (*gaves*). The chief are the Gave d'Oloron, and Gave de Pau, and other tributaries of the Adour. The Bidassoa, with the Isle of Pheasants, where the treaty of 1659 was signed, forms the dividing line between France and Spain for a short distance. The high valleys and slopes are generally fertile, and well adapted for the growth of the vine, chestnut, and other fruits. Agriculture is the principal industry; large herds of cattle and sheep are fed on the extensive pastures, and many swine in the wide forests. Of the numerous mineral springs the most important are those of Biarritz, Eaux-Bonnes, and Eaux-Chaudes. The western half of the department is the home of the Basques (q.v.).

Pyrénées, HAUTES, a department of France, lying east of Basses-Pyrénées, is a part of the old province of Gascony. As its name implies, it contains the loftiest summits of the Pyrenees (q.v.), and is divided into the three arrondissements of Tarbes, Argeles, and Bagnères de Bigorre; chief town, Tarbes. The principal rivers are the Adour and the Gave de Pau. The climate is generally mild in the plains and sheltered valleys. The well-cultivated and artificially watered lowlands yield good crops of cereals, vegetables, and fruits of every kind, including the grape. Horses, cattle, sheep, and swine are reared. Marble and slate are quarried. In this department are the springs of St Sauveur, Bagnères de Bigorre, Barèges, and Cauterets. Area, 1750 sq. m.; pop. (1921) 185,760.

Pyrénées-Orientales, a southern department of France, is bounded on the E. by the Mediterranean and on the S. by the Pyrenees. Area, 1598 sq. m.; pop. (1921) 217,503. It is divided into the three arrondissements of Perpignan, Prades, and Céret. The chief town is Perpignan. Like the other Pyrenean departments, this one embraces a series of parallel valleys formed by spurs from the Pyrenees. The plain of Roussillon occupies all the east of the department. Agriculture is extensively prosecuted, but vines constitute the wealth of the district, and include the red wines of Roussillon, the white muscatel of Rivesaltes, and others. This department ranks among the first as a producer of iron ore; granite, slate, and limestone are quarried. There are mineral springs at Amélie-les-Bains, Vernet, and elsewhere. The population is Catalan.

Pyrethrum, an old genus of Compositæ now included in *Chrysanthemum*. Feverfew (q.v.), a native of Britain, is a notable species. A handsome double-flowered variety is cultivated; and Golden Feather, much employed in bordering, &c. in the bedding-out system of flower-gardening, is a yellow-leaved variety. Several other species are to be met with in flower-gardens, the most ornamental *P. roseum* (*Chrysanthemum coccineum*), from which have sprung many beautiful varieties with double and single flowers of brilliant colours. See INSECT-POWDER.

Pyrehellometer, a radiative thermometer (for measuring the direct heating effect of the sun's rays), consisting of a body heated by the sun's rays and a thermometer. See THERMOMETER.

Pyrîtes, a name employed by mineralogists to designate a large class of minerals, which are com-

pounds of metals with sulphur, or with arsenic, or with both. They are crystalline, hard, generally brittle, and frequently yellow. The name pyrites originally belonged to the disulphide of iron, known as iron-pyrites or simply pyrite, and was given to it in consequence of its striking fire with steel (Gr. *pyr*, 'fire'), so that it was used for kindling powder in the pans of muskets before gun-flints were introduced. Pyrite (iron-pyrites) is commonly of a bright brass-yellow colour; it is often found crystallised in cubes, in which form small crystals of it are abundantly disseminated in some roofing-slates, and very large ones occur in some of the mines of Cornwall; it is also found crystallised in pyritohedrons and octahedrons, alone or in combination with cube faces; and it often occurs massive, globular, stalactitic, capillary, or investing other minerals as an incrustation. Beautiful specimens of globular pyrite are found in the chalk of England. It is a very widely diffused and plentiful mineral, occurring in many different kinds of rock. It is too abundant in many coal-seams, the action of water and air changing it into sulphate of iron (vitriol), during which change so much heat is evolved that the coal is frequently kindled by it, mines become unworkable, and the progress of the fire can only be stopped, if at all, by building up portions of them to cut off the access of air, or by the admission of a plentiful supply of water. Sandstones containing pyrite ought not to be employed for building purposes, as it is prone to oxidation. Sometimes it is changed into sulphate of iron, but when other bases are present in the rock the sulphuric acid often unites with these in preference, leaving the iron of the original sulphide free. The iron then becomes oxidised, and appears as dark brown blotches. The presence of pyrite thus leads to corrosion and unsightly staining. The colour of pyrite has often caused it to be mistaken for gold, a mistake which its hardness and comparative lightness should prevent, or its ready solubility in nitric acid, and its burning before the blowpipe on charcoal with bluish flame and smell of sulphur. But it sometimes does contain a small proportion of gold, occasionally even in visible grains. This auriferous pyrite is found in Siberia and in South America. Pyrite is never used as an ore of iron, but it is much employed in the manufacture of sulphuric acid, and sulphur is obtained from it by sublimation. It is also used for the manufacture of alum. A rather unstable variety of iron disulphide of a very pale colour is called *Marcasite*; it crystallises in orthorhombic forms. Another sulphide of iron known as *Pyrrhotite* ($\text{Fe}_n\text{S}_{n+1}$) is magnetic, and may contain up to 5 per cent. of nickel.

Copper Pyrites, also called *Yellow Copper* and *Chalcopyrite*, is the most abundant of all the ores of copper, and yields a large proportion (perhaps a third) of the copper used in the world. It is brass-yellow, the colour varying with the amount of copper which it contains, a rich colour indicating much copper, and a pale colour the presence of a comparatively large amount of iron; for this ore is not a sulphide of copper alone, but of copper and iron. It occurs massive and disseminated in rocks of almost every class, and is often found crystallised in octahedrons and tetrahedrons, but generally in very small crystals. It may at once be distinguished from iron-pyrites by its comparative softness, yielding readily to the knife, and by the green colour of its solution in nitric acid. Before the blowpipe, with borax and soda, it yields a bead of copper.—*Cobaltite*, an arsenio-sulphide of copper, is a principal ore of cobalt. It is generally of a silver-white colour, and occurs massive, disseminated, or crystallised in cubes, octahedrons, pyrito-

hedrons, either alone or in combination.—*Nickelite*, used as an ore of nickel, is a compound of nickel and arsenic. It is generally found massive, and is of a copper-red colour; hence it is called by the German miners *Kupfer-nickel*, because they mistook it for an ore of copper.

Pyritz, a manufacturing town of Pomerania, 25 miles SE. of Stettin by rail; pop. 10,000.

Pyrmont, a small town of Germany, was in Waldeck (or 'Waldeck-Pyrmont') till 1922, when by plebiscite it joined Prussia.

Pyrogallie Acid. See GALLIC ACID, PHOTOGRAPHY.

Pyroligneous Acid, or WOOD VINEGAR, a crude commercial form of Acetic Acid (q.v.). It is made by the destructive distillation of wood, and, besides acetic acid, contains tar, creasote, wood-naphtha, and other products, which have to be removed if it is required in a very pure state. The best woods for the distiller are 'hard' woods, although all will yield it. Oak branches stripped of their bark are cut into short billets, which are placed in cast-iron retorts, and a sufficient heat applied to drive off the volatile constituents and carbonise the wood. This acid is of great use in the arts, especially in making the acetates used by dyers and calico-printers; and it is also, when very carefully purified and properly diluted with water, used extensively as a substitute for common vinegar in pickling, and even for table use. It is also used in the preservation of fish, giving them a 'smoked' flavour.

Pyromancy. See DIVINATION.

Pyrometry, the measurement of temperatures beyond the compass of the mercurial Thermometer (q.v.). The leading methods are ocular, calorimetric, and pyrometric. The eye alone is often sufficiently accurate, and can distinguish dull red, 525° C. (say 975° F.); cherry red, 800° C. (say 1450° F.); orange, 1100° C. (2000° F.); white, 1300° C. (2350° F.); dazzling white, 1500° C. (2700° F.). Or we may use cobalt glass as a means of more sharply discriminating the changes of visible colour; or other absorbent media, appropriate to different temperatures, may be used so as just to make the light invisible or too weak to enable an interposed pattern to be discriminated. Or, a wire may be heated by an electric current adjusted until the wire just becomes invisible against the background of the glow; the corresponding temperature of the wire is ascertained, by reference to a table, from the measured strength of the current. Calorimetric: a lump of heated metal is thrown into a known quantity of water; the rise of temperature is measured; the temperature of the heated metal is next calculated from its weight, its specific heat, and the rise of temperature and the quantity of the water. This method admits errors from loss of time and radiation; hence only rough results are attained, comparable with one another, but not numerically reliable. Of pyrometric methods may be named expansion of air, hydrogen or nitrogen (only suited for laboratory purposes, for glass melts, metals become permeable, and porcelain is fragile), or of mercury vapour; dilatation of solids—porcelain, platinum, or iron (Professor J. F. Daniell, 1821)—whose expansions are very small and difficult to measure, as they generally take up a new set or form when alternately heated and cooled; the shrinkage of clay (Wedgwood's pyrometer) giving variable results; the actual fusion of definite metals, alloys, or enamels whose melting-points have been previously ascertained; the temperature acquired by water made to flow uniformly through a tube partially exposed to the heat to be explored; the speeds of outflow

of air through an aperture at the atmospheric and at the furnace temperature (Bains, *American Journal of Science*, 1889); Siemens's electric pyrometer, which measures the change in the resistance of platinum wire exposed to the furnace heat; Becquerel's thermo-electric pyrometer, in which a thermo-electric couple (platinum-palladium) is exposed to the heat. When Le Châtelier's thermo-electric couple, consisting of platinum and platinum-plus-ten-per-cent.-of-rhodium, is used, the readings of a thermo-electric pyrometer may be consistent with one another.

See Poggendorff's *Annalen*, vol. xxix.; and for Ericsson's Solar Pyrometer, see *Nature*, vol. xxx.

Pyrope, a variety of garnet having the composition $3\text{MgO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$. Chromium, calcium, and iron occur in some specimens. The colour of the mineral ranges from deep red to nearly black; it is often quite transparent, and is then of value as a gem stone. Pyrope is found in serpentines and peridotites. Well-known occurrences are those of Bohemia and Saxony. Specimens from South Africa are known as 'Cape rubies,' those found at Elie in Fife as 'Elie rubies.'

Pyrophone, also called *Flame-organ*, is a musical instrument invented about 1873 by Eugene Kastner (1852-82) of Paris, in which the musical tones are produced by flames of hydrogen gas burning in tubes of different sizes and lengths, arranged somewhat as in an ordinary organ.

Pyrophorus (from the Gr. *pyr*, 'fire,' and *phero*, 'I bear') is a term applied to any substances which take fire from the rapidity with which they are oxidised. If iron, cobalt, or nickel be reduced by hydrogen from its oxide at a low red heat, it is obtained in a state of such extreme division as to become incandescent by the oxidising action of the atmosphere; and the tendency to rapid oxidation is much increased by the interposition of some infusible matter, as a little alumina or magnesia, between the particles of the oxide. This is probably due to the cohesion of the minute particles of the reduced metal being thus mechanically prevented, and the access of air to the surface of each particle being thus facilitated. If tartrate of lead be heated in a tube till the organic portion becomes charred, the metallic lead is reduced to a state of extreme subdivision, and usually takes fire when poured into the air. If finely-powdered sulphate of potash be mixed with half its weight of lamp-black, and heated in a covered crucible, the sulphate is reduced to sulphide of potassium, which remains in a finely-divided state, mixed with the excess of carbon, and takes fire spontaneously in the air from the rapid absorption of oxygen. These are amongst the best examples of pyrophori.

Pyrosis. See INDIGESTION.

Pyrosoma, a genus of compound or colonial Tunicates, sometimes called 'fire-flames' on account of their brilliant phosphorescence. The colonies are hollow cylinders, open at one end, and the walls are formed of hundreds of individuals. These have inhalant apertures on the exterior, while their exhalant apertures open into the cavity of the cylinder, thus producing a gentle current, by means of which the colony is slowly propelled through the water with the closed end foremost. Several species occur in the warmer seas, and *P. giganteum* is from 2 to 3 feet long. See ASCIDIANS, PHOSPHORESCENCE.

Pyrotechny, the art of making fireworks, is of unknown antiquity. It was practised amongst the Chinese from very early times, and has attained with them so much perfection that the beauty and ingenuity of their devices have often been admired by Europeans. Fireworks, as the name is now understood, were hardly known in Europe until

the nature of gunpowder became known, and for a long time only very simple pyrotechnic contrivances were used.

The compositions employed for most kinds of fireworks are of the nature of gunpowder. That is to say, the mixtures of which they are made contain combustible or oxidisable substances, along with bodies available for their rapid combustion, since these latter contain large quantities of oxygen. The most frequently employed combustible materials are carbon (charcoal) or some compound of carbon, such as sugar or gum, and sulphur or a compound of this element, such as sulphide of antimony. Such bodies as charcoal and sulphur burn slowly in common air, because its oxygen is largely mixed with nitrogen, which does not support combustion; but when they are compounded with nitrates and chlorates the store of oxygen in these salts being given off by heat enables the firework composition to burn at a more or less rapid rate whenever a spark is applied to it. It is not desirable, however, to have too sudden a union of combustible matter with oxygen, hence violent explosives, like nitro-glycerine, are unsuitable for showing coloured or brilliant flames. The two most important oxidising ingredients used in firework compositions are nitrate and chlorate of potash. Iron, in the form of cast-iron or steel, and in a state of fine division, is a frequent ingredient in fireworks, and to some extent the powder or filings of antimony, zinc, magnesium, and copper are also employed. When the particles of these metals are highly heated they produce sparks and scintillations of different colours. A few substances, such as sand and sulphate of potash, are used to modify the rate of combustion.

Variety of colour is much studied in the production of fireworks, as it contributes greatly to their beauty. The colours usually seen are those given by simple metals when burned. Compounds of the metals form part of the mixtures, and these are reduced to the metallic condition in a state of very fine division by contact with the carbon present in the hot mass. A yellow colour is one of the most easily managed, any of the common compounds of sodium producing it. Copper gives a green colour when burned in a hydrogen flame, which changes to blue in the presence of a little free chlorine; so that when this metal is used for green some substance containing hydrogen is added, and when employed for blue, calomel (one of the chlorides of mercury) is put into the mixture. Nitrate of barium is also employed for green. Salts of strontium give fine crimson tints, calcium compounds a red, and lithium carbonate (a costly substance) a purple red. Among the substances used to produce white colours are sulphide of antimony and sulphide of arsenic.

The cases which contain the firework compositions are carefully made of paper or pasteboard, or both, pasted in layers. They are usually cylindrical in shape, and the proportion of length to diameter, and the size of openings for the escape of the burning mixtures, are matters of importance. So also is the proper mechanical construction of the framework of rotatory fireworks. Touch-paper, prepared with a solution of nitrate of potash in alcohol, is used for capping squibs, crackers, and indeed for all kinds of fireworks; quick-match of cotton-wick, which has been saturated with gunpowder, gum, and other ingredients, connects the parts of complicated designs; and portfires, small pencil-like articles filled with saltpetre, sulphur, and gunpowder, are used to fire the touch-paper cappings.

The simpler kinds of fireworks include squibs, crackers, gerbs, Roman candles, stars, sparks, maroons, theatre-fires, Bengal lights, &c. *Squibs*

are small stout paper tubes filled with grained powder, to which a little charcoal, sulphur, and steel filings are sometimes added, a sufficient quantity of bursting powder being put in to cause a slight explosion at the end when fired. *Crackers* consist of a tube bent into folds, and containing meal-powder, charcoal, sulphur, saltpetre, and sometimes iron filings in varying proportions. The folds are tied by a cord; and on a cracker being fired a report is given at every turn of the tube. Serpents are tubes, some of which have a choke in the middle. When fired they take a zigzag direction, and give out a hissing noise. *Gerbs* consist of a straight cylindrical case filled with a composition which produces a bright sparkling jet of fire somewhat in the form of a waterspout. They sometimes contain coloured stars. *Roman candles* have a resemblance to gerbs. In filling them stars are placed at intervals along the tube between layers of the composition. *Stars* are of different kinds, such as simple stars, tailed stars, and pointed stars. Simple stars consist of saltpetre, sulphur, and fine gunpowder made into a paste ball with gum and spirits of wine, and dried. Sometimes they contain iron filings. Many compositions are, however, used for stars, their various colours alone necessitating this. Sparks, or small stars, are also made of different colours. *Maroons* are small boxes, round or square, bound with a cord, and containing a composition which explodes with a loud report. *Bengal lights* consist of compositions varying according to colour, which are burned in small saucers; for example, a red light can be produced by a mixture of chlorate of potash, nitrate of strontia, sulphur, and lampblack; and a green by chlorate of potash, nitrate of baryta, chloride of lead, sulphur, and resin. *Theatre-fires* are produced by slow-burning compositions containing some colouring ingredient. They are burned without cases on a fireproof slab; and all substances obnoxious when burned indoors, such as sulphur, antimony, and arsenic, or their compounds, should be omitted in preparing them. Magnesium powder and the minute spores of one or more species of lycopodium are used to imitate lightning in theatres.

The most complicated kind of fireworks are some of the rotating wheels. These are called wheels because they have a framework of nave and spokes, round the rim of which cases of the nature of rockets are arranged. They revolve on a pin or metal spindle, and the motion is produced, as will be presently explained, by the recoil as the fire escapes from the cases, which are connected with each other by leaders. There are a number of different forms, but they may be classed under three kinds—vertical, horizontal, and spiral wheels. In the case of the last, a rod (nave) rises vertically from the centre of the horizontal wheel, forming the base, and upon this rod cases are arranged so as to form a spiral. *Pin or Catherine wheels* and *pastilles* consist each of a long paper case coiled round a rod in the form of a flat spiral, the case being, of course, filled with a burning composition. *Suns* are either fixed or revolving. Fixed suns are of various designs, but a common kind has a number of cases radiating from a centre, from which jets of fire proceed outwards. By a suitable arrangement the fire is communicated at the same time to the mouths of each of the cases. *Revolving suns* are somewhat similar to fire-wheels with spokes. Of ascending fireworks the *rocket* is the most familiar, and it has been known from an early period. It consists of two parts—viz. a long stick to guide it in its course, and a head. The latter, of strong paper and cylindrical in shape, has its lower portion formed into a hollow cone, base downwards, and round this cone is the burn-

ing composition. The object of the cavity is to effect a rapid combustion, which fills it with heated gases, and these, issuing downwards through a small hole in the base, force the rocket up through the air. The upper portion of the head is separated from the lower by a perforated plug of plaster of Paris, through which a fuse passes, so that when the lower portion is burned, the upper, which has a conical head, takes fire and sets off its garniture of stars, snakes, and other ornaments. When fire-arms are discharged there is a recoil, in the case of a heavy gun, of a short distance; in the case of a light cannon, with a larger charge in proportion to its weight, of a much greater distance; and in the case of a rocket which has a bulky charge in a very light barrel the recoil is great enough to send it high in the air. The motion of a fire-wheel is explained in the same way, there being a recoil caused by the backward pressure of the heated gases on the atmosphere as each case on the ring of the wheel takes fire. The *tourbillion* ascends and rotates at the same time. Upward motion is given by the fire escaping from holes on the under side of the cylinder, and rotatory motion by its finding vent from holes at the ends, but on opposite sides.

Aquatic fireworks, in which the devices which come in contact with the water require to be protected with grease or oil, consist of skimmers or water devils, floating Chinese trees, gerbs, and Roman candles, water-mines, water fire-fountains, &c.

Pyroxenes, a group of minerals comprising monoclinic, orthorhombic, and triclinic forms. The monoclinic pyroxenes occurring commonly in igneous and metamorphic rocks include both aluminous and non-aluminous silicates of calcium, magnesium, and iron, the former including Augite (q.v.), the latter Diopside. Varieties rich in sodium, such as Aegerine, are less common. The orthorhombic pyroxenes are all silicates of magnesium and iron. They form an isomorphous series, the names Enstatite (q.v.), Bronzite, and Hyperssthene (q.v.) being given to varieties having respectively less than 5, between 5 and 15, and more than 15 per cent. of ferrous oxide. Triclinic pyroxenes, such as Rhodonite, a silicate of manganese, are rare.

Pyroxylic Spirit, also called WOOD-SPIRIT and WOOD-NAPHTHA, is a mixture of acetone, methyl-alcohol, acetate of methyl, &c., obtained by the destructive distillation of wood in the manufacture of Pyroligneous Acid (q.v.). It is also obtained as a by-product in the manufacture of wood-pulp. Many of its properties are the same as those of common alcohol. It is of nearly equal value to alcohol in making varnishes, as it dissolves the resins, oils, and other similar substances. It has a peculiar naphtha-like odour, which is inseparable from it, and prevents its use as a potable spirit at present; but it is asserted that some makers produce it almost odourless, and that it sometimes takes the place of common alcohol in the manufacture of cheap perfumes. It is used in making Methylated Spirit (see METHYL) and in preparation of formaline.

Pyroxylin, a name for Gun-cotton (q.v.).

Pyrrhic Dance, the most famous war-dance of the ancient Greeks, especially the Spartans. The name was said to be derived from Pyrrichos, the inventor of the dance. The *Pyrrhic measure* in prosody consisted of two short syllables.

Pyrrho (Gr. *Pyrrhōn*), the founder of a school of Greek scepticism, named after him, was a native of Elis, born in the third quarter of the 4th century B.C. A pupil of Anaxarchus, he followed him when he went in the train of Alexander to Asia

and India. He lived to be ninety years old. Our knowledge of his teaching is derived principally from his pupil, Timon 'the Sillograph' (i.e. writer of *silloi*, 'satiric poems'); he himself left no writings. Pyrrho taught that we can know nothing of the nature of things, but that the best mental attitude is suspense of judgment, which brings with it calmness of mind. Pyrrhonism is often regarded as the *ne plus ultra* of (philosophical) scepticism: consistent Pyrrhonists were said even to doubt that they doubted.

Pyrrhus, king of Epirus, born about 318 B.C., a Greek warrior, was the son of Æacides and a distant kinsman of Alexander the Great. After experiencing many vicissitudes of fortune in his youth, he became sole king of Epirus in 295 B.C., and in the following year increased his territories by the addition of the western parts of Macedonia. In 281 B.C. a glorious prospect opened up before the eyes of the restless warrior—the conquest of Rome and the western world, which would confer on him a renown equal to that of his Macedonian kinsman. The Tarentines, a Greek colony in Lower Italy, then at war with the Romans, sent an embassy to Pyrrhus, in the name of all the Greek colonies in Italy, offering him the command of all their troops against their enemies. The king was overjoyed at the proposal, instantly accepted it, and in the beginning of 280 B.C. sailed for Tarentum with 20,000 foot, 3000 horse, 2000 archers, 500 slingers, and a number of elephants. The pleasure-loving Tarentines were far from pleased at the strict measures taken by Pyrrhus to inure them to the hardships of war. The first battle between Pyrrhus and the Romans, who were commanded by the consul, M. Valerius Lævinus, took place at the river Siris in Lucania. The contest was long, obstinate, and bloody; and Pyrrhus only succeeded by bringing forward his elephants, whose strange appearance and gigantic size excited a sudden panic among the Romans. It was a hard-bought victory for Pyrrhus, who said, as he looked upon the field, thick-strewn with his numerous dead, 'Another such victory, and I must return to Epirus alone.' Hence the phrase 'Pyrrhic victory.' Many of the Italian nations now joined Pyrrhus, and he proceeded on his march towards Central Italy. The Roman senate would have accepted the terms proposed by Cineas, the eloquent ambassador of Pyrrhus, but for the stirring speech of old Ap. Claudius Cæcus, which made them resolve to 'fight it out' with the foreigner. Pyrrhus, after penetrating to within 20 miles of Rome, found it impossible to proceed farther with safety, as one Roman army occupied the city and another hung upon his flanks and rear. He therefore withdrew to Campania, and thence to Tarentum, where he wintered. The campaign of 279 was carried on in Apulia, and the principal engagement took place near Asculum. The Romans were again defeated; but Pyrrhus himself lost so heavily that he felt it impossible to follow up his victory, and again withdrew to Tarentum. Here a truce was entered into between the belligerents, and Pyrrhus passed over into Sicily to assist the Sicilian Greeks against the Carthaginians, 278. His first exploits in that island were both brilliant and successful; but the repulse which he sustained in his attack on Lilybæum broke the spell which invested his name. Soon afterwards he became involved in misunderstandings with the Greeks, and in 276 he quitted the island in disgust to renew his war with Rome. As he crossed over to the mainland the Carthaginians attacked him and destroyed seventy of his ships. In 274 he fought a great battle with the Romans, under the consul Curius Dentatus, near Beneventum, and was utterly defeated, escaping to Tarentum with only a few personal attend-

ants. He now saw himself forced to abandon Italy and return to Epirus, when he almost immediately engaged in war with Antigonos Gonatas, son of Demetrius, and king of Macedonia. His success was complete, for the Macedonian troops deserted to him *en masse*, and he once more obtained possession of the country; but nothing could satisfy his love of fighting, and in less than a year he was induced to enter on a war with the Spartans. He marched a large force into the Peloponnesus and tried to take their city, but was repulsed in all his attempts. He then proceeded against Argos, where he met his death by means of a tile hurled at him by a woman from the roof of a house, 272 B.C.

Pyrus, a genus of trees and shrubs of the Rosaceæ, with five-celled fruit, with a cartilaginous endocarp and two seeds in each cell. It includes species differing very much in appearance, in foliage, and in almost everything except the characters of the flower and fruit, and formerly constituting the genera *Sorbus*, *Aria*, *Aronia*, &c., or included in *Mespilus* (see MEDLAR) and *Cratægus*. *Pyrus japonica* is by some referred to *Cydonia*; see QUINCE. Amongst the species of *Pyrus* are some of the most valuable fruits of temperate climates and some highly ornamental trees and shrubs. See APPLE, PEAR, SERVICE, ROWAN, BEAM-TREE.

Pythchley, a village of Northamptonshire, 3 miles SW. of Kettering, whence the famous Pythchley Hunt takes name. Amongst more than twenty masters of the hunt the most noted have been Lord Althorp (afterwards Earl Spencer; master from 1808 to 1817), 'Squire' Osbaldeston (1827-34), and Mr Payne (1844-48). See FOXHUNTING; and H. O. Nethercote, *The Pythchley Hunt, Past and Present* (1888).

Pythagoras is for us at once the glorified and the actual founder of the Pythagoreans—a philosophical school or sect which exercised a profound and lasting influence on the course of ancient science, philosophy, and theology from pre-Socratic times in Lower Italy, and then, down to the days of the Roman empire, in Greece, in Alexandria, and elsewhere. It cannot be too carefully borne in mind that the earliest written information we have about Pythagoreanism is the fragments not of Pythagoras himself but only of Philolaus, a successor, that the school was at first mainly characterised by its ethico-religious and political tendencies, and that the founder became among later adherents the object of mystical reverence and contemplation; accordingly our knowledge about the doctrines of the Pythagoreans and about the personality of Pythagoras is extremely limited. Aristotle, for example, only speaks of the Pythagoreans in his *résumé* of Greek philosophy, and he with Plato probably only knew of Pythagoras through the oral utterances of Philolaus. Pythagoras was born in Samos about 582 B.C. As regards his education we know only that he was made acquainted with the teachings of the early Ionic philosophers, and, through his travels (which are said to have been not only among the Egyptians, but among the Phœnicians, the Chaldeans, the Persian Magi, the Indians, Jews, Druids, Thracians, &c.), with those of the Egyptian priests. About 530 he settled in Crotona, in Magna Græcia, where he founded the moral and religious school called by his name. Pythagoreanism was first a life and not a philosophy, a life of moral abstinence and purification, reactionary against the popular and the poetic religions, but yet sympathetic towards the old (Doric) aristocratic forms and institutions. All that can be certainly attributed to Pythagoras is the doctrine of transmigration of souls, the institution of certain religions and ethical regulations, and

the beginning perhaps of those investigations into numbers and the relations of numbers which made the school famous. The Pythagoreans as an aristocratic party became unpopular after the defeat of the Sybarites by the Crotoniates in 510 (see CROTONA, SYBARIS), and at first were instrumental in putting down the democratic party in Lower Italy; but the tables were afterwards turned upon them, and they had to flee from persecution. How Pythagoras himself died is not exactly known; his death (according to tradition, at Metapontum) may be placed about 500 B.C.

The Pythagoreans adhered at first to certain mysteries—indeed, the Orphic mysteries; an examination as to fitness qualified for admission into their number; obedience and silence, abstinence and simplicity in dress and food and 'external goods,' and the habit of frequent self-examination were prescribed. The enjoined disposal of worldly goods may have helped to foster contemplation and scientific enthusiasm. This at least developed itself in the school. Pythagoras, for example, is said to have practised investigations into harmonies and the properties of numbers. Mathematical investigations were first begun by individuals, and then carried on prominently by the school. Their attention was early turned to the odd and even, to prime numbers, square numbers, &c.; and from this arithmetical standpoint they cultivated geometrical studies, number becoming for them the chief principle in space. The elementary relations of harmonies and the regular rotations of the spheres led the Pythagoreans to think of the cosmic order as a numerical one, and, like the early Greek Realists in philosophy, they took number to have a metaphysical significance—to be, as Aristotle tells us, not only the form, but the very substance of things: 'All is Number' came to be their thesis. As numerical proportions are repeated in different things, they regarded numbers also as archetypes, of which things were in a sense the ectypes. They explained the harmonious arrangement of things as that of bodies in a single all-inclusive sphere of reality, moving according to a numerical scheme, the earth itself and the fixed stars all being in progress round the central fire. (It is interesting to notice this idea so early in science of the movement of the earth.) The scheme of revolution was given them first by the decad, each number of which had a peculiar significance, especially the unit, the dyad, the square, &c. The table of contraries they also used in explaining the kosmos: this included such contrasts as the limited and the unlimited, the even and the odd, one and many, right and left, male and female, light and darkness, and so on. In all this room was naturally given to fanciful and arbitrary speculation, developed later among the Neo-Pythagoreans in such tables as 1, the point; 2, the line; 3, the surface; 4, body; 5, quality; 6, soul, and so on. To the virtues numbers were also given, justice being the square number; the soul, too, was in general a harmony chained to the body. As the Pythagoreans thought the heavenly bodies to be separated from each other by intervals corresponding to the harmonic lengths of strings, they held that the movement of the spheres gave rise to a pleasing sound called the 'harmony of the spheres.' Of the so-called 'elements' they had also numerical theories, fire being the tetrad, earth the cube, air the octahedron, water the equation.

The great mathematical discovery of Pythagoras is of course the hypothenuse theorem, where the square is equal to the sum of two squares. 'Pythagorean numbers' are such numbers as are related in the way the theorem indicates—e.g. 5, 4, and 3 ($5^2 = 25 = (4^2 + 3^2) = 16 + 9$).

Various other theorems are closely connected with this cardinal one; these concern chiefly the squares of the various perpendiculars which may be let fall from the different angles of the right-angled triangle upon the hypotenuse and sides. The speculations in general of the Pythagoreans may be regarded from various sides. Their formal principle of number is often said, and with truth, to mark a transition from the crude Hylozoism of Thales and the Ionic philosophers to a formal or rational or conceptual contemplation of the world, developed, say, by the Eleatics, and culminating in Plato. Their idea of a quantitative combination of elementary units became a commonplace of Greek speculative cosmology, constituting the ground for a deductive ontology. The conception-general of a measure or proportion in things is, of course, a most pronounced trait in the Greek mind. It is easy to trace in the Pythagorean doctrine of the elements and the contraries and of combination and of spheric completeness all the essential features of Greek cosmology. The influence of Pythagoras and geometrical conceptions over the mind of Plato can hardly be exaggerated. The chief interest of the Pythagoreans doubtless lay in the domain of physics, and their astronomical theories may be said to constitute their capital achievement. If we remember, too, that Pythagoras is perhaps the first Greek thinker who conceived of philosophy as first a life, a life in common, we shall see in this the beginning of the legislative and ethical view of the philosopher's function expressed in the fullest way in Plato's *Republic*. The ascetic and mystical aspects of Pythagoreanism linked it closely with Platonism in the mind of Christian idealists in later times. See NEOPLATONISM, NEO-PYTHAGOREANISM.

BIBLIOGRAPHY.—The fragments of Philolaus were published by Böckh in 1819. The brief notices Aristotle gives of the Pythagoreans in the first book of the *Metaphysics* contain almost all that is of philosophical importance in their theory. Zeller notices most that had been written on the subject (*The Pre-Socratic Schools*, Eng. trans. 1882). See also Delatte, *Études sur la littérature Pythagoricienne* (1915), Rostagni, *Il verbo di Pitagora* (1924), Cornford in the *Camb. Anc. Hist.*, vol. iv. (1926).

Pytheas of Massilia. See GEOGRAPHY.

Pythia. See DELPHI.

Pythian Games, one of the four great national festivals of the Greeks, held in the Crissean plain, near Delphi (anciently called *Pytho*), are said to have been instituted by Apollo after vanquishing the snaky monster, Python, and were celebrated in his honour every four years. Originally the contests were restricted to singing, with the accompaniment of kithara-playing; but flute-playing, athletic contests, horse-racing, contests in poetry, and art were afterwards introduced, and long continued a distinguishing feature of these games, which are believed to have lasted down to nearly the end of the 4th century A.D. The prize was a laurel-wreath and the symbolic palm-branch. Several of Pindar's extant odes relate to victors in the Pythian Games.

Pythias. See DAMON.

Pythium, a genus of Fungi (q.v.). See DAMPING-OFF.

Python, a name applied to several large serpents, especially of the genus *Python*, which inhabit tropical Asia, Africa, and Australia, and closely resemble both in structure and habit the Boas of the New World. The body is rarely 20 feet in length, usually indeed nearer 10, though often estimated at 40; it is plump and very muscular; the tail is prehensile; there are beside the anus two rudimentary hind limbs or 'spurs,' which have perhaps a sexual function besides being of use in

climbing. The pythons usually lurk near water, among the herbage or on an overhanging tree. They seize small mammals, strangle and crush them in their coils, and swallow them slowly. They do not cover them with saliva before beginning to swallow them, reports to this effect being inferences from the appearance of the occasionally disgorged prey. After a heavy meal the serpents are very lethargic. 'The animals on which the pythons ordinarily feed are seldom larger than a small dog, and though they may seize and overpower animals as large as a goat, to swallow them "horns and all" is absolutely impossible.' We must allow for about fifty per cent. of exaggeration in almost all the popular stories about pythons. It is true, however, that the mother reptile coils herself around her pile of eggs and incubates them for about three months. Among the pythons are the following: the Netted Python (*P. reticulatus*) of the Malay Archipelago, Burma, and Siam; *P. molurus*, the Adjiger of the Hindus; *P. regius*, the Royal Rock-snake of West Africa; *P. natalensis*, the Natal Rock-snake; *P. sebae*, the 'fetish' snake of tropical Africa: and several Australasian genera—e.g. Morelia, Aspidiotes. See ANACONDA, BOA.

Pyx (Gr. *pyxis*, 'a box,' properly of boxwood), the sacred vessel used in the Catholic Church to contain the consecrated eucharistic elements which are preserved after consecration, whether for the communion of the sick or for the adoration of the faithful in the churches. It is sometimes called ciborium—a name, however, also given to the Baldachin (q.v.). The form of the pyx has varied very much at different times. Anciently it was sometimes of the form of a dove, which was hung suspended over the altar. More commonly, how-

ever, it was, as its name implies, a simple box, generally of the precious metals, or, at least, of metal plated with gold or silver. At present the pyx is commonly cup-shaped, with a close-fitting cover of the same material. The interior is ordered to be of gold, or at least plated with gold. Like all the other sacred utensils connected with the administration of the eucharist, it must be blessed either by a bishop, or by a priest delegated by a bishop.

Pyx, TRIAL OF THE, the annual trial by weight and assay of the gold and silver coins of the United Kingdom issued from the mint during the preceding year. It is so called from the Pyx—i.e. box or chest—in which are deposited specimen coins. Before the coins are weighed into bags at the mint for issue to the public, two pieces are taken out of each 'journey-weight' (180 oz. Troy in the case of gold, and 720 oz. in that of silver coin), one for assay within the mint, the other for the pyx. The latter are sealed up and deposited in the chest or pyx. The pyx chest, having been brought to Goldsmiths' Hall in the custody of officers of the mint, is opened in the presence of a jury of goldsmiths, who proceed to examine the coins in regard to their number, weight, and fineness. The standard weights used, as well as the trial-plates, are produced by an officer of the Board of Trade. The weight of the total bulk is ascertained, as well as that of selected specimen pieces, and assays are taken from a bar formed by melting a number of coins as well as from separate coins. The verdict recording the results of these several trials releases the officers of the mint from their responsibility in regard to the coinage, and affords a public guarantee that the standard of the currency is well maintained. See ASSAYING, MINT.

Q



the seventeenth letter of our alphabet, descends from the nineteenth letter of the ancient Semitic alphabet, which represented a consonant sound peculiar to the Semitic languages, differing from *k* in being pronounced with constriction of the throat. The sound still

exists in Arabic, though in some dialects it is replaced by *tsh* or *g*. In popular modern transliterations it is rendered by *K*, as in the Hebrew names Korah, Hezekiah (the eleventh letter being in the English Bible rendered by *C* or *Ch*), and in the Arabic Koran. In learned transliterations it is commonly written *Q* or *Q̣*. The name of the letter is in Hebrew *qāf*, in Syriac *qāf*, and in Arabic *qāf*. The current conjectures as to the meaning of the name have no foundation. The earliest known form of the letter is *Q̣*, whence through a series of intermediate forms the ordinary Hebrew *P* is derived.

The Greeks adopted the letter with the rest of the alphabet, usually employing the form *Q*, which is found in some Semitic inscriptions. As the true sound did not exist in their language, they used *koppa* and *kappa* (*K*) for the same sound; the former, as its name suggested, being chiefly employed before *O*. In the end *koppa* was found to be superfluous, and disappeared from ordinary use; but it long retained its place in the alphabet, and still later continued to be used as a numeral for 90.

The letter passed into the Roman alphabet in the form *Q*, which was afterwards altered into *Q* and *Q̣*. The printed capital, in all its varieties, differs only slightly from the Roman form. In minuscule writing the 'tail' was rendered more conspicuous by being made to descend

vertically below the line. The script capital *Q̣* was

developed from *Q̣*, a natural way of writing *Q̣* without taking off the pen.

In Latin the letter, which had been an unnecessary member of the Greek alphabet, was made to serve a useful purpose. The Latin *V* expressed the two sounds *w* and *v*; in general, owing to the phonological characteristics of the language, this ambiguity caused no inconvenience, but to write the sounds *ku* and *ku* alike would have caused misunderstanding (e.g. the nominative *qui* would have been confused with the dative *cui*). The difficulty was obviated by writing *kw* as *QV* and *ku* as *CV*. As *Q* was not used in any other connexion, no inconvenience would have resulted from dropping the second letter of the combination, and using *Q* alone as the symbol of the complex sound *kw*. This simplification was not effected, and even in the modern European languages (with trifling exceptions to be noted afterwards) the letter is used only as part of the compound symbol (now written *qu*; in Swedish and Danish *qv*).

In Italian *qu* still retains its Latin value; in French, Spanish, and Portuguese it has the value

of *k*, and is the regular symbol for that sound before *e* and *i*.

In Old English *qu* was rarely used, the sound being normally represented by *cp* (*p=w*), which survived in occasional use till the 13th century. In the 12th century *qu* was reintroduced from French; until the 16th century it was occasionally written *qw* or *qv*. In modern English the final combination *que* (occurring in words adopted from French or imitating French spelling, as *antique*, *mosque*, *grotesque*) is pronounced as *k*, and *qu* is similarly pronounced in *conquer*, *liquor*, and their derivatives.

In certain Middle English dialects, chiefly Northern and North Midland, *qu*, *guh*, *guh*, *ghw*, *ghu*, *gh* were used to denote the sound of *wh*. In Scottish spelling *guh* survived into the 17th century.

The German *qu*, and the Swedish and Danish *qv*, have nearly the sound of *kw*, the second element approaching to *v*. In Dutch spelling *kw* is substituted.

The letter *q* occurs dissociated from *u* in the French words *cog* and *cing*, and in certain French proper names, as *Vidocq*.

The Roman name of the letter, *cū*, has been preserved in all the languages that are written in the Roman alphabet.

Quack Doctors. Medical quackery is a product of all countries and of all ages; it flourishes among civilised and uncivilised communities alike, and was as rampant before the Christian era as it is in our own day. At all times it has found a numerous public ready and willing to be gulled, and this not only among the illiterate and vulgar, but even specially among the higher and better educated classes. In many cases royalty itself has set the fashion by lending its patronage to notorious charlatans. An exact definition of what constitutes medical quackery is not easy to give. The term 'quacksalver,' in use in the 17th century for quack doctor, seems to be derived from the Dutch *kwakzalver* (Ger. *quacksalber*), meaning a person who praised loudly his own medicines or methods of cure. The first part of the word is derived from the well-known but unmusical note of the duck, and typifies the hoarse blatant tones in which itinerant medicine vendors are accustomed to laud their wares. The equivalent French term is *Charlatan*, derived from the Italian *ciarlar*, 'to chatter' (Lat. *circulari*; *circulator*, 'a pedlar or mountebank')—a name which also indicates their characteristic and persistent loquacity. In more ancient days the loquacity and persistence were verbal; now they are both verbal and literary, as is shown in the deluge of advertisements with which medical quacks flood the world.

Quackery may be taken to include all devices—whether practised by legally qualified medical practitioners or by those who have had no recognised medical training—which tend to deceive the public by disseminating false ideas of disease, or a belief in imaginary ailments, which vaunt certain medicines or methods of treatment as panaceas or cure-alls, or which attribute to an individual a supernatural or exceptional power of influencing and curing disease. The element of pecuniary gain

or of personal vainglory also comes into a definition of quackery, as opposed to the singleness of purpose and devotion to the interests of the patient which are traditionally held to be the guiding principles of the orthodox practitioner of medicine. Perhaps the most amusing description of quacks and their methods has been given by Goldsmith in his *Citizen of the World*, and it is as true and as trenchant to-day as it was then. He says: 'Whatever may be the merits of the English in other sciences, they seem peculiarly excellent in the art of healing. There is scarcely a disorder incident to humanity against which they are not possessed with a most infallible antidote. The professors of other arts confess the inevitable intricacies of things, talk with doubt, and decide with hesitation. But doubting is entirely unknown in medicine; the advertising professors here delight in cases of difficulty; be the disorder ever so desperate or radical, you will find numbers in every street, who, by levelling a pill at the part affected, promise a certain cure without loss of time, knowledge of a bedfellow, or hinderance of business. When I consider the assiduity of this profession their benevolence amazes me. They not only in general give their medicines for half value, but use the most persuasive remonstrances to induce the sick to come and be cured. Sure there must be something strangely obstinate in an English patient who refuses so much health upon such easy terms.'

The Sieur de Courval, writing in 1610, gives a lamentable account of the way in which France, Germany, and Italy were overrun with medical quacks in his day. He describes them as being apostates, vagabonds, disgraced clergy, women of loose character, and rascals of all kinds, and says that they are more dangerous to mankind than vultures, for the latter devour only the dead, while the former prey upon the living. Cadet de Gassicourt, classified quack doctors in a whimsical manner in groups, families, and species, of which the following is an abridgment. *Circulatores*: Insects, very venomous, of the order of suckers; common everywhere, found in all countries and all latitudes. Their external characters are very varied. Some have brilliant elytra, velvety, and studded with gold; others have them more coarsely formed, dull, not entire, and marked with rents. Their intestines have an enormous capacity, the heart is wanting or very small; they attack man exclusively, their stings being always injurious and sometimes mortal. The sting is sometimes very evident, sometimes quite hidden or little apparent. He divides them into two great groups, the *Circulatores Phanerorhynchi*, or peripatetic quacks who practise in public, and the *Circulatores Cryptorhynchi*, or *Charlatans en Chambre*. The latter are described as 'the charlatan of the aristocracy, of the bourgeoisie, and of those who do not wish to be seen consulting him in public. This honest son of toil is imbued with a sense of his own importance, his language is sententious, he speaks with assurance, and is lodged luxuriously. He is often a specialist, and so on. These two groups are further largely subdivided, and an amusing description given of each species.

The methods of quack doctors have been the same from all time, and consist principally in attracting and impressing public attention by extraordinary surroundings and behaviour, and in loudly and persistently asseverating the virtues of their nostrums. This is essentially advertising; and while the invention of printing has stimulated many industries, there are few which it has benefited to a greater extent than that of the quack doctor, as it at once opened the way to a much wider public. The enormous modern spread of newspaper reading has further been largely turned by

the quack to his own advantage, as it opens up a still wider field for the puffing of his wares. When once public attention has been caught, the battle is more than half won; patronage, popularity, and success follow almost as a matter of course. Fortunately these are frequently of a very temporary character; but, as quack doctors are essentially a migratory tribe, this drawback troubles them comparatively little. When they return to their old haunts a new crop of dupes is certain to have come up. The success of quacks must be attributed largely to an imperfect knowledge among the general public of what constitutes disease, added to which there is often an implicit faith in the curative power of drugs. There is little popular conception of what is possible or impossible in the way of healing, and thus the most absurd and extravagant statements are received as facts. Their success, however, has a deeper origin—viz. in the most potent of all human passions—the desire to preserve life. The strong desire for life, health, and the relief of pain clouds the judgment and causes the chance of relief from any source to be eagerly grasped at. The popular love of the marvellous and mysterious has also been of great assistance in pushing the fortunes of many quacks.

Quack medicines, as a rule, form no real additions to our means of treating disease. Almost without exception they are formulæ taken from some old or modern pharmacopœia, or the prescription of some well-known physician, christened with a name calculated to strike the popular fancy, and then puffed and advertised into fame. Such remedies are to be found for every real and imaginary ailment of mankind; but the happy hunting-ground of the quack is more especially in the regions of chronic, but not fatal, disease, such as the multifarious rheumatic affections, chronic skin affections, asthma, hysteria, hypochondriasis, 'nervous disorders,' and a host of others. Persons afflicted with such ailments have naturally alternations of good, bad, and indifferent health, and are often very prone to attribute what is simply natural improvement to the action of the remedy last taken. It is such people who certify so confidently and so gratefully to the curative powers of quack medicines. Cures for cancer, sterility, and consumption, various elixirs of life and youth, and single antidotes efficacious against all poisons must alone have made the fortunes of many thousands of quack doctors. The sad part of the whole matter is that mankind never seems to learn by experience; no new methods of deception are introduced, no real originality or inventive enterprise is ever shown by quacks; they rely upon exactly the same old artifices as their predecessors did, and generation after generation are duped by them just as surely.

Quadragesima ('fortieth') is the Latin name for the whole season of Lent, with its forty days (so also its French derivative, *carême*); but the name is commonly assigned to the first Sunday in Lent, by analogy with the three Sundays which precede Lent—Septagesima, Sexagesima, and Quinquagesima (q.v.).

Quadrant (Lat. *quadrans*, 'a fourth part'), literally the fourth part of a circle, or 90°; but signifying, in Astronomy, an instrument used for the determination of angular measurements. The quadrant consisted of a limb or arc of a circle equal to the fourth part of the whole circumference, graduated into degrees and parts of degrees. Picart was the first to apply telescopic sights to this instrument. Quadrants were adjusted in the same way as the Mural Circle (q.v.). Various innate defects of the quadrant—such as the impossibility

of securing exactness of the whole arc, concentricity of the centre of motion with the centre of division, and perfect stability of the centre-work—led to its being superseded by the repeating circle, otherwise called the mural circle. *Hadley's Quadrant* is more properly an *octant*, as its limb is only the eighth part of a circle, though it measures an arc of 90° . Its principle is that of the Sextant (q.v.). For the quadrant electrometer, see ELECTRICITY.

Quadratic Equations. See EQUATIONS.

Quadrature. The 'quadrature' of a plane curve is effected when a square is found which has the same area as the given curve. Practically it is effected when any rectilinear figure of equal area has been found, for it is easy then to obtain the equivalent square. The quadrature, regarded as an arithmetical process, consists in finding the area of the curve in terms of any square unit.

The great problem in quadrature has been the *Quadrature of the Circle*. The workers in this subject may be divided broadly into two classes: (1) trained mathematicians, who clearly understand the nature of the problem and the difficulties which surround it; (2) those who do not understand the nature of the problem or its difficulties, and who think that they may, by good fortune, succeed where others have failed. The number of the workers of the second class became greatly diminished when the search for 'perpetual motion' became general. And, at the present day, the ranks (now fortunately small) of the perpetual-motionists and the circle-squarers are almost entirely composed of unfortunate individuals whose mental capacities are small, in too many cases the impairment of their faculties having been brought about by a development of their fruitless idea into monomania. Apart from its great historical interest to the mathematician, the subject scarcely merits detailed notice, except in so far as such notice may be useful in preventing further waste of mental energy by some who, were their energies properly directed, might succeed in increasing the sum of useful knowledge.

The nature of the problem may be understood from the following brief account. Let an equiangular n -gon be inscribed in a circle, and let its corners be joined to each other and to the centre. The area of each triangle so formed is $\frac{1}{2}ar \cos \theta$, where a is the base of the triangle, r is the radius of the circle, and θ is one-half of the vertical angle. Hence the area of the polygon is $\frac{1}{2}nar \cos \theta$; and this can be made as nearly equal to the area of the circle as we please by making n sufficiently large. In the limit, when n is infinite, the two areas are equal. But, when n is infinite, θ vanishes and na becomes the circumference, c , of the circle. Hence the area of the circle is $\frac{1}{2}cr$ —that is to say, it is equal to the area of a triangle erected on the radius of the circle as base and of height equal to the circumference of the circle.

The arithmetical quadrature of the circle would therefore be effected if we could find the value of the ratio of the circumference to the diameter—that is, the value of π in the equation $c = 2\pi r$. The geometrical quadrature would be effected by finding a geometrical method of drawing a straight line equal in length to the circumference.

It has long been known that the arithmetical solution of the problem is impossible, for it has been proved that the quantity π is *incommensurable*. And proofs have been advanced that the geometrical quadrature is also impossible; but these proofs are by no means simple, and do not always convince those who are able to judge of their accuracy. James Gregory, in 1668, gave a proof of the impossibility of the geometrical quadrature which Huygens, although he at first objected

to it, finally admitted in so far as it applied to any sector of a circle. Newton also gave a proof of this limited problem, but his proof is not conclusive. A rigid proof has now been given by Lindemann that π cannot be the root of a rational algebraic equation, and therefore cannot be found geometrically. Still, apart from such proofs, the mere consideration of the fact that (discounting incapable workers) the question has been fruitlessly attacked by the ablest mathematicians of past centuries should be sufficient to deter any reasonable person from engaging in the quest. Any mathematician who now considers the question seeks not for a solution but for a simple and convincing proof that a solution is impossible. (It must be remembered that a 'geometrical' solution means a solution which involves no more postulates than those of Euclid.)

Archimedes was the first to give a practical measurement of the quantity π . By a consideration of the inscribed and escribed 96-gons he proved that it lies between $3\frac{1}{7}$ and $3\frac{1}{4}$. This result is correct only to the second decimal figure. Two Hindu measurements are 3.1416 and 3.1623 . Ptolemy gives 3.141552 . A great improvement on previous results was made by Adriaen Anthonisz in the 16th century. His result was correct to the sixth decimal place inclusive. It was published by his son, Adriaen Metius, in 1625. Vieta gave the result correct to the ninth decimal place inclusive; Adrianus Romanus gave it correct to the fifteenth; and Van Ceulen gave it to the thirty-sixth. Snell introduced considerable improvements in the method, and gave 55 decimal figures. Abraham Sharp gave 75, Machin 100, De Lagny 128, Vega 140. The latter result is only correct to 136 places. Montucla cites an Oxford manuscript in which the result (given to 154 places) is correct to 152 places. In 1846 Dase gave a result with 200 decimals, and in the following year Clausen gave 250. In 1851 Shanks gave 315, which were extended by Rutherford to 350, and shortly afterwards (in 1853) Shanks gave 530, which he extended to 707. His calculation seems to have been verified by Richter to five hundred places. An interesting experimental method was adopted by R. A. Smith. He tossed a thin rod upon a uniformly planked floor, the length of the rod being three-fifths of the breadth of a plank. If l be the length of the rod, while b is the breadth of a plank, the probability of the rod intersecting a seam is $2l/\pi b$. From the result of 3204 tosses he found $\pi = 3.1412$. The true value to 20 places is 3.14159265358979323846 .

For a more detailed historical account, see De Morgan's *Budget of Paradoxes* (rev. ed. 1915), or E. W. Hobson's *Squaring the Circle* (1913); see also CIRCLE.

Quadratures, METHOD OF. This name is applied to any arithmetical method of determining the area of a curve. When the exact area is known, a square whose area is equal to it can be found—hence the term 'quadratures.'

It has been shown, under the heading CALCULUS, that the area of a curve whose equation is $y=f(x)$ is $\int y dx$, and can therefore be found when the integral can be evaluated. Hence the approximate determination of the value of a definite integral is obtainable by the method of quadratures.

Let it be required to find the area bounded by a portion of a curve, the ordinates at its extremities, and the axis. The usual method of procedure is to divide the portion of the axis which is included between the two ordinates into a number of equal parts, and to erect ordinates at the points so obtained. The area is approximately equal to the product of one of the given equal parts into half of the sum of the two extreme ordinates

together with the sum of all the intermediate ordinates. To obtain a very accurate result by this process the number of equidistant ordinates must be so great that the portions of the curve which are intercepted by successive ordinates are very nearly straight.

A better method, due to Simpson, consists in drawing, through the first, second, and third points obtained as above on the curve, a parabola whose axis is parallel to the ordinates, and repeating this process with the third, fourth, and fifth points, and so on—the points being chosen so that the total number of points is even. The area of the given curve will be approximately equal to the sum of the areas of the various portions of the parabolas included between successive ordinates when these ordinates are sufficiently close together. It is therefore approximately equal to one-third of the product of one of the given equal portions of the axis into the sum of the extreme ordinates together with twice the sum of all the odd intermediate ordinates and four times the sum of all the even intermediate ordinates.

When the successive equidistant ordinates are very close together, the area is approximately equal to the product of the common intercept on the axis between successive ordinates into the sum of all the ordinates. The labour involved in the estimation of an area by this process would be fatal to its employment unless the number of ordinates was small. But, if the ordinates were few in number, considerable error would in general result unless a correction could be applied. This method is adopted in that process which is known as *the method of quadratures par excellence*, and which is as follows: Let y_0, y_1, \dots, y_n be the several equidistant ordinates, and let a be the intercept on the axis between y_0 and y_n . Also let s be the sum above referred to; and let $\Delta y_0 = y_1 - y_0$, $\Delta y_1 = y_2 - y_1$, &c.; $\Delta^2 y_0 = \Delta y_1 - \Delta y_0$, $\Delta^2 y_1 = \Delta y_2 - \Delta y_1$, &c.; and so on. The value of the whole area is (not s , but)

$$s - \frac{1}{2} \frac{a}{n} (y_n + y_0) - \frac{1}{12} \frac{a^2}{n^2} (\Delta y_{n-1} - \Delta y_0) \\ - \frac{1}{24} \frac{a^3}{n^3} (\Delta^2 y_{n-2} + \Delta^2 y_0) - \frac{1}{720} \frac{a^4}{n^4} (\Delta^3 y_{n-3} - \Delta^3 y_0) \\ - \frac{1}{1680} \frac{a^5}{n^5} (\Delta^4 y_{n-4} + \Delta^4 y_0) - \frac{1}{63000} \frac{a^6}{n^6} (\Delta^5 y_{n-5} - \Delta^5 y_0), \text{ \&c.}$$

It will not in general be necessary to proceed beyond the fifth difference. As an example we shall find the area of the curve $y = x^2$ between the limits $x = 10$ and $x = 15$. In this case all differences beyond the third vanish, and $a/n = 0.5$ if we make eleven ordinates in all. The following table represents the results:

	x	y	Δy	$\Delta^2 y$	$\Delta^3 y$
0	10.5	1000			
1	10.5	1157.625	157.625	15.75	
2	11	1331	173.375	16.5	0.75
3	11.5	1520.875	189.875	17.25	0.75
4	12	1728	207.125	18	0.75
5	12.5	1953.125	225.125	18.75	0.75
6	13	2197	243.875	19.5	0.75
7	13.5	2460.375	263.375	20.25	0.75
8	14	2744	283.625	21	0.75
9	14.5	3048.625	304.625	21.75	0.75
10	15	3275	326.375		

Hence we have $s = 22515.625 \times 0.5 = 11257.8125$; $\frac{1}{2} \times 0.5 \times (y_{10} + y_0) = 1093.75$; $\frac{1}{12} \times 0.5 \times (\Delta y_9 - \Delta y_0) = 6.61458$; $\frac{1}{24} \times 0.5 \times (\Delta^2 y_8 + \Delta^2 y_0) = 0.78125$. We therefore get by this method, approximately, for the value of the area the quantity 10156.67. The correct value is 10156.25, and so the error is less than one in twenty thousand.

This method is of extreme utility in the evaluation of definite integrals when rigorous processes are not attainable.

Quadriga. See CHARIOT.

Quadrilateral, a figure enclosed by four straight lines. The name is given in history to the four fortresses of North Italy—Mantua, Peschiera, Verona, and Legnago—which form a sort of outwork at the bastion of the mountains of Tyrol, and divide the north plain of the Po into two sections by a most powerful barrier. They figured in all the later wars fought in North Italy, especially those of Austria.—Russia had a similar combination of four fortresses in Poland—Warsaw, Nowogeorgiewsk, Ivangorod, Brześć-Litewski—called the Polish Quadrilateral.

Quadrille, a dance of French origin, introduced about 1808 into England. It consists of consecutive dance movements, generally five in number, danced by four or more couples, opposite to, or at right angles to, each other. See DANCING.

Quadrille, a game of cards, very fashionable about two centuries ago. It was very similar to the Spanish game of Ombre (q.v.), with the necessary alterations to fit it for a four-handed game. When whist came into fashion after 1740 quadrille began to lose favour.

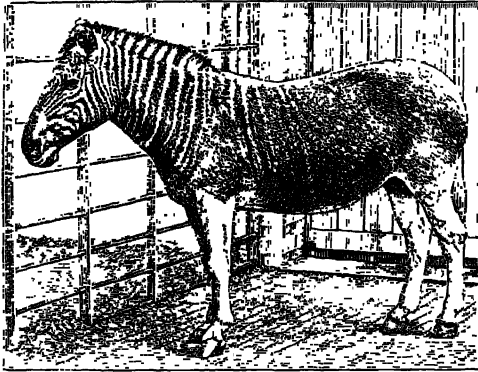
Quadrivium. See ARTS.

Quadruple Alliance, a league formed in August 1718 between England, France, Austria, and Holland to counteract the ambitious schemes of Alberoni. It was made upon the basis of the Triple Alliance which was formed in the January of 1717 between England, Holland, and France, and by which the clauses in the treaty of Utrecht having reference to the accession of the House of Hanover in England, the renunciation by the Spanish king of his claims on the French throne, and the accession of the House of Orleans to the French throne should the young king, Louis XV., die without issue, were guaranteed. The Spanish fleet was destroyed by Byng off Cape Passaro, while the French crossed the Pyrenees and inflicted several defeats upon the Spaniards; and at length Philip was compelled to dismiss his ambitious minister, and accept the terms of the Quadruple Alliance, 19th January 1720.

Quæstor, a class of Roman magistrates, reaching as far back, according to some writers, as the period of the kings, but probably not older than the consulate. The Twelve Tables speak of the *quæstores parricidii* ('investigators of murder,' ultimately public accusers), who were two in number, and conducted the prosecution of persons accused of murder, although their jurisdiction probably extended to other crimes. They are identified on good authority with the more important though later magistracy the *quæstores urbani*, who possessed certain criminal jurisdiction during most of the republican period, and to whom was entrusted the charge of the public treasury. At first they were only two in number, but in 421 B.C. two more were added to accompany the consuls into the provinces. In 267 B.C. the number was increased to eight, the four additional quæstors being the *quæstores classici*, who were stationed at various points on the coast of Italy, and entrusted mostly with naval matters. As province after province was added to the Roman Republic they amounted in the time of Sulla to twenty, and in the time of Cæsar to forty, but were again reduced to twenty under the empire. On its first institution the quæstorship (*quæstura*) was open only to patricians; but after 421 B.C. plebeians also became eligible.

Quagga (*Equus quagga*), a species of striped wild horse, peculiar to Africa, and nearly related to the zebras. Formerly found in profusion south of the Vaal River, beyond which its range seldom extended, it is believed to be now quite extinct. The illustration represents the last animal

of its species owned by the Zoological Society; it was sent from the Cape by Sir George Grey in 1858. The quagga was a handsome animal, more strongly built than the mountain zebra and Burchell's zebra. The upper parts of the body were dark



Equus quagga
(From a Photograph by Messrs York & Son, London)

rufous brown, becoming gradually more fulvous, and fading to white at the rump and ventral surface, the dorsal line dark and broad, widening over the crupper. The head, neck, mane, and shoulders were striped with dark brown, gradually waxing fainter till lost behind the shoulder. It was usually found in herds of from ten to a hundred, but often seen in troops of many hundreds on the plains of the Orange Free State and Cape Colony, and often associated with the white-tailed gnu, not seldom with ostriches. The quagga was swift and enduring, but could be run down by a first-rate horse. Its extinction was mainly wrought by the Orange Free State and Transvaal Boers, who slew thousands annually for their skins. In the old days it was tamed with success, was more tractable than the zebra, and even bred in captivity. The term Quagga is a corruption of the old Hottentot name *Quacha*, bestowed in imitation of the peculiar barking neigh of this quadruped. The quagga is not to be confounded with Burchell's zebra, which is often erroneously called quagga by hunters of the South African interior.

Quail (*Coturnix*), an Old-World genus of the Partridge family (Perdidae), ranging over the temperate Palaearctic, Ethiopian, and Oriental regions, and in the Australian region to New Zealand. The quails are the smallest of the partridge family. Six species are described in this restricted genus. The best known is the Common Quail (*Coturnix communis*). In size it is about 7½ inches long; the general colour above is brown, varied with buff, and on the under parts buff. The male is somewhat smaller in size, is brighter, and has a reddish throat and two dark-brown bands descending from the ear-coverts and ending at the throat in a blackish patch acquired at the second year. Quails fly rapidly, and take long and fatiguing journeys. Immense flocks visit the countries bordering the Mediterranean, especially during the spring emigration; and they are caught for food in large numbers—17,000 have been brought to Rome in one day, and in the small island of Capri, in the Bay of Naples, over 160,000 have been netted in a single season. Many remain to breed, but the majority pass northwards. In England quails are spring visitors; they are becoming scarcer, but at times there is a great influx. Northwards the numbers are fewer, but nests have been found in the northernmost mainland of Scot-

land, and in the Orkneys, Shetlands, and Outer Hebrides, and in summer they reach the Faeroe Islands. A few remain on the south-west coast of England and in Ireland during winter, but the majority leave in October; many pass the winter in the south of Europe and in North Africa; and the species is resident in the Canaries, Madeira, and the Azores. It is also found at the Cape, in

Madagascar and Mauritius, and in Egypt, while in Palestine, as of old (Exod. xvi. 13), quails come up at night and cover the land. It ranges to India and China, and passes the cold season in those countries. Its flesh is considered a delicacy, and in the countries they commonly visit



Common Quail (*Coturnix vulgaris*).

the arrival of the quails is eagerly expected. Quails feed chiefly on insects and slugs, but also on grain and seeds, and they seek their food in the evening. In habit they are unsocial, unamiable, and pugnacious with their own species. They are partly polygamous, partly monogamous. The female is, however, an excellent and careful mother. She builds her nest of bits of plants, and lays from seven to fourteen eggs, pear-shaped, light brown in colour, with dark shading. The young are full grown in six weeks, and two broods may be reared during the season. The call-note of the male is three-syllabled, and from it the quail is known as 'wet-my-lips,' or 'wet-my-feet,' and the species has also for the same reason been named *C. dactylisogramus*. The Button-quails, a different group, including twenty species or more ranged under the genus *Turnix* or *Hemipodus*, are distributed in Barbary and in the Ethiopian, Indian, and Australian regions. Australia possesses a genus, *Synoicus*, peculiar to itself, which includes four species. The American Quails, of which there are about fifty or sixty species, are included in the family or sub-family Odontophoridae, and differ in habit from all the Old-World forms in perching upon trees. The Virginian Quail (*Ortyx virginianus*), known as the Partridge and the Bob-White, from its calling-note, and the Californian Quail (*Lophortyx californica*) have been introduced into England as game-birds, but they have not yet become resident there.

Quain, an Irish family of distinction. (1) JONES QUAIN (1796-1865), born at Mallow, Co. Cork, studied medicine at Dublin and Paris, and in 1829 was appointed lecturer on Anatomy and Physiology in the Aldersgate School of Medicine, London. Two years later he was made professor of Anatomy and Physiology at London University, and held that post until 1835. The well-known students' text-book, Quain's *Elements of Anatomy*, was originally written by him (first edition, 1828). He published also a series of elaborate *Anatomical Plates* (1858) and a translation of Martinet's *Pathology* (1835).—(2) RICHARD QUAIN (1800-1887), brother of the above, was born at Fermoy, Co. Cork, studied at London, and was appointed professor of Anatomy and Clinical Surgery in University College, London, in 1837. He was surgeon-extraordinary to the Queen, and was elected president of the Royal College of Surgeons

in 1868. Amongst his works the principal are: *Anatomy of Arteries*, with folio plates (1845), *Diseases of the Rectum* (1854), *Observations on Medical Education* (1865). He edited, along with others, the fifth edition of (Jones) *Quain's Anatomy*. By his will he left nearly £75,000 to University College, London, for the 'education in modern languages (especially English) and in natural science.'—(3) SIR RICHARD QUAIN, first-cousin to the above, was born at Mallow on 30th October 1816. He was Lumleian lecturer at the Royal College of Physicians (*Diseases of the Muscular Walls of the Heart*) in 1872, and Harveian Oriator (*The Healing Art in its Historic and Prophetic Aspects*) in 1885, and was made physician-extraordinary to the Queen. He edited the *Dictionary of Medicine* (1882); and contributed to various medical journals. He became president of the General Medical Council in 1891, was created a baronet the same year, and died 13th March 1898.—(4) SIR JOHN RICHARD QUAIN, born at Mallow in 1817, the half-brother of Jones and Richard Quain, was made a judge of the Court of Queen's Bench in 1871, and justice of the High Court of Judicature in 1875. He died 12th September 1876. Along with H. Holroyd he published *The New System of Common Law Procedure* (1852).

Quakers. See FRIENDS.

Quantification of the Predicate, a phrase belonging to Logic, and introduced by Sir W. Hamilton. According to the Aristotelian Logic, propositions are divided, according to their *quality*, into affirmative and negative, and, according to their *quantity*, into universal and particular ('All men are mortal,' 'Some men live eighty years'). If we combine the two divisions we obtain four kinds of propositions. But the proposition 'All men are mortal' is not fully stated: the meaning is, that all men are a *part* of mortal things, there being (possibly and probably) other mortal things besides men. The complete proposition is to this effect: 'All men are *some* (or part of) mortals,' where quantity is assigned, not only to the subject, but also to the predicate. The first result of stating the quantity of the predicate is to give eight kinds of propositions instead of four; the next result is to modify the process called the Conversions of Propositions. *Limitation* (All A is B, *some* B is A) is resolved into simple conversion, or mere transposition of premises without further change. 'All A is *some* B'; 'Some B is all A.' See the article LOGIC.

Quattocks. See SOMERSETSHIRE.

Quantum Theory. In its scientific use the word quantum has the meaning of an allotted fixed amount, and is limited to specify an amount of Energy (q.v.) or its time-integral.

The quantum theory originated at the commencement of the present century, and now shares with the relativity theory a position of dominance in the theoretical formulation of physical science. It is the definite outcome of the gradual pushing of physical inquiry into the field of atomic and sub-atomic actions. If these actions are involved directly in the emission and absorption of light, we might expect that characteristics of them would be impressed markedly upon the phenomena of light; and, for more than half a century now, the existence of this impress has been recognised and inquired into. As a result of these investigations chemistry was supplied with one of its most recently developed methods of analysis, Spectrum Analysis (see SPECTRUM). In that case it is the *selective* emission or absorption of light that is dealt with; but the impress appears also in the law of distribution of the energy amongst the wave-lengths, even when the radiation observed is that from a 'black' body possessing no selective action at all.

The law of black-body radiation was found experimentally, but no useful formulation was practicable until a theoretical determination of it was made and tested. Even before that was done the nature of radiation was known to be inconsistent with accepted physical principles. If Maxwell's doctrine of the equipartition of energy amongst different degrees of freedom were true, the ratio of the specific heats of a gas should have a very different value from those which actually exist; for the observed spectra of gases exhibit the existence of many freedoms, while the observed values of the specific heats necessitate a small number only. Hence Kelvin, in speaking of this condition as one of two 19th-century clouds on the doctrine of heat, was led to deny the doctrine of equipartition; and he was right in so far as radiation is concerned. But Maxwell's demonstration of the doctrine was sound if Newtonian dynamics be accepted. The true condition is found to be that the subatomic motions are not governed by the Newtonian laws, but by very different conditions.

Wien first gave a law of radiation founded on certain postulates, and, later, Planck deduced the same law in a more rigid manner. But observation showed that it deviated from fact at long wave-lengths, though at short wave-lengths it suited well. Planck then modified Wien's law of radiation in a way which made it accord with observation; and, soon after, gave the deduction of the modified law, now known as Planck's law, on an entirely fresh basis, which gave the first expression of the quantum hypothesis. There is still some doubt as to the complete accuracy of Planck's law of radiation, but there can be no doubt as to the general success of the postulate, that energy, in its passage to or from the atom, is transferred not continuously but in discrete quantities of definite magnitude. In radiation these quantities are proportional to the frequencies of the vibrations; and this shows, as Planck pointed out, that there exists a more fundamental quantum than the quantum of energy. For the law of proportionality shows that the product of the quantum of energy emitted into the periodic time of emission has the same constant value for all radiations; that is to say, the time-integral of the energy emitted during the complete period of a vibration is absolutely constant for radiation of all periods. This integral is called the 'action': so the law indicates that *action* is ascertained in absolutely fixed quanta. This amount, a constant of nature, is known as Planck's constant, and is denoted by the letter h . The quantum of energy, given by the equation $e = h\nu$, where ν is the frequency, is only constant for any one definite frequency of radiation.

The idea that radiation exists in the æther in definite quanta is directly opposed to the idea of the continuous wave-front entertained in the undulatory theory of light; and no evidence of the existence of these discrete quanta has ever been found even by the most delicate methods based upon interference. The known laws of interference are actually the wave theory laws. On the other hand, certain phenomena of the ionisation of a gas by Röntgen rays, which are radiation of short wave-length, and of photo-electric and other actions, are entirely in accordance with the quantum view.

Indeed many physical phenomena indicate that quanta of energy are involved in other actions than in those of radiation. The quantum theory has in fact been no less fruitful in the elucidation of physical phenomena than has the theory of relativity.

It has given an accurate evaluation of the chemical constant of monatomic gases; and, by taking account of quanta in the rotational

energy of molecules, it has accounted for the infra-red absorption spectra of polyatomic gases, and largely for the molecular heat of diatomic gases. Similar success has attended its applications in the region of the atomic heats and the thermal and electric conductivities of solids. Perhaps the most wonderfully accurate of all its results lie in the domain of the fine structure of bright-line and Röntgen emission spectra.

The theory has registered some failures, but these seem rather to be due to the absence of sufficiently accurate knowledge of the structure of atoms than to any intrinsic defect of the theory. At present interest centres most round the elucidation of the enigma presented by the simultaneous needs for a discontinuous and a continuous propagation of radiation.

Quarantine (from the Fr. *quarantaine*, 'a period of forty days') is a forced abstinence from communication with the shore which ships are compelled to undergo when they have come last from some port or country where certain diseases held to be infectious, as yellow fever, plague, or cholera, are or have been raging. Where a quarantine is established it is a punishable offence for any person in the suspected ship to come on shore, or for any one to disembark any merchandise or goods from her, except at lazarettos, which are establishments provided for the reception of goods or passengers or crew, and where such purifying processes as the sanitary science of the time prescribes are applied. Until a ship is discharged from quarantine she exhibits a yellow flag at the mainmast-head if she has a clean bill of health, and a yellow flag with a black spot if not clean. Quarantine is not of necessity limited to a sea-frontier; and it is enforced at the frontiers between contiguous states. Quarantine for maritime intercourse was established by the Eastern emperors in the 6th century and by the Venetians in 1127, but the practice must have been greatly older on land-frontiers; the precautions of the Jews against leprosy were a species of quarantine. So far as it is in use in Britain, the Public Health Amendment Act, 1896, placed it under the control of the Local Government Board (now the Ministry of Health). But it has practically been superseded by medical inspection, a detention of suspected persons in hospital, and the disinfection of the ship. The Act of 1896 applied only to yellow fever, plague, and cholera, but since 1921 the port sanitary authorities may interfere in respect of any infectious disease. See **BILL OF HEALTH**, **PRATIQUE**.

Quaritch, BERNARD (1819-99), bookseller and collector, was born at Worbs, Prussian Saxony. He went to London in 1842, and there won for himself a premier place in the old book trade. Quaritch published the earlier editions of Fitzgerald's *Omar Khayyâm*. His Catalogues, especially those of 1880 and 1887-88 (suppl. 1894 and 1897) are important bibliographically.

Quarles, FRANCIS, a minor religious poet, belonged to a good Essex family, and was born at the manor-house of Stewards near Romford in 1592, being baptised on 8th May. He studied at Christ's College, Cambridge, and at Lincoln's Inn, and was successively cup-bearer to the Princess Elizabeth, secretary to the famous Archbishop Ussher, and, like Middleton and Ben Jonson, Chronologer to the City of London (1639). He married in 1618 a wife who bore him eighteen children, and penned shortly after his death a touching short memoir, prefixed to *Solomon's Recantation* (1645). Quarles was a bigoted royalist and churchman, suffered losses and calumny in the cause, and died 8th September 1644. He wrote abundantly both in prose and

verse, and his books were extraordinarily popular in their day. Nor are his *Divine Emblems* and *Enchiridion* entirely unworthy of their reputation. Pope's lines in the *Dunciad* are familiar to every one:

Or where the pictures for the page atone,
And Quarles is saved for beauties not his own.

But the clever gibe is not entirely justifiable, for the *Emblems* (1635), in spite of verbose and dull if edifying moralising, helpless bad taste, not infrequent bathos, and ever present monotony, shows wealth of fancy, excellent good sense, felicity of expression, and occasionally a bright though intermittent flash of the true poetic fire. And the *Enchiridion* (1640), a collection of short essays and meditations, affords many an example of compact and aphoristic prose, while its antithesis and word-play are often effective and sometimes fine.

The only complete edition is that by the Rev. A. B. Grosart in the 'Chertsey Worthies Library' (3 vols. 1880-81).

Quartan Fever. See **MALARIA**.

Quarter, a measure of weight, equal to the fourth part of a hundredweight—i.e. to 28 lb. avoirdupois. As a measure of capacity, for measuring grain, &c., a quarter contains 8 bushels. This latter quarter, however, the Corn Sales Act abolished as a standard for the sale of dry produce, the hundredweight alone being legal since 1st January 1923.

Quarter-day. See **TERM**.

Quarter-deck, that part of the upper deck which extends from the mainmast or gangway amidships to the poop, or where there is no poop, to the stern; in turret and barbette war-ships it generally extends from the after-turret or barbette to the stern. It is the place of honour, and is considered the 'King's or Queen's Parade'; and every officer and man stepping upon it salutes it, as a mark of respect to the majesty of the throne. There is a theory that the practice points to the former presence of a crucifix. 'H.M. quarter-deck' is used as a promenade by officers only, at sea the weather side, and in harbour the starboard side being reserved for senior officers. Persons of distinction and officers are received on the quarter-deck; and when the captain addresses the men, or confers rewards or honours on any individual, it is on the quarter-deck that the officers and men fall in for the purpose.

Quartering. See **HERALDRY**; also **EXECUTION**, **TREASON**.

Quarterly Review. John Murray, conscious of the growing power and influence of the *Edinburgh Review*, and strongly disapproving of its Whig opinions, set about the organisation of a work which should counteract what he believed to be its dangerous tendencies. Accordingly, in September 1807, he wrote to Canning with a view of securing his interest. Through his cousin, Stratford Canning, Murray was introduced in January 1808 to Gifford (q.v.), who became its first editor. In October 1808 Murray secured the assistance and co-operation of Scott, whose *Marmion* had been severely reviewed in the *Edinburgh* (1808). Scott not only wrote to his brother Thomas, C. K. Sharpe, Morritt, and Southey, on behalf of the first number, but sent a letter of advice to Gifford, and became himself a considerable contributor. The first number, rather more literary than political in tone, appeared at the end of February 1809. An edition of 4000 was sold at once, of which 850 went to Ballantyne in Edinburgh. The publisher bravely persevered, and, though up to the fifth number not one had paid its expenses, by 1817 it was an assured success, 14,000 being printed. Gifford, who suffered from ill-health, proved unpunctual, resigned the

editorship in 1824, and was succeeded first by John T. Coleridge, then by John Gibson Lockhart (q.v.). Murray's original offer to Gifford as editor was 160 guineas a number for contributions, and £200 a year as editor; when he invited Lockhart to London his offer was £1000 a year, which could be made £1500 by contributions, and a share for three years, the profits of which would not be worth less than £1500 per annum. Besides Scott and Southey, George Ellis, Heber, Barrow, Croker, and Captain Head were considerable contributors. Croker had 99 articles in the first 100 numbers. A frequent rate of payment to Scott and Southey was £100 per article. See Smiles, *A Publisher and his Friends* (2 vols. 1891), and articles BOOK-TRADE, MURRAY (JOHN), PERIODICALS, and SCOTT.

Quartermaster. In the British army the *quartermaster-general* is a staff-officer of high rank (usually a major-general), and ranks after the chief of the general staff and the adjutant-general as the third military member of the Army Council. He is the head of the department of the quartermaster-general to the forces, having charge of transport and remounts, army veterinary services, movements and quartermastering, and supplies and clothing, with a complete staff to attend to these duties. There are also officers with the rank of assistant quartermaster-general and deputy assistant quartermaster-general for the different subordinate commands. The army in India has a similar staff for these duties, and so has every division. In a brigade the duties fall upon the brigade-major. A *quartermaster* is an officer, with the rank of lieutenant, on the staff of a dépôt, a cavalry regiment, or an infantry battalion, charged with the care of stores, issues of clothing, food, forage, and fuel, allotment of barracks, tents, &c., but has no control over monetary matters. Nor is he permitted to undertake any of the duties of paymaster or to preside over mess or other regimental committees having charge of funds. Several are employed, at the War Office and elsewhere, on duties different from those mentioned above, on special rates of pay. A *quartermaster-sergeant* assists the quartermaster in a regiment or battalion.

In the navy the *quartermasters* are generally petty officers; at sea they are stationed at the *con*, their duty being to take care that the helmsmen keep the ship on her proper course, and also to see that all orders from the officer of the watch affecting the movements of the helm are promptly and correctly carried out; they also assist in taking readings of the log and in taking soundings when necessary. In harbour they keep regular watch at the gangways, looking out for boats arriving and leaving, and conveying the necessary orders for the carrying out of the work of the ship. Their pay depends upon their gunnery or torpedo qualifications, number of good-conduct badges, &c.

Quartern is a term employed in some parts of Great Britain to designate the fourth part of a peck; in liquid measure it is the fourth part of a pint, and so synonymous with the imperial gill. A quartern loaf generally weighs 4 lb.

Quarter Sessions, a court of Justices of the Peace (q.v.) established in 1350–51, and meeting once a quarter. Most of their administrative duties were in 1888 transferred to the County Councils (see COUNTY).

Quarter-staff, once a favourite weapon with the English for hand-to-hand encounters, and still sometimes used in athletic exercises, is a stout pole of heavy wood, about 6½ feet long, often bound with iron at both ends. It is grasped in the middle by one hand, the other holding half-way between the middle and end (hence apparently the name 'quarter-staff'); and the attack is made by

giving it a rapid circular motion, which brings the loaded ends on the adversary at unexpected points. See *Broadsword and Singlestick*, by Allanson-Winn and Philipps-Wolley (1890).

Quartet, a piece of music arranged for four solo voices or instruments, in which all the parts are *obbligato*—i.e. no one can be omitted without injuring the proper effect of the composition. A mere interchange of melody, by which the parts become in turn principal and subordinate, without any interweaving of them, does not constitute a quartet. Quartets for stringed instruments are generally arranged for two violins, viola, and violoncello, and are in sonata form. They originated with Haydn, and were further developed by Mozart, and notably by Beethoven, who perfected the art of part-writing. Subsequent writers are Schubert, Spohr, Mendelssohn, Schumann, and Brahms. Vocal quartets are a frequent feature in oratorios and operas up to the time of Wagner.

Quartodecimans. See EASTER.

Quartz, a mineral composed of silica, SiO₂. It is met with chemically pure, but not infrequently contains variable proportions of ferric oxide, manganese oxides, alumina, magnesia, lime, organic matter, &c. Very often it shows inclusions, microscopic or macroscopic as the case may be, of various minerals and fluid cavities. It occurs both in crystals and massive, the more common crystals being hexagonal prisms terminated by hexagonal pyramids. Double hexagonal pyramids are also not uncommon. It scratches glass easily, and becomes positively electrical by friction—two pieces rubbed together giving light in the dark. Quartz when pure is colourless, but, owing to the presence of foreign substances, many coloured varieties are known. Three types of quartz are recognised: (1) *Rock-crystal*, (2) *Common Quartz*, and (3) *Compact Quartz*.

Rock-crystal.—Under this head are included the varieties which are more or less transparent and assume well-marked crystalline forms. The water-clear crystals are known as *Rock-crystal*. The crystals are sometimes slender, crossing and penetrating each other in exquisite groups. They frequently enclose other substances, which are beautifully seen through the transparent rock-crystal, as slender hair-like or needle-like crystals of hornblende, asbestos, oxide of iron, rutile or oxide of titanium, oxide of manganese, &c., and such specimens are known by various fanciful names, as *Thetis' Hair-stone*, *Venus' Hair-stone*, *Venus' Pencils*, *Cupid's Net*, *Cupid's Arrows*, &c.; and sometimes the enclosed substances are small spangles of iron-glance, or crystals of iron pyrites, or native silver in fern-like leaves, or spangles of gold. Fluid inclusions are also not uncommon, as in the quartz of Poretta. Very large crystals of perfectly pure rock-crystal are sometimes found. One from the Alps, which was among the treasures carried from Italy by the French in 1797, is 3 feet in length, about 1½ feet in diameter, and weighs 7 cwt. Similar giant crystals are obtained in Madagascar. Rock-crystal was prized by the ancients, and was used by them, as it still is, for vases, cups, seals, &c. An important modern use of it is for lenses of spectacles, &c., its hardness rendering it much less liable to be scratched than glass. Lenses of rock-crystal are often called *Pebble lenses* (see SPECTACLES). Rock-crystal is best developed in the crevices and cavities of crystalline schistose and granitoid rocks, such as those of Tyrol and the Alps, where it is associated with felspar, titanite, rutile, mica, chlorite, and other crystallised minerals. *Smoky Quartz*, smoky-brown; *Cairngorm*, smoky-yellow; and *Morion*, black, are varieties whose colours have been variously

attributed to the presence of small quantities of oxide of iron or manganese, or titanitic acid or organic substance. Yellow and pellucid varieties of rock-crystal are known as *False Topaz*. *Amethyst* (q.v.) or *Amethystine Quartz* is purple or violet; the darker shades are often highly prized; sometimes speckled varieties of this beautiful mineral occur. When subjected to heat amethyst loses its violet colour and becomes yellow. The *Gold Topaz* and *Citrin* of jewellers are in most cases amethysts which have been treated in this way.

Common Quartz includes non-transparent varieties, some of which, however, are more or less translucent. They are either white, colourless, or coloured, the tints being generally pale, but many show intense shades of red, green, yellow, brown, &c. Sometimes they assume crystalline forms, at other times they have a granular or massive structure. The following are varieties: *Milk-quartz*, milk-white and slightly opalescent (Greenland, &c.); *Greasy Quartz*, like milk-quartz, but with a greasy lustre; *Rose-quartz*, rose-red, sometimes crimson, the colour fading on exposure (Bodenmais); *Siderite* or *Sapphirine-quartz*, indigo or blue in colour, from the presence of asbestos-like fibres of blue crocidolite (Golling in Salzburg); *Ferruginous Quartz*, coloured red with ferric oxide or brown with hydrous ferric oxide; *Prase*, leek and other shades of green, which are due to needles of actinolite (Saxony, &c.); *Star-quartz*, containing within the crystal whitish or coloured eccentric radiations (Bohemia); *Fibrous Quartz*, brown, with a silky lustre, pseudomorphous after crocidolite (Griqualand West); *Quartz-pisolite* is an oolitic aggregate of quartz granules (Sicily, Egypt); *Floatstone*, porous, cavernous, which floats in water until the air in its numerous cavities becomes displaced (Cornwall, &c.); *Cat's-eye*, yellow or greenish, exhibits opalescence, but without prismatic colours, an effect due to fibres of asbestos or minute tubes arranged in parallel directions (Ceylon, &c.). True *cat's-eye* is a variety of *Chrysoberyl*. *Avanturine Quartz* is a variety containing plates of mica. In reflected light, and particularly on a polished surface, these act as mirrors and give to the specimen a beautiful spangled appearance.

Compact Quartz embraces compact and also finely granular aggregates, which are only translucent on their edges. Here may be included *Jasper* (q.v.), which is really a mixture of quartz with clay and with red or yellow oxides of iron.

Allied chemically, but quite distinct in their optical characters, are the chalcidones, which consist essentially of silica in a fibrous microcrystalline condition. *Chalcedony* (q.v.) itself is colourless or pale gray, or pale bluish or yellowish, translucent to semi-opaque, and occurs either in irregular layers or in mammillary, botryoidal, or stalactitic forms. The following are coloured chalcidones: *Carnelian*, clear red and sometimes yellowish; *Plasma*, green; *Heliotrope* or *Bloodstone* (q.v.), green with red spots; *Chrysoprase*, apple-green. Flint, chert, hornstone, and touchstone are rocks rather than minerals, but are sometimes classed with the chalcidones. *Mocha-stone* or *Moss-agate* is a colourless chalcedony, containing brown moss-like dendritic inclusions. *Agate* (q.v.) consists of alternate layers of chalcedony and other varieties of crystalline and amorphous silica. *Onyx* is composed of even layers of black or brown and white chalcedony; while in *Sardonyx*, which has a similar structure, the alternate layers are red and white. For amorphous forms of silica which contain variable quantities of water, see OPAL.

Quartz is the most abundant and widely diffused of all rock-forming minerals. It is an important and characteristic ingredient of acid igneous rocks, such as granite, quartz-porphyry, &c., and

forms one of the principal constituents of gneiss. In many other igneous and schistose rocks it is met with as a more or less prominent constituent. It occurs also abundantly as a secondary mineral or alteration-product in igneous and schistose rocks generally—sometimes irregularly diffused, at other times occupying cracks, crevices, cavities, &c. Many rocks, especially Archæan and Palæozoic rocks, are traversed by veins of quartz, which vary in breadth from mere lines up to many feet. In some places such veins are more or less impregnated with gold—indeed quartz-veins may be looked upon as the chief repositories of the precious metal (see GOLD).

Quartz, in crystals, is also one of the most common minerals met with lining the walls of metalliferous lodes. Amongst derivative rocks it plays an important part—conglomerates and sandstones being composed as a rule chiefly of siliceous materials. Chalcedony as a rock-constituent is a product of alteration, and is met with commonly in the vesicles and pores of many igneous rocks, or as irregular aggregates diffused through their ground-mass. It is also a common vein-mineral—the coloured chalcedonies especially occurring in this form. Agates occur in veins, and especially in the amygdaloidal cavities of igneous rocks.

Quartz-porphyry, an igneous rock, consisting of crystals of quartz and felspar scattered porphyritically through a compact or very finely crystalline ground-mass of the same minerals. It occurs both as an intrusive rock and in the form of lavas which have flowed out at the surface. Some of the quartz-porphyrries which have a very compact or microfelsitic ground-mass appear to have been originally volcanic vitreous rocks—the glass having subsequently become devitrified. The non-porphyrific varieties which have a flinty or hornstone-like aspect are called *Felsite* (q.v.). 'Quartzless-porphyry' is a name for Orthoclase-porphyry (q.v.).

Quartz-rock, or **QUARTZITE**, is a commonly occurring rock, composed of an aggregate of quartz-grains welded together. It is usually white, gray, or rusty yellow or reddish in colour, and has a splintery fracture. Under the microscope the grains show a rounded and often semi-fused appearance, as if they had been mutually agglutinated while in a softened condition. The siliceous paste in which the granules are frequently set has usually a crystalline texture, and now and again crystals of quartz are developed in it. The rock not infrequently shows false-bedding, and occurs in strata of variable thickness, often forming mountain-masses. Sometimes it assumes a foliated structure (*Quartz-schist*), and contains scales of mica which occasionally form layers or laminæ. The rock is obviously of sedimentary origin, and has subsequently been subjected to metamorphic action.

Quartz-trachyte. See LIPARITE.

Quasimodo Sunday. See LOW SUNDAY.

Quassia, a genus of trees and shrubs of the natural order Simarubaceæ (q.v.); having hermaphrodite flowers, with five petals combined into a tube, and much longer than the small calyx, ten stamens, five ovaries, and only one style; the fruit composed of five drupes. *Quassia amara* is a native of the tropical parts of America and of some of the West India Islands. It is a shrub 10 to 15 feet high, with racemes of bright-red flowers, and large pinnate leaves, the stalks of which are remarkably winged and jointed. The wood, and particularly that of the root, has a strong, purely bitter taste, and was at one time much used in medicine under the names of *Quassia-wood*, *Bitterwood*, &c. The flowers were valued in Surinam for their stomachic properties as early as the beginning of the 18th century; the wood of the

root began to be known in Europe before the middle of that century, and was more fully brought into notice about 1756 by Rolander, a Swede, who had visited Surinam, and had learned its value from a



Quassia: Bitterwood (*Picræna excelsa*), branch with bisexual flowers; *a*, fruit.
(Bentley and Trimen.)

transferred to the Bitterwood (q.v.) of the West Indies, *Picræna excelsa*, a lofty tree, the wood of which possesses the same properties, although in an inferior degree; but this inferiority is compensated by the greater facility with which any requisite supply is obtained. It is the wood of this tree which is now sold as *Quassia-wood*, or *Quassia-chips*, in the shops. It has been used to a considerable extent instead of hops for making beer bitter, although the use of it is illegal in Britain, and beer made with it is said to become muddy and flat, and not to keep. Quassia-wood is very feebly narcotic, and a decoction of it is used for killing flies. Cabinet-work made of it is safe from all attacks of insects. In medicine it is a valuable stomachic tonic; but in fevers it is not to be compared in efficacy with cinchona and its alkaloids. Its properties depend on a bitter principle called quassin, $C_{10}H_{12}O_8$, which is present in minute amount in the wood.

Quaternary, or POST-TERTIARY, the fourth great division of the fossiliferous strata, which embraces the Pleistocene (q.v.) or Glacial and Post-glacial (q.v.) and Recent systems.

Quaternions (or 'sets of four'), the name of a calculus of peculiar power and generality invented by Sir William Rowan Hamilton (q.v.) of Dublin. As a geometry, it primarily concerns itself with the operations by which one directed quantity or Vector (q.v.) is changed into another. Such an operation is called a quaternion, for reasons which will appear hereafter. From this point of view alone we shall discuss it here. We assume the law of vector addition, which asserts that the vector or directed line AC (see fig. 1) is equal to the sum of the vectors AB and BC—or any other directed lines parallel and equal to them. For example, the resultant of two velocities or coterminal forces is a vector equal to the vector sum of the components (see COMPOSI-



Fig. 1.

TION). Quantities which do not involve the idea of direction or directedness are called *Scalars*; such are the quantities used in arithmetic and ordinary algebra. Parallel vectors can all be represented as scalar multiples of one another, or (better) of the parallel vector whose length is unity. By the latter representation, the scalar multiple gives the length or *tensor* of the vector. Thus any vector a may be factorised into its tensor and directed unit part. This is symbolised by the equation $a = T_a U_a$, where T and U appear as selective symbols of operation, separating out the length and direction respectively.

The operation which simply rotates a vector into a new direction without changing its length is a particular kind of quaternion called a *Versor*. A second application of this versor produces an extra equal rotation in the same plane—i.e. about the same axis. With every versor, therefore, are associated an axis having a definite direction and an angle through which any vector perpendicular to this axis is rotated by the versor operating on it.

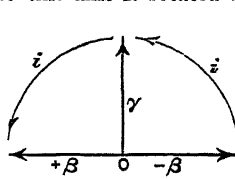


Fig. 2.

A very important case is the quadrantal or right versor, which turns a perpendicular vector through a right angle. Let i represent the right versor whose axis is perpendicular to the plane of the paper. Then (fig. 2) if β is any vector in the plane of the paper, the quantity $i\beta = \gamma$ gives a vector perpendicular to β and to the axis of i . A second operation gives

$$i i \beta = i^2 \beta = i \gamma = -\beta,$$

or symbolically $i^2 = -1$. Thus the square of any right versor is negative unity. It is easy to show that $n i$, where n is a scalar, is an operator which still turns any appropriate vector through a right angle, but at the same time increases its tensor n times. Such an operator is a quadrantal quaternion, whose tensor is n and versor i . A quaternion can always be factorised into its tensor and versor parts.

Now let Oi , OI (fig. 3) be the axes of two right versors i and I , making angle θ with each other. Describe the sphere of unit radius with O as centre, and draw the vector OA or a perpendicular to i and in the plane OiI . Draw OB or β perpendicular to i and a —i.e. upward from the plane of the paper; and finally draw OC or γ perpendicular to I and β . Then first $ia = \beta$ and secondly $Ia = I\beta = \gamma$; so that $Ii = (\gamma/a)$ is the versor which rotates a into the position γ . This versor has its axis parallel to OB , and its angle equal to the complement of θ . Thus any versor can be represented by the product of two right versors perpendicular to it and making with each other the appropriate angle. If the two right versors are themselves at right angles, their product becomes the right versor perpendicular to both. We thus arrive at what is historically the basis of quaternions—viz. Hamilton's remarkable system of mutually perpendicular right versors, ijk . As operators (see fig. 4) they are connected by the equations

$$\begin{aligned} ij &= k = -ji \\ jk &= i = -kj \\ ki &= j = -ik \\ ijk &= -1 = i^2 = j^2 = k^2. \end{aligned}$$

The special point to notice is the non-commutative character of the process of multiplication, ij not being the same as ji . The discovery of the equation $ij = -ji$ on 16th October 1843 was

quickly followed by the development of the whole calculus of quaternions. Now, if j and k were vectors instead of right versors, the equation $ij=k$ would still be true as an equation of operations. In fact, as is capable of easy proof, right versors obey the law of vector addition; and in the identification of unit vectors and right versors, or more generally of vectors and right quaternions, lies one of the great simplifications of the calculus. Thus the operator $(i+j)$ is a right quaternion whose axis (see fig. 4) is along the

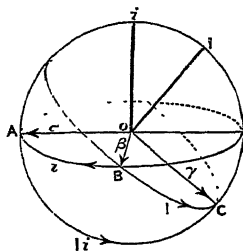


Fig. 3.

diagonal of the square of which i and j are the sides, and whose tensor is equal to the length of this diagonal.

The following conclusions are readily come to. The square of every unit vector is negative unity; the product of two parallel vectors is *minus* the product of their tensors; the product of two perpendicular vectors is a third vector perpendicular to both and having its tensor equal to the product of the tensors of its factors; the product of any two unit vectors is in general a versor; the product of any two vectors is a quaternion whose tensor is the product of the tensors, and whose versor is as mentioned in the preceding sentence. The quaternion $a\beta$ transforms β^{-1} into the vector a ; and β^{-1} , being itself that quaternion which undoes the effect of the right quaternion β , must also be a right quaternion—i.e. a vector. In fact, β^{-1} is always equal to a scalar multiple of $-\beta$. Hence the quaternion $a\beta$ is the operator which changes the vector β^{-1} into the vector a . This operation involves *four* numbers: first, the change of length; second, the angle through which the one vector must be rotated so as to bring it into parallelism with the other; and third and fourth, the two numbers necessary to fix the *aspect* of the plane in which the rotation takes place, or the direction of the axis about which rotation takes place. Thus a quaternion, in general, depends on *four* numbers, whence the name. A vector or quadrantal quaternion is a degenerate quaternion, involving only *three* numbers; while a scalar, which might be defined as the quaternion which changes one vector into a parallel one, is still more degenerate, involving only *one* number—viz. itself.

There is still one very important representation of a quaternion to consider. This is done most simply as follows: Let $a\beta$ be the two vectors OA, OB (fig. 5). Resolving β along and perpendicular to a we get $\beta = OM + ON$; and hence $a\beta = OA.OM + OA.ON$. But OA.OM, being the product of two parallel vectors, is *minus* the product of the lengths or tensors. On the

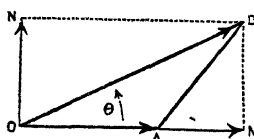


Fig. 5.

other hand, the product OA.ON, being the product of two perpendicular vectors, is a vector perpen-

dicular to the plane of the paper with tensor equal to twice the area of the triangle OAB. Thus the quaternion $a\beta$ is equal to the sum of a scalar and a vector; and generally for any quaternion (q) we have the relation

$$q = S.q + V.q,$$

where S selects the scalar part and V the vector part. The geometrical meanings of S and V operating on $a\beta$ are easily seen to be these—

$$S.a\beta = -TaT\beta \cos \theta, \quad V.a\beta = iTaT\beta \sin \theta,$$

where i is the unit vector perpendicular to a and β .

We end with a few illustrations. Thus, if a is a constant vector, and ρ a variable vector, the equation $S.a\rho = c$, a constant, means that the resolved part of ρ along the direction of a is constant, and that therefore the extremity of ρ traces out a plane perpendicular to a . The versor that turns any line through an angle θ in a given plane has the form $\cos \theta + i \sin \theta$, where i is the right versor perpendicular to that plane. Demoivre's theorem (see DEMOIVRE) at once follows if we write $i = \sqrt{-1}$. Finally, if β represents a force acting at the extremity of a , $V.a\beta$ is the vector moment of the force about the origin; and in the almost self-evident equation

$$V.a(\beta + \beta^1) = V.a\beta + V.a\beta^1$$

we have a completely general demonstration of Varignon's theorem of moments. See MOMENT.

Hamilton's *Lectures on Quaternions* (1853) and his *Elements of Quaternions* (1866) are still the classical works on the subject. Tait's *Elements of Quaternions* (3d ed. 1890) is probably better fitted as a text-book for the student to work through, and contains some original applications of high physical interest. Kelland and Tait's *Introduction to Quaternions* (1874) may be recommended to the beginner. Tait's treatise has been translated into French and German.

Quatre-Bras, a village of Belgium, about 10 miles SSE. of Waterloo, situated at the intersection of the great roads from Brussels to Charleroi, and from Nivelles to Namur, whence its name ('four arms'). On 16th June 1815, two days before the battle of Waterloo (q.v.), Quatre-Bras was the scene of a desperate battle between the English under Wellington and the French under Ney. The honours of the field remained with the former; but the severe defeat of Blücher the same day at Ligny compelled Wellington to retreat. The loss on the English side was 5200, on the French 4140, amongst the Allies being the Duke of Brunswick, the gallant chief of the Black Brunswickers. A monument to his memory, a bronze lion 10½ feet high, was erected in 1890.

Quatrefages de Bréau, JEAN LOUIS ARMAND DE, French naturalist, was born at Berthezène (Gard) on 10th February 1810, studied medicine at Strasburg, and in 1838 was appointed professor of Zoology at Toulouse. But this post he soon resigned and went to Paris to study further for himself. In 1850 he was elected professor of Natural History in the *Lycée Napoléon*, and in 1855 of Anatomy and Ethnology at the Natural History Museum in Paris. He devoted his attention principally to anthropology and the lower animals, especially annelids. His chief works are *L'Espèce Humaine* (1877; 8th ed. 1886; Eng. trans. 1879); *Souvenirs d'un Naturaliste* (1854; Eng. trans. 1857); *Unité de L'Espèce Humaine* (1861); *Crania Ethnica* (1872-82); *La Race Prussienne* (1871; Eng. trans. 1872); *Les Pygmées* (1887); *Histoire Naturelle des Annelés* (2 vols. 1865); *Darwin et ses Précurseurs Français* (1870); and *Théories Transformistes* (1892). He died 12th January 1892.

Quatrefoil, an opening in tracery, a panel, &c., divided by cusps or featherings into four leaves. This form is much used as an ornament in Gothic architecture.



Quatrefoil.

Quattro Cento (Ital., 'four hundred,' a contraction for one thousand four hundred; cf. CINQUE CENTO), in Italian a term for the 15th century, its literature and art; the early Renaissance. Outstanding *Quattrocentisti* in art are Donatello, Della Robbia, Brunellesco, Masaccio, Ghirlandajo, Lippo Lippi, and Mantegna.

Quebec, a province of Canada, has an area of 706,834 square miles, 15,969 square miles of which is water. It is bounded on the north-east by the Newfoundland dependency of Labrador; on the south by the United States and the Canadian provinces of Ontario and New Brunswick; on the west by Ontario and Hudson Bay. The surface of the northerly portion or uplands comprises a part of the Laurentian plateau, most of which is unexplored. This portion is exposed to summer frosts, but is rich in mineral promise. The lower lying portion along the lower St Lawrence is in many places rugged and rocky, and along the shores are situated many fishing hamlets. The main agricultural area is in the eastern townships, south of the St Lawrence, between Quebec and Montreal, but along the north shore between the same cities there is a fine agricultural district. Quebec possesses many great rivers, the principal being the St Lawrence, which flows out of Lake Ontario and into the Atlantic, a distance of over 1000 miles; the St Lawrence is tidal as far as Three Rivers, a town between Quebec and Montreal, the spring tide rising to 18 feet, and the river is navigable for ocean steamers as far as Montreal, and for other vessels 1220 miles farther inland in Ontario to Fort William on Lake Superior, to which place a channel of 14 feet depth has been provided. The Soulanges Canal, 14 miles, and the Lachine Canal, 8½ miles long, are a part of the waterway in the province of Quebec. The main tributary of the St Lawrence is the Ottawa, about 600 miles in length, and dividing Quebec from Ontario. Other large rivers are the Nottaway, Rupert, East Main, Big, Great Whale, Leaf, Koksoak (with Kaniapiskau), George, and Hamilton (or Grand). The principal islands belonging to the province are Anticosti, at the mouth of the St Lawrence, 140 miles long and 30 miles wide, with an area of 2600 square miles; and the Magdalen islands, lying south of Anticosti; the leading occupation on these islands is fishing; the catch consists chiefly of mackerel, cod, and halibut. The islands off the north and west coasts belong not to Quebec but to the North-west Territories.

Agriculture is the principal pursuit of the people of the province. Dairy produce takes the first place. Other products are oats, barley, wheat, Indian corn, hay, rye, buckwheat, flax, pulse, potatoes, turnips, carrots, celery, beets, parsnips, melons, plums, apples, and small fruits. The apples of the Montreal district and the eastern townships have a high reputation. Tobacco and maple sugar are also produced to a large extent, and the breeding of horses, swine, cattle, sheep, and poultry has attained great proportions. The province is notably rich in minerals; alluvial gold is found in various places; copper is found in the eastern townships; while iron is very generally distributed. Other minerals, such as lead, silver, platinum, and zinc are also found, while the asbestos and apatite deposits have achieved a reputation far beyond the limits of the province.

Lumbering is carried on extensively, and the many large rivers form an excellent medium for transporting the immense quantities cut in the forests of the interior. The forests are estimated to cover over 200,000 square miles. The principal manufactories are those connected with cloth, linen, furniture, leather, sawn timber, flax, iron and hardware, paper, chemicals, sugar, soap, india-rubber goods, boots and shoes, cotton and woollen goods, cheese, and all kinds of agricultural implements. There are numerous falls and rapids on the rivers and streams (especially the Hamilton River) capable of furnishing an immense supply of power. The total development to date is well over a million horse-power.

The affairs of the province are administered by a lieutenant-governor, who is appointed by the governor-general, an executive council consisting of 24 members appointed for life, and a legislative assembly of 86 persons elected every five years. Women are not enfranchised and are not eligible. The province is represented in the Dominion Senate by 24 members, and in the House of Commons by 65 members. Quebec's representation in the Federal House of Commons was arbitrarily fixed at the time of confederation at a minimum of 65, the representation of the other provinces being made proportionate thereto. The population, four-fifths of whom are French, in 1881 was 1,359,027; in 1891, 1,488,535; in 1901, 1,648,898; in 1911 (including the districts added in 1912), 2,005,776; and in 1921, 2,361,199. In religion the Roman Catholics comprise about nine-tenths of the population. Education is under the supervision of a council, which is divided into two committees for the government of Roman Catholic and Protestant schools respectively. The two Protestant universities are McGill, at Montreal, and Bishop's College, at Lennoxville. Laval, at Quebec, and Montreal, a separate university since 1920, are Catholic. The principal city in the province is Montreal, which now claims a population of over 618,000, and is the commercial metropolis of the Dominion. The next is Quebec, the most historic city in Canada, and the seat of the provincial government.

From a historical point of view the province of Quebec is probably the most interesting part of the continent, and has already been dealt with up to the 'Quebec Act' of 1774 in the article Canada (q.v.). The French language is still used in the province, and is sanctioned by law; the same remark applies to the French law. It is generally supposed that these privileges were conferred upon the French-Canadians by statute, but this is not the case. By the proclamation of 1763 French law was abolished in the province, and the English law substituted for it. The civil law of France was established again in 1791, and the use of the French language was officially recognised for the first time in that year; but by the Act of 1840 the French language was again set aside, and it was only legalised again in 1848. The principal historical occurrences in the 19th century were the rebellion of 1837-38, which led to the union of Upper and Lower Canada in 1840, and the subsequent difficulties which ended in confederation (1867) with the other provinces of Canada. In 1912 the area of Quebec was greatly increased, with little addition to its population, by the inclusion of Ungava, bringing the province to include the whole of the Labrador peninsula except the north-east region, belonging to Newfoundland. The boundary with Newfoundland was settled by the Privy Council in 1927.

See *Quebec Past and Present*, by J. M. Lemoine (Montreal, 1876); *Picturesque Quebec* (1881); *Canear's History of Canada*; *Sulte's Histoire des Canadiens*

Français; Cassell's *Picturesque Canada*; M. Mercier's sketch of the Province (1890); *The Siege of Quebec* (6 vols. Quebec, 1903); *Old Quebec*, by Sir G. Parker and others (1903); Sutherland's *Province of Quebec* (1922); and books named at CANADA.

Quebec, capital of the province of that name, is situated on a steep promontory on the north-west bank of the St Lawrence at its junction with St Charles River, 300 miles from the Gulf of St Lawrence and 180 miles below Montreal (172 by rail). The highest part of the headland is Cape Diamond, 333 feet above the level of the river. Quebec is the most important military position in Canada. The citadel occupies an area of 40 acres, and commands a magnificent view. The harbour is spacious, and the docks and tidal basin are perfect specimens of engineering skill. On the Lévis side of the river is the extensive graving-dock. The city is divided into an Upper and a Lower Town. In the latter are situated the banks, warehouses, and wholesale and retail stores. In the Upper Town are the principal residences, public buildings, churches, gardens, and retail shops. Towards the west are the thriving suburbs of St John, St Louis, and St Roch. The addition of St Malo and Limoilu wards doubled the city territory. St Roch and Jacques Cartier have immense warehouses and stores. To the south-west of St John are the Plains of Abraham, the historic battlefield, with a column to the memory of General Wolfe. Another monument (65 feet) to Wolfe and Montcalm overlooks the St Lawrence. In 1908 the Plains of Abraham, a scene of the historic battle, were set apart as a National Park and a monument erected. On the Ste Foye road is an iron pillar crowned by a bronze statue, commemorating the deeds of the British and French under Murray and Lévis in 1760. There is a shaft also to the memory of Cartier and the Jesuit Brébeuf. In 1898 a statue to Champlain (q.v.), founder of the city, was unveiled. In the Upper Town is Dufferin Terrace, 1400 feet long, commanding a noble view. The Grand Battery is also picturesquely situated. Three handsome modern gates have replaced the old gates. The principal edifices are the parliamentary and departmental buildings, court-house, post-office, custom-house, city hall, masonic hall, basilica, the archiepiscopal palace, the Anglican Cathedral, Church Hall, and Young Men's Christian Association building. Laval University, named after the first Roman Catholic bishop of Quebec, who in 1663 founded the seminary, holds two charters, one from Queen Victoria (1852) and the other from Pope Pius IX. The building is well equipped with library, museum and art gallery, laboratory, &c. The Quebec seminary is the oldest institute of superior education in America, older than Harvard. At the Grand Seminary theology is taught; the minor seminary is devoted to literature and philosophy. Other Roman Catholic halls of instruction are Laval Normal School, the Ursuline Convent, the Convent of the Good Shepherd, and several nunneries. The supply of water is continuous and good, and comes from Lake St Charles. The city is lighted by electric power from the Falls of Montmorency, 9 miles distant. The Canadian National Railway crosses the St Lawrence above the city, and an immense bridge was open for traffic in 1917. See BRIDGE.

Quebec trades in grain, lumber, pulp, and beef. The principal manufactures are worsted goods, iron-castings, machinery, cartridges, cutlery, nails, leather, musical instruments, boots and shoes, paper, tobacco, and steel. The city has repeatedly suffered from disastrous fires. It is the seat of a Roman Catholic archbishop and an Anglican bishop. It was originally called Stadaconé, and

was visited by Cartier in 1535. In July 1608 Champlain founded the town and gave it its present name. It continued to be the centre of French trade and civilisation, as well as of the Roman Catholic missions in North America, till 1759, when it fell into the hands of the British (see WOLFE). In 1763 it was ceded to Great Britain by the treaty of Paris. Pop. (1852) 42,052; (1901) 68,840; (1911) 78,190; (1921) 95,193. The old walled city and its historical monuments and memories make the city a place of pilgrimage for tourists from all countries.

Quebracho ('axe-breaker'), a name given to several trees with very hard and heavy wood. *White Quebracho* (*Aspidosperma Quebracho*; family Apocynaceæ) grows in swampy forests of Argentina and Paraguay. Its timber is valuable for railway sleepers and many other purposes involving exposure to the weather; but it is exploited (very crudely and wastefully) for the sake of its heartwood, which yields the purest and quickest of all tanning extracts. This tree yields another extract, *Aspidospermine*, which acts like quinine—lowers the temperature in some cases of fever, promotes secretion from the kidneys, intestinal and salivary glands, and relieves dyspnoea or asthma of functional origin.—*Red Quebracho*, also used for tanning, comes from the South American genus *Schinopsis* (Anacardiaceæ), especially *S. Lorentzii* and *S. Balansea*.

Quedah, or KEDAH, a state on the west side of the Malay Peninsula, with an area of 3800 sq. m. and a pop. of 339,000, of whom two-thirds are Malays. Siam ceded the greater part to Britain in 1909. The capital is Alor Star. See MALAY STATES.

Quedlinburg, a town of Prussia, at the northern base of the Harz Mountains, 56 miles by rail SE. of Brunswick. Founded by Henry the Fowler in 924, it is still in part surrounded by a wall flanked with towers. On an eminence overlooking the town stands the castle, which prior to the Reformation was the residence of the abbesses of Quedlinburg, who were independent princesses of the empire, and had a vote in the diet and other privileges. The castle chapel contains monumental tombs of Henry I., his wife Matilda, and the Countess of Königsmark. Here Klopstock and Karl Ritter were born. Pop. 27,000.

Queen (O.E. *cwēn*, 'a woman,' cognate with Dutch *kween*, Ice. *kván*, Gr. *gynē*, Sansk. *jani*), in its primary signification, the king's consort, who has in all countries been invested with privileges not belonging to other married women. The Statute of Treasons makes it treason to compass her death, or to violate her chastity, even with her consent, and the queen consenting is herself guilty of treason. If accused of treason, the queen is tried by the peers of the realm. The queen-consort is exempt from paying toll, and from amercements in any court. She has a Household (q.v.) of her own. It has been the usual practice to crown the queen-consort with solemnities similar to those used in the coronation of the king. In the case of Queen Caroline, consort of George IV., who was living apart from her husband, this was not done. Certain rents or revenues were anciently appropriated to the income of the queen, but no separate revenues seem ever to have been settled on any queen-consort by parliament. Her personal expenses are defrayed from the king's privy purse.

The queen-dowager is the widow of the deceased king. She retains most of the privileges which she enjoyed as queen-consort, nor does she lose her dignity by re-marriage; but it has been held that no one can marry the queen-dowager without permission from the king, on pain of forfeiture of

lands and goods. On the marriage of a king, or accession of an unmarried prince, parliament makes provision for the queen's maintenance in case of her survivance.

The queen-regnant is a sovereign princess who has succeeded to the kingly power. In modern times, in those countries where the Salic law does not prevail, on failure of males a female succeeds to the throne. By an act of Queen Mary, the first queen-regnant in England, it was declared 'that the regal power of this realm is in the queen's majesty as fully and absolutely as ever it was in any of her most noble progenitors kings of this realm;' and it has since been held that the powers, prerogatives, and dignities of the queen-regnant differ in no respect from those of the king. The husband of the queen-regnant is her subject; but in the matter of conjugal infidelity he is not subjected to the same penal restrictions as the queen-consort. He is not endowed by the constitution with any political rights or privileges, and his honours and precedence must be derived from the queen.

Queen Anne Style. See RENAISSANCE.

Queen Anne's Bounty, the name given to a fund appropriated to increase the incomes of the poorer clergy of England, created out of the first-fruits and tenths, which before the Reformation formed part of the papal exactions from the clergy. The first-fruits are the first whole year's profit of all spiritual preferments, and the tenths are one-tenth of their annual profits, both chargeable according to the ancient declared value of the benefice; but more than half of the livings are now exempted from the tax. Henry VIII., on renouncing the papal authority, annexed both first-fruits and tenths to the crown; and, by an act passed in 1703, these revenues were set aside, with the consent of Queen Anne, to form a perpetual fund for the augmentation of poor livings. To 'The Governors of the Bounty of Queen Anne, for the augmentation of the Maintenance of the Poor Clergy,' was granted the revenue of first-fruits and tenths. The application of the funds at the disposal of governors is now made subject to a long series of statutory provisions. Until 1919 the greater part of governors' grants consisted of capital sums to meet benefactions of money, lands, tithes, rent-charges, stipends, &c., of equal value, offered on behalf of benefices not exceeding £200 in net annual income. Since that date the funds have been devoted mainly to the relief of dilapidation assessments on benefices not exceeding £250 per annum, also to loans for building, &c. The governors have also the administration of moneys in respect of sales of parsonages, glebes, and tithe redemption, and are owner-trustees of all ecclesiastical rent-charge. See annual report; also TITHE.

Queen Anne's Farthings. See FARTHING.

Queenborough, a municipal borough on the Isle of Sheppey, Kent, 2 miles S. of Sheerness, was founded by Edward III. (1369), and named after Queen Philippa. There were daily sailings between Queenborough and Flushing before the Great War. Pop. 3000.

Queen Charlotte Islands, a group, some 150 in all, to the north of Vancouver Island, off the coast of British Columbia. The two principal islands, Graham and Moresby, have a length of 160 and a greatest breadth of nearly 70 miles. The climate is healthy, but very rainy. Anthracite, copper and iron ore, and gold have been found, and forests abound. Halibut fishing is very important. For the Indians (Haidas), see C. Harrison, *Ancient Warriors of the North Pacific* (1925)—*Queen Charlotte Sound* is a strait separating Vancouver Island, on the north, from the mainland.

Queen of the Meadow. See SPIRÆA.

Queens, a 'borough' of New York City (q.v.).
Queensberry, WILLIAM DOUGLAS, DUKE OF, 'Old Q,' was born in 1724, and succeeded his father as Earl of March, his mother as Earl of Ruglen, and his cousin in 1778 as fourth Duke of Queensberry. He was famous for years as a patron of the turf, and infamous always for his shameless debaucheries. He is said to have 'displayed great taste in a song,' but to-day lives solely through Wordsworth's indignant sonnet, composed at Neidpath, whose venerable trees 'degenerate Douglas' had felled, to spite his heir or to dower one who he flattered himself was his daughter. After long fear of death he died unmarried, worth over a million sterling, on 23d December 1810, and was buried beneath the communion-table of St James's Church, Piccadilly. See Life by J. R. Robinson (1895).

Queensberry Plot. See LOVAT.

Queen's College, for women (43 and 45 Harley Street, London), was established in 1848, and incorporated by royal charter in 1853. It owed its existence partly to the Governesses' Benevolent Institution and partly to a movement originated by the Rev. C. G. Nicolay, and supported by the Rev. F. D. Maurice and other King's College professors. Its Committee of Education as at first constituted included the names of Maurice, Trench, and Kingsley; of Sterndale Bennett and Hullah; of Ansted and Edward Forbes; of Mulready and Richmond.

For other Queen's Colleges, see IRELAND, CAMBRIDGE, OXFORD.

Queen's Counsel. See KING'S COUNSEL.

Queen's County, or LEIX, an inland county of Leinster, Ireland, is bounded N. by King's County, S. by Kilkenny, and W. by Tipperary, and measures 33 miles by 37 in its extreme dimensions. Area, 424,854 acres; pop. (1841) 153,988; (1861) 90,650; (1881) 73,124; (1891) 64,639; (1926) 51,549. Catholics are in the great majority. Queen's County is, for the most part, within the basin of the Barrow, and is flat and, except where bogs prevail, fertile. It is drained by the Nore and crossed by the Grand Canal. On the north-western border lie the Slieve Bloom Mountains, reaching 1734 feet. Coal occurs in the south-east. Agriculture is the principal occupation, oats, barley, potatoes, and turnips being the principal crops; there is much dairy-farming, and a little woollen and cotton weaving. This district was made a shire in honour of Queen Mary, from whom also the chief town, Maryborough (pop. 3382), was called. The antiquities include a round tower and some ecclesiastical and feudal remains, the most important being a castle on the picturesque rock of Dunamase.

Queensferry, a town of Linlithgowshire, 9 miles WNW. of Edinburgh, on the south shore of the Firth of Forth, which here is crossed by the great Forth Bridge (1882-90); see BRIDGE. Named after St Margaret (q.v.), it has been a burgh of royalty since 1363, a royal burgh since about 1639, and a police burgh since 1882; with Stirling, &c., it returned one member till 1918. Remains of a Carmelite friary were converted in 1890 into an Episcopal church; and one of its hotels is the Hawes Inn of Scott's *Antiquary* and Stevenson's *Kidnapped*. Close by are the seats of the Earl of Rosebery and Marquis of Linlithgow. Pop. 2200.

Queensland, a State of the Australian Commonwealth, occupies the north-eastern regions of the island continent. On the east it is bounded by the Pacific Ocean, here known as the Coral Sea; on the north by Torres Straits and the Gulf of Carpentaria; on the west by the line of long.

138° E., separating it from North and Central Australia, and lines along lat. 26° S. and long. 141° E., separating it from South Australia; and on the south by the line of lat. 29° S. to the Dumaresq River, thence along that river upwards and along the Dividing and Macpherson Ranges to Point Danger on the coast, in lat. 28° 8' S. The area of the State is 670,500 sq. m., rather less than a quarter of the whole area of the Commonwealth.

The districts now included in Queensland were originally discovered by two separate routes. Cook and Flinders both passed along the coast, but Oxley, surveyor-general under Governors Macquarie and Brisbane, was the first to explore it for purposes of settlement in 1823; he was looking for a site for a penal station, and was induced by two castaway timber-getters to penetrate the recesses of Moreton Bay and sail up the river which he afterwards named the Brisbane. In 1827 Allan Cunningham made his way behind the Dividing Range north across the Namoi to the Darling Downs, and squatters looking for pasturage followed in his tracks; so that, although Cunningham himself in 1828 discovered a pass connecting the downland with the Brisbane valley, the penal (afterwards largely agricultural) settlement on the coast had for many years little intercourse with the inland pastoral stations, which communicated direct with Sydney along the tracks by which they had been opened up. This division in many ways seriously affected the colony's subsequent history. The pastoralists had no objection to convict labour, and welcomed it when in 1849 Sydney and Melbourne had refused to let convicts land; while the original penal settlement at Brisbane, transformed into a prosperous farming area by the efforts of Dr Lang, resented the reintroduction of the convict element. And when in 1859 the two districts were cut off from New South Wales and constituted an independent colony, the wish of the Imperial Government to retain the northern half was frustrated by the fears of the Brisbane settlers and their friends farther south that the retained portion would be again used to receive transportees. Consequently the colony has been unwieldy from the first, a mixture of temperate and tropical coastlands and dry inland areas all ruled from a seaport capital in the far south-eastern corner; and its history has been full of movements for further subdivision, Rockhampton in the centre and Townsville in the north being aspirants for the headship of new States to-day. For the State's further history and the work of the explorers Mitchell and Leichhardt, see AUSTRALIA.

Geography.—The main Dividing Range, with its foothills merging into the great central plain, accounts for the whole of Queensland as of New South Wales. But its resemblance to a genuine mountain-range is even smaller than in the southern State. It is merely a watershed meandering across a much-dissected tableland, at first not far from the coast, then passing 200 miles and more inland, then bearing east again about lat. 17° and almost hugging the eastern shores up to Cape York. Behind Brisbane some of its peaks exceed 3000 feet, but nowhere else does it reach that height; the highest hills in the State are Mount Bartle Frere (5438 feet) in a coastal range near Cairns, and Mount Barney (4300 feet) in an eastern spur on the southern border. As a result of this the coastal rivers of Queensland are far more important than any farther south. While the Hunter, the most important river of New South Wales, is 340 miles long, and drains about 11,000 sq. m., the Burdekin in Queensland is 440 miles long, the Fitzroy (to the head of the Dawson) nearly 500, and each drains about 55,000 sq. m. Other important coastal rivers are the Brisbane (200), Mary (165), and Burnett

(250, draining an area exceptionally large for its length), south of the Fitzroy basin, and the Herbert (150) and Normanby (162) north of the Burdekin basin. West of the Great Divide the tableland slopes away in 'downs,' of which the Darling Downs are the best known, to the central plain. This is divided by two long, low ridges—the Grey Range and the Kirby-Selwyn Ranges—into three basins; the Moonie (215), Condamine-Balonne (495 in Queensland), Warrego (365 in Queensland), and Bulloo (370) flow into or towards the Darling; the Thomson (240) and Barcoo or Victoria (310), joining to form Cooper's Creek, flow under that name nearly 600 miles farther into Lake Eyre, which also occasionally receives the outflow of the Diamantina (743, of which 468 in Queensland); while the Leichhardt (300), Flinders (520), Gilbert (312), and Mitchell (350), with numerous smaller streams, drain into the Gulf of Carpentaria. It must be remembered that practically all the rivers of the first two basins—the Condamine is the only important exception—are permanent only in their upper courses, and dwindle sadly as they approach the plains. To prevent confusion, it should also be noted that some authorities use the term 'Great Divide' to denote the low watershed between the Lake Eyre and the Gulf basins; in this account the official Australian nomenclature is adopted.

The population of the State averages little more than one person to the square mile, but over the greater part of the area there is not one to 4 square miles. Still, Brisbane is the only State capital on the continent which contains less than a third of its State's population, its actual share (230,000) being little more than a quarter; the other chief centres of population are Maryborough (11,000), Rockhampton (25,000), and Townsville (21,000) on the coast, Ipswich (20,000) in the Brisbane valley, and Toowoomba (21,000) on the Darling Downs. Among the smaller towns are Gympie (6500) and Charters Towers (9500) on gold-fields east of the watershed; Mount Morgan (7200) near Rockhampton—which during 1921 was temporarily deserted owing to strikes at the big mine, but with the collapse of the strike and the increase in the price of copper was gradually repopulated; and the prosperous little seaports, backed by large areas planted with sugar-cane, of Bundaberg (9000), Mackay (6000), and Cairns (7500). South of Maryborough the coastal districts are mainly agricultural; northwards lie long stretches of pastoral hill-country, broken with patches of rich sugar-land near the ports already named, and at Bowen, Ayr, Cardwell, and Innisfail between Mackay and Cairns. On the range west and south-west of Cairns is one of the richest and most varied mineral districts in Australia. The basins of the Fitzroy, Burdekin, and the Gulf rivers are the great cattle regions; sheep are better suited by the low inland downs on the upper waters of the Barcoo, Thomson, and Diamantina. In the north-west corner, where the great western tableland of Australia intrudes on the plains—a district known as the Barkly Tableland—cattle again prevail over sheep.

Geology.—Post-Tertiary deposits are represented in this State by the coastal alluvia of the Gulf of Carpentaria and by a few bone-drifts. Of Tertiary age hardly anything remains except some outflows of basalt covering patchy areas of the tableland from the Burdekin valley northwards. Cretaceous deposits are of great importance. The Lower Cretaceous marine clays, dating from a time when the Gulf of Carpentaria extended south to the Darling on one side and to Lake Eyre on the other, cover more than half the State; they are known as the 'Rolling Downs' formation, and mark the artesian

area; a very porous bed of sandstone—known as the Blythesdale Braystones—outcropping along the western edge of the tableland, intercepts the flow of large rivers, and conducts it beneath the Cretaceous clays, from which artesian bores release it. It is probable that at one time the whole of the Lower formation was covered by sheets of Upper Cretaceous sandstones and shales, known as the Desert Sandstones; extensive denudation has reduced these to isolated patches occurring (a) over the Cape York Peninsula; (b) along the western edge of the tableland from Hughenden south to the New South Wales border; (c) in ridges and plateaux on the great plain. Trias-Jura deposits, including coal-seams of more or less value, are found in the coastal districts; one patch—the Burrumbeds—covers about 100 miles of coastline each side of Maryborough, the other—the Ipswich formation—occupies 12,000 sq. m. round and behind Brisbane, and occurs also behind Gladstone, where it contains at least one seam of sound coal 30 feet thick. But the bulk of the tableland south of lat. 20° is of Permo-Carboniferous age; the chief formations are the Gympie beds, in which most of the principal gold-fields occur, and the Middle and Upper Bowen beds, extending in a broad belt from near Townsville south-east and south to the Dawson River, which include valuable seams of anthracite coal on the Dawson and near Clermont. There is a second Permo-Carboniferous area behind Cairns and Cooktown, the direct connection being broken by the great block of metamorphic rocks (Archæan according to Professor Gregory, Silurian in the opinion of most local geologists) which crosses the root of the Cape York Peninsula from the Gilbert to Charters Towers. In this occur mineral deposits of a very varied nature, and gold, copper, silver-lead, tin, wolfram, molybdenite, and bismuth are mined advantageously. The same rocks, jutting out into the western part of the State from the great western Australian tableland, account for the rich mineral-fields of the Cloncurry district, where, in addition to those already mentioned, ironstone of high quality is also found. The only other series of deposits worth special note is a Devonian limestone formation, best known where it bestrides the Great Divide from the upper Burdekin to the upper Gilbert.

Industries.—The principal industries of the State have been already referred to. It is still essentially pastoral, containing nearly half the cattle and nearly a quarter of the sheep of the Commonwealth, and about 30 per cent. of the horses. Its agriculture, though rapidly growing, is insignificant in comparison with that of the southern States; its dairying also grows rapidly, especially on the hills behind Brisbane, and a condensed milk industry has developed considerably of late years. But its chief agricultural product is sugar, which occupies nearly a quarter of the lands under crop, against 17 per cent. under maize and 20½ under wheat. In 1923–24 about 41,000 acres under cotton were harvested, giving a yield of 1½ million lb. unginned, and this new industry is rapidly extending its bounds. During the war the Federal Government took control of the sugar output, and in 1916 fixed the wholesale price at £29, 5s. per ton; in 1920 this was raised to £30, 6s. 8d.; but in 1923 direct government control ceased, and it was agreed that for the next two years the price should not rise above £27 per ton. This agreement, coupled with an embargo on the importation of foreign sugar, has been prolonged until 1st September 1928; afterwards the industry will be protected like any other by means of the customs tariff. The manufactures of the State are also for the present of minor importance, the value of their output being only 11 per cent. of the total values

for the Commonwealth. In mining, on the other hand, though its total output is only a third of that of New South Wales, and is exceeded by that of Western Australia, Queensland excels the other States and approaches New South Wales in the variety of its resources. It produces more than half the copper and molybdenite of Australia, and more than 30 per cent. of the wolfram; and its hitherto small production of coal and iron, as well as of the minerals previously mentioned and several others, is due entirely to the difficulties of transport over the great inland distances or the steep coastal ranges.

In 1923 about 5½ per cent. of the State's area was alienated or in process of alienation; the proportion has been steadily decreasing since 1915, which shows that more land has been abandoned—partly, no doubt, because the young settlers enlisted and were killed—than has been taken up. Pastoralists and a few others held under lease or license 71·7 per cent.

Trade.—Direct exports from the State have nearly doubled in value since 1915. Wool, though still the chief staple of export, and worth more per lb. than that of any other State, has fallen off very greatly in quantity since 1915; it is almost entirely merino. The meat export is mainly beef, over a million pounds' worth of which was sent away in 1923–24; butter accounted for nearly £3,000,000.

Government.—The State government is of the usual type (see AUSTRALIA), except that the Legislative Council was abolished in 1922. The Legislative Assembly has 72 members, representing single-member constituencies, with a modified system of optional preferential voting; they are paid £500 a year. A unique provision allows members to vote by proxy, so that the rule of the majority in the legislature is not imperilled by the absence or sickness of any of its members. Ten ministers administer as many departments. The State revenue, which between 1915 and 1924 ran up from 7½ to 13½ millions, showed a slight credit balance in the latter year. Nearly half the revenue, however, is derived from the State railways, and is more than accounted for by their working expenses and interest on the capital invested—during the five years 1920–24 the yearly loss averaged £2,330,000, or 3 per cent. on the capital cost; their percentage of net revenue to capital expenditure is the lowest in any State, except Tasmania, averaging little more than 1. Apart from railways, the State revenue is mainly derived from taxation (£4, 9s. 2d. per head of population, the highest in Australia), land-sales and rents (also the highest per head), and the Federal subsidy of about £1,000,000; the expenditure includes over 1½ millions for education. Of the total loan expenditure of about 70 millions, two-thirds has been invested in railways and tramways. Owing to flotation and other expenses, the actual public debt considerably exceeds the amount expended; on 30th June 1924 it amounted to 90½ millions—£109, 8s. 9d. per head of population—at an average interest rate of £4, 8s. 10d. per cent.; nearly 70 per cent. of the money was borrowed in England. The sinking fund is negligible, about £940,000.

The State railways had, on 30th June 1924, a mileage of 6040—the largest in Australia—open for traffic, with another 441 miles under construction, and 1166 more authorised. Practically the whole State system is of 3 ft. 6 in. gauge. When the planned system is complete, it will include a coastal railway from Tweed Heads to Cairns, a far western line from Eromanga to Camooweal, and three or four cross-country lines connecting the two, with numerous cockspur branches and separate inland extensions from Cooktown, Cairns, and Normanton. Connection with the rest of Australia will be afforded by lines through Kyogle and Tweed

Heads with the New South Wales coastal lines, and by branches running south-west from Brisbane with various inland lines of the same State, while an extension from Camooweal into the Northern Territory is also projected. Private railway lines had a mileage of 1300.

Population, Education, &c.—The population between 1901 and 1924 increased from 493,847 to 834,894; about 53 per cent. are males. About three-quarters of the population was born in Australia, and another fifth in the United Kingdom.

Queensland's primary educational system is of the usual Australian type (see EDUCATION); but, owing to the sparseness of the population, provision is made for average attendances as small as twelve. Isolated families are dealt with by itinerant teachers, or by 'correspondence tuition.' Authorised ministers of religion are permitted to give religious instruction during school hours, and Scripture lessons are included in the regular curriculum. Private schools may, under arrangement with the department of education, be inspected by State school inspectors, and advantage is frequently taken of this privilege. Up to 1912 secondary education was carried on mainly in subsidised grammar-schools governed by trustees, of whom the government appoints a majority. Of these schools there were ten, established in the ten principal towns of the State, and State school pupils were admitted by means of scholarships. These schools and arrangements still exist, but in 1912 six State high schools were established, and five more have since been added; nine primary schools in important country centres have also been provided with secondary departments. All these schools, State and private, are connected with the university of Queensland by a scheme which provides twenty three-year scholarships. A teachers' training college at Brisbane is in operation, entry being obtained by gaining a certificate at the 'junior' or 'senior' public examination. Technical education is provided for by seventeen colleges with sixty-three branches, including commercial schools, domestic science schools, preparatory trade schools, and classes for apprentices. In certain trades the attendance of young workers at these classes is made compulsory by industrial awards. At Gatton, 60 miles W. of Brisbane, there are a State agricultural college and high school, and at Nambour, Boonah, Marburg, Grace mere, and Home Hill there are rural schools providing vocational education. In many centres special instruction is given to backward, subnormal, and defective children. The university of Queensland was founded in 1909, and commenced its work in three faculties (arts, science, and engineering) in 1911. In 1923 11 professors and 16 lecturers taught 387 undergraduates. Its activities include evening lectures, correspondence classes, and extramural lectures. Among other institutions of educational value are the public library, the museum, the national art gallery (all three in Brisbane), and many so-called 'schools of arts' in country municipalities; these are subsidised libraries with reading-rooms attached, and are often connected with halls in which lectures or entertainments are given.

See AUSTRALIA and works there cited. Russell's *Genesis of Queensland* is a lively account of the early days of settlement. *The Geology and Palaeontology of Queensland*, by Jack and Etheridge, is a valuable work, but needs bringing up to date. *Northmost Australia* (1922), by the late R. Logan Jack, gives an exceptionally detailed and accurate account of the northern districts and their exploration.

Queensland Nut, the edible nut of the Australian proteaceous genus *Macadamia*, with a taste like the hazel-nut.

Queen's Metal, a kind of Britannia Metal (q.v.).

Queen's Tobacco-pipe, the facetious designation of a peculiarly shaped kiln which stood by the Tobacco Warehouses of London Docks. The kiln consisted of a circular brick stalk, bulging out at the bottom to a width of five feet inside. In the interior were piled up damaged tobacco and cigars, and contraband goods, such as tobacco, cigars, tea, silk, &c., which had been smuggled, books which were attempted evasions of the Copyright Act, &c., till a sufficient quantity had accumulated, when the whole was set fire to. The total value of the goods thus destroyed was enormous; and though this wanton destruction was often censured, government till 1891 continued from time to time to fill and light the 'Queen's Pipe.' Seized goods are now distributed to inmates of public institutions or sold at 'custom sales,' though worthless stuff is still burned.

Queenstown, now COBH, a seaport of Ireland, on the south side of Great Island, in the harbour of Cork, by rail 12 miles SE. of the city of Cork and 177 SW. of Dublin. Its name of Cobh (or Cove of Cork) was changed to Queenstown to commemorate a visit of Queen Victoria in 1849, but resumed in 1920. The town is built in parallel streets on the slopes of a hill shaped like an amphitheatre. It enjoys a high reputation for its mild and salubrious climate (similar to Torquay), and is a health and bathing resort. The splendid Roman Catholic cathedral for Cloyne diocese is the principal building. Queenstown is an important port of call, the mails between Ireland and the United States being landed and taken on board here. Pop. (1926) 7070.

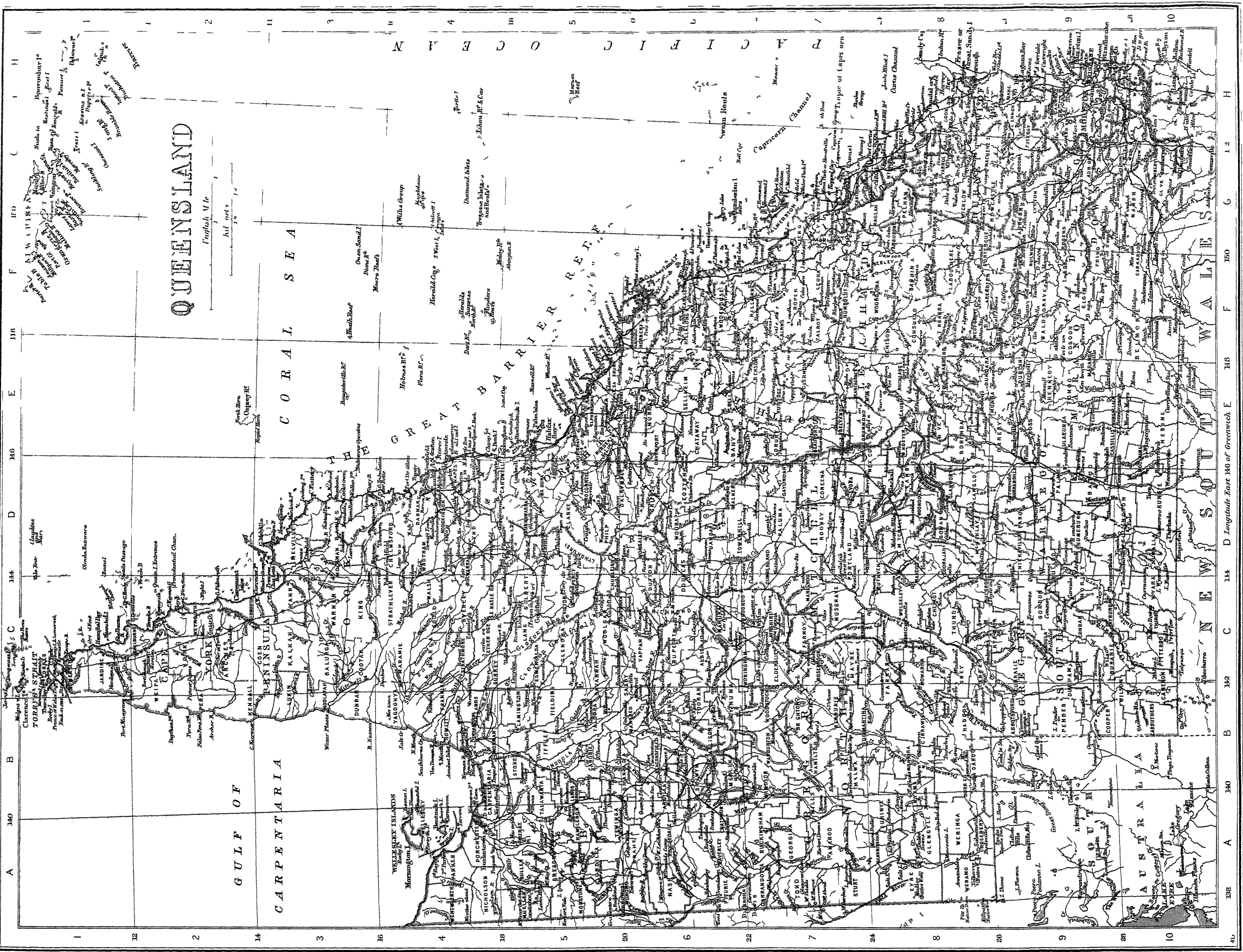
Queen's Town stands on an arm of the Klaas Smits River on a plateau (3544 feet) between the Stormberg and Kabsberg mountains, in the east of the Cape Province, 164 miles NW. of East London; pop. (1921) 12,868 (7637 natives).

Quelpart, an island 60 miles off the south coast of Korea, about 40 miles long by 17 broad. It is rock-bound and mountainous, the volcanic Mount Auckland being 6500 feet high. It has fertile soil and good timber, and is populous.

Quercitron, the name both of a dye-stuff and of the species of oak of which it is the bark. This oak (*Quercus velutina*), also called Dyer's Oak and Yellow-barked Oak, is a native of North America, one of the noblest forest trees of the United States, found in New England, and as far south as Georgia, although there only at a considerable elevation.

Querétaro, an important town of Mexico, capital of Querétaro state (see MEXICO), is charmingly situated on a hilly plateau, 6000 feet above sea-level, 153 miles by rail NW. of Mexico city. It contains a government palace, a cathedral (c. 1535), a lengthy aqueduct 90 feet high, and in the vicinity large cotton-spinning mills. Here the Emperor Maximilian (q.v.) was shot. Pop. 35,000.—The state is important agriculturally; fruit-farming is considerable. There are valuable opal mines.

Quern, a primitive mill for grinding corn, the stone of which was turned by the hand. Querns occur in the Scottish Earth-houses (q.v.), or cyclopean underground dwellings; in the lake-dwellings of Ireland, Scotland, and Switzerland; and abundantly among the remains of the Roman period in Britain and northern Europe. The most usual form of quern consists of two circular flat stones, the upper one pierced in the centre with a narrow funnel, and revolving on a wooden or metal pin inserted in the lower. The upper stone is occasionally ornamented with various devices; in the



QUEENSLAND

English Mile
Half mile

Roman period it is sometimes funnel-shaped, with grooves radiating from the centre. In using the quern, the grain was dropped with one hand into the central opening, while with the other the upper stone was revolved by means of a stick inserted in a small opening near the edge. Though as early as 1284 an effort was made by the Scottish legislature to supersede the quern by the water-mill, hand-mills were largely used in Scotland down to the beginning of the 19th century. Probably the oldest British type of quern was that fashioned from a section of oak. A less simple variety, the Pot Quern, consisted of a circular stone basin, with a hole through which the meal or flour escaped, and a smaller circular stone fitting into it, perforated with an opening through which the grain was thrown into the mill.

Quesnay, FRANÇOIS, a great French economist, was born at Mérey, near Montfort-l'Amaury, June 4, 1694, studied medicine and surgery at Paris, and in 1718 commenced practice at Mantes. He acquired a high reputation in his profession, and at his death on December 14, 1774, was first physician to the king. But the fame of the 'European Confucius,' as he was called by his followers, depends upon his speculations in political economy, in the pages of the famous *Encyclopédie* (articles 'Fermiers' and 'Grains'), and various serials. Around him and his friend, M. de Gournay, gathered the famous group of the *Économistes*, also called the Physiocratic School (q.v.; and see POLITICAL ECONOMY). Quesnay's views were systematically set forth in a little treatise, entitled *Tableaux Économiques*. Only a few copies of this work were printed about the end of the year 1758, and these have now all disappeared; yet the principles maintained by Quesnay are well known, both from the sources above mentioned, and from other treatises that have met with a better fate—his *Maximes Générales du Gouvernement Économique d'un Royaume Agricole*, the notes to which occupy more space than the text; *Le Droit Naturel*, included in the *Physiocratie* of Dupont de Nemours; *Analyse du Tableau Économique*; *Problèmes Économiques*; and *Dialogues sur le Commerce et sur les Travaux des Artisans*—collected in Ocken's edition of his *Œuvres Économiques et philosophiques* (Frankfurt, 1888).

Quesnel, PASQUIER, a French theologian, was born at Paris, July 14, 1634, and, after a distinguished course in the Sorbonne, entered the Congregation of the Oratory in 1657. So great was his reputation for learning and piety that at the age of twenty-eight he was appointed director of the Paris house of his Congregation. It was for the use of the young men under his care that he commenced the celebrated series *Réflexions Morales sur le Nouveau Testament*. In 1675 he published an edition of the works of Leo the Great, which in the notes was held to maintain Gallicanism (see GALICAN CHURCH), and was accordingly placed on the *Index*. Having refused to subscribe the formula of condemnatory of Jansenism required by a decree of 1684 from all members of the Oratory, Quesnel saw himself compelled to flee to the Low Countries, where he attached himself to Arnauld. He continued at Brussels his *Réflexions*, which were published in a complete form, with the approval of the Cardinal de Noailles, Bishop of Châlons, and ultimately Archbishop of Paris (1693-94). The Jesuits were unceasing in their malignant hostility, and Quesnel was denounced and flung into prison, but escaped to Holland. His book was finally condemned in 101 several propositions by the celebrated bull *Unigenitus* (1713). Quesnel spent his last years in Amsterdam, where he died December 2, 1719. A complete list of his many

books will be found in Moréri's *Dict. Hist.* His Letters were edited by Le Courayer (1721-23). For the later history of Jansenism, see Séché, *Les Derniers Jansénistes* (1891).

Quételet, LAMBERT ADOLPHE JACQUES, a celebrated Belgian statistician and astronomer, was born at Ghent, 22d February 1796, and studied at the lyceum of his native city. Here at eighteen he began to teach mathematics, and five years later was appointed to this chair at the Brussels Athenæum. He superintended the building of the Royal Observatory, and became its director in 1828, while in 1836 he accepted the chair of Astronomy and Geodesy at the Brussels Military School. From 1834 he was perpetual secretary of the Belgian Royal Academy. He died 17th February 1874. His scientific work lay mostly in the regions of meteorology and statistics relating to anthropology. His greatest book is *Sur l'Homme et le Développement de ses Facultés* (1835), in which he sums up his researches on the physical and intellectual qualities of man. Both in this and in later work in the *Bulletin de la Commission Centrale de Statistique*, in *l'Anthropométrie, ou Mesure des différentes Facultés de l'Homme* (1871), and in other books and papers he shows the use that may be made of the theory of probabilities, as applied to the 'average man'—at times carrying out that method so as to arrive at a mechanical precision not justified by facts, and rejected by later writers on 'mind statistics.' Quételet's contributions to meteorology, astronomy, terrestrial magnetism, &c., in the *Mémoires* and *Bulletins* of the Belgian Royal Academy, were numerous and important. See Mailly's *Essai sur la Vie et les Travaux de Quételet* (1875), and Wolowski's *Eloge* (1875).

Quetta, known locally as Shalkot, a town near the north frontier of Beluchistan, strategically important as commanding the Bolan Pass and the Pishin Valley. Since 1887 it has been connected with the Indian railway system, and since 1877 Quetta and its district have been administered by British officers; it is now the headquarters of the British agent in Beluchistan, and of a considerable military force, and is strongly fortified. The valley is fertile, well watered, and populous. Coal and petroleum were discovered in 1890. Pop. 49,000.

Quetzal. See TROGON.

Quetzalcoatl. See MEXICO.

Quevedo y Villegas, FRANCISCO GÓMEZ DE, was born at Madrid in 1580. His father was secretary to the queen, and his mother one of her ladies-in-waiting. The Quevedos were one of the old families of the Montaña, the mountain-region between Burgos and Santander. The name was no doubt derived from a place on the Besaya River, but the punning motto of the scutcheon on their house in the adjacent Toranzo valley, 'I am he who stopped—*el que vedó*—the advance of the Moors' expressed the family tradition, and, like others of the race, Quevedo was not a little proud of an ancestry that claimed a share in stemming the tide of Moslem conquest. Villegas was the name of his grandmother's family. He was left an orphan at an early age, and sent by his guardian to the university of Alcalá, where he won for himself a name for varied scholarship. He was attracted to the court of Philip III., but the issue of a duel, in which he killed his opponent, drove him in 1611 to the court of his friend the Duke of Osuna, the new viceroy of Sicily; and he, perceiving in Quevedo, poet, scholar, and bookworm as he was, the capacities of an able administrator and diplomatist, made him his right-hand man, and when promoted to the viceroyalty of Naples chose him as his minister of finance, an office in which

Quevedo's success was only equalled by his integrity.

He was involved in the fall of Osuna in 1619, and kept in prison for a time, but there was in fact nothing to tax him with except fidelity, and he was permitted to retire to La Torre de Juan Abad, a small estate of his in the Sierra Morena; he was allowed, however, to return to Madrid on the death of Philip III., and became a *persona grata* at the court of Philip IV. In 1626 he published his most important work, the *Política de Dios*, sketched probably in Italy, but put into shape during his banishment. He had seen for ten years the working of one-man rule in its worst form under the autocracy of the Duke of Lerma, and in the *Política* he made an earnest and eloquent appeal to the king to be a king, not in name only, but in fact. 'The heart of the king,' he said, 'must be in no hand but God's.' In 1628 he followed up his attack on government by favourites in an apologue entitled *Hell Reformed*. He remained, however, on friendly terms with Olivares; and if honours and high place could have tempted him he might have had anything in the minister's gift. But Quevedo had no mind to be a favourite's favourite, and all that he could be got to accept was the purely honorary title of secretary to the king. In the winter of 1639 a way presented itself to Olivares of ridding himself of a man who had an awkward knack of telling the truth in a way that brought it home to the public. A memorial in verse to the king, imploring him in respectful and loyal language to look with his own eyes to the miserable condition of his kingdom, was one day placed in his napkin on the royal table. Quevedo was denounced as the author (and no doubt he was, though his biographer, Dr de Tarsia, strives to disprove it), and was arrested at night and carried off to the convent of San Marcos at León, where, heavily ironed, he was lodged in a cell below the level of the river that washes the convent wall. Cold and damp brought on an illness from which he never recovered. He appealed to Olivares, but Olivares represented the king as implacable. In 1643, however, the count-duke fell from power, and Quevedo was free to return to Madrid, broken in health and fortune; all his property within reach had been seized, with his books and papers. After a year in Madrid he went home to La Torre; but the next year his sufferings became so acute that he had to remove to Villanueva de los Infantes for medical aid, and there he died in September 1645.

Quevedo was one of the most prolific Spanish poets, and was ranked by his contemporaries with Juan de Mena, Garcilaso, Lope, and Góngora; but he wrote no poetry for the world. Except those verses in the *Flores* of Espinosa (1605), the few pieces published in his lifetime were printed without his consent. Poetry was with him a recreation and a solace, and, according to his nephew, some of his gayest and brightest verses were written in his cell at San Marcos. His poetry therefore is for the most part of an occasional character, and to a great extent made up of what would now be called *vers de société*: sonnets, serious and satirical, form a large portion of it, and light humorous ballads and songs a still larger. His more ambitious work is at times disfigured by conceits, but that it is the work of a true poet no one will dispute. All through life he was at war with the poets of the 'Culto' School, Góngora and his followers ('the scourge of silly poets' Cervantes called him), and this perhaps may have made him chary of appearing in public as a poet; but if he took no pains to place himself upon the roll of Spanish poets, he added to it the names of Francisco de la Torre and of Luis de León, whose poems he published in 1631. His place as a dramatist is not so well defined.

About a dozen of his interludes are extant; but of his comedies, except two of which he was joint-author with Antonio de Mendoza, nothing is known. His prose is even more multifarious than his verse. His first book was a life of St Tomás de Villanueva in 1620, and his last, in 1644, a life of St Paul; and the greater part of his prose is of the same character, as is indicated by the titles: *The Patience and Constancy of Job*, *The Cradle and the Grave*, *Virtue Militant*, *The Martyrdom of Marcelo Mas-trillo*, *Instruction how to Die*, *The Introduction to Devout Life*, from St Francis de Sales, and others of the same kind. Of his political works the *Política de Dios* is the chief; but he also wrote a *Life of Marcus Brutus*, to which he was adding a second part when struck down by his last illness, a *Letter to Louis XIII.* on the war of 1635, and several shorter tracts. In 1626, at Saragossa, his brilliant picaresque novel, the *Vida del Buscón Pablos*, or, as it was called after his death, the *Gran Tocaño*, was printed, apparently, like most of his books, without his permission, and at once took its place beside *Guzmán de Alfarache*; and in 1627 his five *Visions*, four of which had been written between 1607 and 1610, and the fifth in 1621, were printed in the same way at Barcelona. His friend, Vander Hammen, printed three of them at Saragossa from his own copies, and added the *Casa de los locos de Amor* ('The Madhouse of Lovers'), which thenceforward was wrongly attributed to Quevedo, though he himself disowned it; and Vander Hammen afterwards confessed himself the author. Chiefly for the sake of the vision or apologue of *Hell Reformed*, a sort of offshoot or sequel to the *Política de Dios*, he wished the *Visions* to appear in an authorised edition at Madrid; but unluckily they were submitted for examination to the Padre Niseno, a friend of Montalván, the dramatist, who had a grudge against Quevedo, and to obtain a licence he had to consent to barbarous mutilations of his work which in some places make utter nonsense of it; and it is in this mangled shape the *Visions* have been printed ever since 1631. He added some short humorous pieces, on the affectations of the Culto school, the use of vulgar slang phrases, silly popular beliefs, and the like; and, the better to mask the design of the others, he called the volume *Juguete de la Niñez* ('Playthings'), and apologised for the whole as the work of his youth, though the principal piece was written only three years back. The vision or apologue was Quevedo's favourite form of expression; his peculiar humour and satire are nowhere better seen than in *Fortuna con Seso* ('Fortune Right'), written in 1635, but not printed till 1650, in which Fortune demonstrates by experiment that if strict logic and justice took her place mankind would have a great deal more to complain of.

There is a good edition of Quevedo's works in the *Biblioteca de Autores Españoles* (vols. xxiii. and xlvi., prose, edited by Aureliano Fernández-Guerra; vol. lxi., verse, edited by Florencio Janer). The volume of verse follows the stupid pedantic arrangement of the 17th-century editors. Editions followed his death in quick succession, but most of them are slovenly in editing, paper, and print. A handsome edition in 3 vols. 4to was issued by Foppens (Brussels, 1660-71), and well printed, if not critical ones by Ibarra (6 vols. 8vo, Madrid, 1772), by Sancha (11 vols. 8vo, Madrid, 1791-94), and by Castellanós (5 vols. 8vo, illustrated, Madrid, 1841-45); and an admirable selection (which in Quevedo's case is not only a defensible but a desirable form) was published by Villalpando (6 vols. 12mo, Madrid, 1798).

The *Sieur de la Geneste* translated the *Visions* into French in 1683, the *Hell Reformed* in 1634, and the *Vida del Buscón* (1633 or 1641). His versions are by no means faithful or accurate, but they have the advantage of being based upon Quevedo's original text. From them most of the English versions have been made—e.g. *Visions*; or *Hell's Kingdom*, by R. Croshawe (1640); *Hell Reformed*,

by E. M. (1641); *Buscon, the Witty Spaniard*, by J. Davies (1657); and the lively version of the *Visions* by Sir R. L'Estrange (1667). Captain John Stevens in 1697 translated *Fortuna con Seso*, the *Vida del Buscón*, and some shorter pieces in 1707; his translations, together with L'Estrange's *Visions*, were published in 3 vols. at Edinburgh in 1798 as *Quevedo's Works*. The best French translation of the *Vida del Buscón* is D'Hermilly's *Fin Matois* (1776). Under the title of *Voyages récréatifs de Quevedo* four of the *Visions* were very freely rendered by the Abbé Beraud in 1756. In 1648 Hans Moscherosch gave a still more free German version under the title of *Wunderliche Geschichte Philander's von Sittewald*; and in 1841 Dr Guttenstein treated the *Buscón* in much the same fashion in *Der Glückssitter*. An Italian translation of the novel by G. P. Franco appeared in 1634.

Quezaltenango, the second city of Guatemala, the capital of a department of the same name, is on the Sigüila, 70 miles W. by N. of Guatemala city. It contains an ornate church, handsome government buildings, national colleges, and a conservatorium. The houses are built of a light brown lava from the Cerro Quemado ('Burned Mountain'), which overhangs the city. Quezaltenango is the centre of the trade in native cloths, also in grain and coffee. Its port is Champerico, on the Pacific. Pop. 30,000, mostly Indians.

Quia Emptores. See FEUDALISM.

Quiberon, a small fishing-town of France (dept. Morbihan), at the extremity of a long narrow peninsula, 21 miles SW. of Vannes; pop. 3500. It was here that a body of French emigrant royalists landed from an English fleet in 1795 and endeavoured to rouse the people of Brittany and La Vendée against the Convention, but were defeated and driven into the sea by General Hoche. Nearly all the prisoners taken were shot by order of the Convention. On 20th November 1759 Hawke completely defeated a French fleet under Admiral Conflans in Quiberon Bay.

Quichua, the language of the Indians of Peru (q.v.).

Quick, ROBERT HEBERT, was born in 1832, and passed from Harrow to Trinity College, Cambridge. He took orders, held curacies in Whitechapel and Marylebone, and was appointed by his college to the vicarage of Sedbergh in 1883, but four years later resigned the living. The great interest of his life was education, and to the discussion of its theories he brought wide study, independent thought, and ripe wisdom; witness his *Essays on Educational Reformers* (1868; 2d ed. 1890). His practical knowledge of the work of teaching he had gained by service at Cranleigh, Harrow, and elsewhere. He died at Cambridge, 9th March 1891. See his *Life* by Storr (1899).

Quickens. See COUCH-GRASS.

Quicksand (*quick*—i.e. 'living' or 'moving,' and *sand*), in its usual significance, a tract of sand which, without differing much in appearance from the shore of which it forms part, remains permanently saturated with water to such an extent that it cannot support any weight. Quicksands are most often found near the mouths of large rivers. They appear only to be formed on flat shores, the substratum of which is an irregular expanse of stiff clay or other impervious formation. Pools of water are retained in the hollows, and become partially filled with sand or mud, which remains like the soft sediment in a cup of cocoa on account of the absence of drainage. The sand on a uniform shelving shore consolidates at low tide because the water which permeates it drains back freely to the sea. In narrow channels through which the configuration of the adjoining shore causes strong tidal currents to run the sand may be kept so constantly stirred up by the moving water that a quicksand results. Thus, while the summit of a sandbank rising

from a gentle slope is usually firm, the hollow margin of the bank where it meets the shore is frequently a quicksand. Quicksands are not commonly of great extent, and their danger has probably been exaggerated in the popular mind by sensational descriptions in works of fiction—e.g. in the *Bride of Lammermoor* and Wilkie Collins's *Moonstone*. Persons sink in a quicksand as in water, only more slowly; and it is probable that if the victim did not struggle he would not sink over the head, as experiments show that water containing a quantity of solid matter in suspension has its floating power increased. The belief amongst sailors that a vessel stranded on a quicksand is inevitably sucked down is unfounded.

The name quicksand is sometimes applied, especially by old writers, to the drifting sands which are carried by wind over cultivated land bordering the seashore or a desert. See DOWNS, DRIFT, DUNES, and ST MICHEL.

Quicksilver. See MERCURY.

Quietism, a name given to a tendency shown at various periods in the history of the church by many classes of mystical religious enthusiasts, of widely different beliefs, to make perfection on earth consist in a condition of uninterrupted contemplation. In this state of quiet the soul ceases to reason, to reflect either on itself or God, or to form any of the ordinary acts of faith, its sole function being passively to receive the infused heavenly light which accompanies this state of inactive contemplation. The first of modern Quietists was the Spanish priest Molinos; its most famous devotee, Madame Guyon, whose gentle but powerful influence led into the same mode of thought the saintly Fénelon. Quietism has been called the Spanish analogue of Quakerism in England, of Jansenism in France, of Pietism in Germany; but these several systems, though they had common tendencies, were also sharply distinguished. It may be said that Quietism involves but little of practical consequence, whether for good or for evil. This may and does hold true in the case of noble and lofty souls like Fénelon; but what moved Bossuet and the church generally to strong opposition was the belief that, carried to its logical conclusion, Quietism led to Antinomianism, and would inevitably prove pernicious in its effects upon the vulgar crowd of followers. From the belief of the lofty and perfect nature of the purely passive state of contemplation there is, it was held, but a single step to the fatal principle in morals, that in this sublime state of contemplation all external things become indifferent to the soul, which is thus absorbed in God; that good works, the sacraments, prayer, are not necessary, and hardly even compatible with the repose of the soul; that so complete is the self-absorption, so independent is the soul of corporeal sense, that even criminal representations and movements of the sensitive part of the soul, and even the external actions of the body, fail to affect the contemplating soul, or to impress it with their debasing influence. See BOSSUET, FÉNELON, GUYON, MOLINOS; also Heppé, *Geschichte der Quietistischen Mystik in der Kathol. Kirche* (1875).

Quigrich. See FILLAN (ST).

Quilimane, or SÃO MARTINHO DE QUILIMANE, a seaport of Portuguese East Africa, stands about 15 miles from the mouth of the river of the same name, the northern arm of the Zambezi delta.—The district of Quilimane, which is fast developing, has an area of 40,000 sq. m. and a pop. of about 1,000,000.

Quiller-Couch, SIR ARTHUR THOMAS, poet, novelist, and critical essayist, born at Polperro, 21st November 1863, was educated at Clifton and Trinity College, Oxford, where for some terms he

was a classical lecturer. After a sojourn in London he settled in 1891 in Cornwall, and became professor of English Literature at Cambridge in 1912. For several years he was a frequent contributor to the *Speaker*, but since 1887 he has been known as a popular novelist. *Dead Man's Rock*, *Troy Town*, *The Splendid Spur* secured a favourable hearing, and were followed by *The Delectable Duchy*, volumes of parodies, poems and ballads, *The Laird's Luck*, *The Westcotes*, *The White Wolf*, *Hetty Wesley* (1903). He completed R. L. Stevenson's *St Ives*. *The Oxford Book of English Verse* and other anthologies established him as the Palgrave of his time. Other publications of his are *Shakespeare's Christmas* (1905), *Poison Island* (1907), *Hocken and Hunkin* (1912), *On the Art of Writing* (1916), *Studies in Literature* (1918; another series, 1922), *Shakespeare's Workmanship* (1918), *On the Art of Reading* (1920); and with Professor Dover Wilson he edited 'The New Shakespeare.' He is well known by his pseudonym 'Q.'

Quillo'ta, a town of Chile, in the fertile valley of the Aconcagua, 13 miles from its mouth, and 25 miles by rail N.E. of Valparaíso; pop. 12,400.

Quills are the large feathers of the wings of birds, certain kinds of which have for centuries been used to make into writing-pens. Swan, goose, and turkey yield the kinds suitable for writing purposes, crow quills being used for drawing. A quill, like horn or hair, is formed of epidermic tissue, and the barrel or tube (the quill proper) has an external membrane and an internal pith. In order to get rid of these, and to bring the naturally soft state of the barrel into a condition ready for making into a pen, it requires to be dressed. This is done by heating and scraping, or (for toothpicks) by steeping in water and manipulating in hot sand. Quill-pens have almost everywhere been superseded by steel pens.

Quiloa, or KILWA, a seaport of East Africa, 190 miles S. of Zanzibar, and an outlet for the trade with Nyasaland, exports ivory, gum copal, rice, and manioc.

Quilon, a town of Southern India, in the state Travancore, is situated on the west coast, 85 miles NW. of Cape Comorin. A settlement of the ancient Syrian Church and subsequently of the St Thomas Christians, it was, under the names Coilon and Columbum, a famous mart for the trade in timber, ginger, pepper, &c. The Portuguese built a fort there in 1503, which the Dutch took in 1661. From 1803 to 1830 it was garrisoned by the British. Pop. 25,000.

Quimper, a town of France (dept. Finistère), is prettily situated on the Odet, 11 miles from its mouth, and 63 miles by rail S.E. of Brest. It has a stately and richly-carved cathedral (1239-1515); also a college, a museum, and an agricultural school. There are potteries, tanyards, sailworks, paper-mills, some manufactures of lace, and a trade in dairy-produce. Pop. 18,000.

Quin, JAMES, a celebrated actor, was born in London, of Irish descent, 24th February 1693, and made his first appearance on the stage in 1714 at Dublin. Shortly after he proceeded to London, where he was engaged at Drury Lane, but for quite inferior parts. In 1716, however, the sudden illness of a leading actor led to Quin's being called on to sustain the character of Bajazet in the once famous play of *Tamerlane*. His success was marked. Next year he exchanged Drury Lane for Rich's theatre at Lincoln's Inn Fields, where he remained as a principal actor for seventeen years. Not long after leaving the former place he had the misfortune to kill a brother-actor in a duel—a circumstance which clouded his reputation for a while. The only really fine parts which he seems to have played

were Captain Macheath in the *Beggars' Opera* and Falstaff in the *Merry Wives of Windsor*. In 1734 he returned to Drury Lane Theatre, 'on such terms,' says Cibber, 'as no hired actor had before received'; and from this date until the appearance of Garrick in 1741 he was by universal consent the first actor in England. In 1746 Quin and Garrick acted together in the *Fair Penitent*, as a contest for pre-eminence. The novelty of seeing the two rival actors in the same tragedy, and the admirable acting of Mrs Cibber as the Fair Penitent, contributed greatly to the extraordinary success of this play. The superiority of Garrick was acknowledged by the best judges; and Quin, by no means pleased at his rising fame, sarcastically declared that 'Garrick was a new religion, and that Whitefield was followed for a time, but they would all come to church again.' In 1751 he withdrew from the stage, and fixed his residence at Bath, where he died, January 21, 1766. In society Quin was also popular, his conversation being full of wit and his stories amusing though coarse. He had a most benevolent heart, and among his many kind actions he was able on one occasion to do a great service to Thomson by delivering him from arrest, and afterwards lived 'in fond intimacy' with the poet, as Johnson tells us in his *Lives of the Poets*. An anonymous *Life of Quin*, dedicated to Garrick in 1766, was reprinted in 1887, with a supplement of corrections and additional information.

Quince (*Cydonia*), a genus of trees and shrubs of the family Rosaceæ, distinguished from *Pyrus* by having many instead of two seeds in each cell, and by their very mucilaginous nature. The Common Quince (*C. oblonga*), a native of the south of Europe and temperate Asia, is a low tree, with generally tortuous branches, ovate, entire, deciduous leaves, and rather large whitish flowers, which are solitary at the extremity of young branches. The fruit is in some varieties of quince globose, in others pear-shaped, of a rich yellow or orange colour, with a strong smell. It is hard and austere, but stewed with sugar becomes extremely pleasant, and is used either by itself or to flavour apple-pies. It is also used for making marmalade, to which indeed it gives the name (Port. *marmelo*, 'quince,' from Gk. *melimelon*, literally 'honey-apple,' i.e. an apple grafted on a quince). A delicious beverage somewhat like cider is made from it. The seeds readily give out their mucilage to water, so that they turn forty or fifty times their amount of water into a substance as thick as syrup. Quince mucilage or quince gum, *Cydonin*, is allied to Bassorin, but differs from it in being readily soluble in water (see GUM). The quince was cultivated by the ancient Greeks



Flowering branch of Quince (*Cydonia oblonga*):
a, ripe fruit; b, section of do.
(Bentley and Trimen.)

used for making marmalade, to which indeed it gives the name (Port. *marmelo*, 'quince,' from Gk. *melimelon*, literally 'honey-apple,' i.e. an apple grafted on a quince). A delicious beverage somewhat like cider is made from it. The seeds readily give out their mucilage to water, so that they turn forty or fifty times their amount of water into a substance as thick as syrup. Quince mucilage or quince gum, *Cydonin*, is allied to Bassorin, but differs from it in being readily soluble in water (see GUM). The quince was cultivated by the ancient Greeks

and Romans, and is at the present day cultivated in the south of Europe, in England, and generally in temperate climates. Its principal use in Britain is a commercial sense is as a stock to bud or graft the pear on. Many choice kinds of pear succeed better when united to it than when they are grafted on the true pear-stock. In Scotland the fruit seldom ripens except on a wall. The Japanese Quince (*C. japonica*, better known as *Pyrus japonica*), a low bush, a native of Japan, but perfectly hardy in Britain, is often to be seen trained against walls, being very ornamental from the profusion of its beautiful flowers, usually a rich red in colour.

Quincey, DE. See DE QUINCEY.

Quincy, (1) city of Illinois, and capital of Adams county, is on the Mississippi River, 160 miles above St Louis and 262 by rail SW. of Chicago. It is handsomely built on a high bluff, has a large trade in grain, live-stock, &c., by river and rail, an important railway bridge crossing the river at this point. The public buildings include a fine courthouse, a medical college, several hospitals and asylums, an Episcopal cathedral, and many other churches. The city has flour-mills, machine-shops, foundries, saw- and planing-mills, and produces stoves, furniture, carriages, tobacco, bricks, &c. Pop. (1890) 31,494; (1920) 35,978.—(2) A town of Massachusetts, near the sea, and 8 miles S. of Boston. The township does shipbuilding, produces the famous Quincy granite, and was the birthplace of John Adams and John Quincy Adams. Pop. (1880) 10,570; (1920) 47,876.

Quincy, JOSIAH, an American orator and man of letters, and son of Josiah Quincy (1744–75), an eloquent advocate of the rights of the colonists, was born at Boston, 4th February 1772, graduated at Harvard in 1790, and was called to the bar in 1793. He took an active interest in politics as a leading member of the Federal party in New England, and entered congress in 1804, and became distinguished as a ready, earnest, and fervent orator. He was one of the earliest to denounce slavery; but his most remarkable speech was one in which, spurred on by the jealousy with which the old New England colonies regarded the new western states, he declared that the admission of Louisiana would be a sufficient cause for the dissolution of the union, and that, 'as it would be the right of all, so it would be the duty of some, to prepare definitely for a separation—peaceably if they could, violently if they must.' Disgusted with the triumph of the Democratic party and the war of 1812, he declined a re-election to congress, and devoted his attention for a while to agriculture. He was, however, a member of the Massachusetts legislature during most of the next ten years, served as mayor of Boston from 1823 to 1828, and in 1829 accepted the post of president of Harvard, which he held until 1845. His remaining years were spent in quiet literary work, and he died at Quincy, 1st July 1864. Among his published works are *Memoirs of his father* (1825) and of J. Q. Adams (1858), and histories of Harvard University (1840), of the Boston Athenæum (1851), and of Boston (1852). His *Speeches* were edited (1874) by his son, Edmund Quincy (1808–77), who was secretary of the American Anti-Slavery Society, and contributed largely to the Abolitionist press.

Quinet, EDGAR, French writer, was born of an old Catholic family at Bourg (Ain) on 17th February 1803. His mother, whose dreamy and emotional nature he inherited, was a Protestant. He spent great part of his boyhood in the remote and dreary solitudes of Certines near Bourg. His parents, both ardent republicans, hated the very name of Napoleon. Accordingly the boy early

made him a hero in his heart; but as he grew up a passion for liberty superseded his first love. Educated at Bourg and Lyons (1817–20), he next went to Paris; but, refusing to take the course for a soldier at the Ecole Polytechnique, he published *Les Tablettes du Juif Errant* (1823) in justification of his choice of a profession. He found the spiritual impulse that he needed in an English translation of Heider's *Philosophy of History*, which he translated into French (1825), although he had first to learn German to do so. His remarkable Introduction procured him the friendship of Cousin, at whose house he met Michelet, for fifty years the 'brother of his heart and mind.' He had already travelled in Germany, Italy, and England, when in 1829 he was appointed to a post on a government mission to Greece. The fruit of his travels was *La Grèce Moderne* (1830). A speculative republican of ideas, one of the earliest writers for the *Revue des Deux Mondes*, and a student before their time of the old Chansons de Geste, Quinet played a conspicuous part in the Paris of his day, and made his name known beyond its walls by his *Ahasvérus* (1833), a kind of spiritual imitation of the ancient mysteries, followed, after his marriage in 1834, by his less successful poems, *Napoleon* (1836) and *Prométhée* (1838), the three works forming a kind of trilogy, in which Ahasuerus represents the race, Napoleon the individual, and Prometheus the martyr. In 1838 he published his *Examen de la Vie de Jésus*, in which he shows that Strauss is too analytic to detect the true principle of life in the gospels. Quinet's deepest conviction was that religion is the very substance of humanity, that the true founders of society have been teachers like Zoroaster and Moses, and that Christianity itself is the apotheosis of personality.

Appointed in 1839 professor of foreign literature at Lyons, he began those lectures which afterwards formed his brilliant book, *Du Génie des Religions* (1842). He was now recalled to Paris to the chair of 'Littératures Méridionales' at the Collège de France, where for four years he lectured on such themes as the revolutions in Italy, the Jesuits, Ultramontanism, and Christianity in relation to the French Revolution. He joined Michelet in attacking the Jesuits, and the blow he struck the order was the deadliest it had received in France since the days of Pascal. But his lectures caused so much excitement that government suppressed them in 1846. After the Revolution, in which Quinet took his place on the barricades, he was elected to represent Ain in the National Assembly, where he voted in the Extreme Left. He was little of a practical statesman, but from the beginning he saw the traitor under the mask of Louis Napoleon. After the *coup d'état* he was exiled to Brussels, whence in 1858 he migrated to Veytaux on the shores of the Lake of Geneva. His mother had died in 1847, his wife in 1851, and soon after his exile he married the daughter of a Rumanian patriot, George Asaky. At Brussels he produced *Les Esclaves* (1853), and an edition of the chief writings of Manix de Ste Aldégonde (1856); and in Switzerland *Merlin l'Enchanteur* (2 vols. 1860), a book of enormous rhetorical power, lofty but ill-sustained thought, and dazzling imagery. Other works were *La Révolution Religieuse au XIX^e. Siècle* (1857); *Histoire de mes Idées* (1858), a delightful fragment of an autobiography; *Histoire de la Campagne de 1815* (1862); *La Révolution* (1865), demonstrating that its frightful crimes were the fruit of the suspicions and mistrust begotten by twelve centuries of despotic education. After the downfall of Napoleon III. he returned to Paris, and during the siege strove to keep aglow the expiring fire of patriotism. He sat in the National Assemblies

at Bordeaux and Versailles, and aroused great enthusiasm by his impassioned if somewhat vague orations. He died at Versailles, 27th March 1875.

Quinet's latest books were *La Création* (1870), a characteristically bold and imaginative incursion into the domain of science; *La République* (1872); and *L'Esprit Nouveau* (1874). *Le Livre de l'Éclaté* appeared posthumously. His wife published in 1870 *Mémoires d'Exil*, his *Correspondance Inédite* followed in 1877 (2 vols.) his *Lettres d'Exil à Michelet et à Divers Amis* in 1884-86 (4 vols.); and his *Lettres à sa Mère* (2 vols.) in 1885; *Lettres Inédites* in 1907. An edition of his *Œuvres Complètes* in 30 vols. (1857-79) was issued as a national tribute. See the biography by Chassin (1859); *Edgar Quinet depuis l'Exil* (1889), and *Cinquante Ans d'Amitié* (1900), by his widow; Richard Heath's *Edgar Quinet: His Early Life and Writings* (1881); also the essay by Professor Dowden in *Studies in Literature* (1878); J. Texte's *La Jeunesse de Quinet* (1897).

Quinine is an alkaloid having the chemical formula $C_{20}H_{24}N_2O_3 \cdot 3H_2O$. Along with cinchonidine, cinchonine, and a large number of other alkaloids, it is present in the bark of numerous species of cinchona and Remijia, of which these substances constitute the active medicinal principles. Good barks yield an average of 5 to 6 per cent. total alkaloids, of which one-half is quinine and cinchonidine, the other half consisting of the other alkaloids in varying proportions. Quinine is by far the most important from a medical and commercial point of view; the yield of it varies greatly, $\frac{1}{2}$ and 8 per cent. being the extremes. Quinine is obtained from the powdered bark by treating it with lime, and then extracting the mixture with alcohol, neutralising with an acid so as to obtain a salt of quinine, and finally purifying the product. In 1820 Pelletier and Caventou isolated pure quinine and demonstrated that it was the chief active ingredient in the bark. Many attempts have since been made to prepare it artificially, but without success. For the history of the introduction of the bark into Europe, and the culture of the tree in South America, India, Ceylon, and Java, see CINCHONA.

Quinine itself is not used in medicine, owing to the inconveniences arising from its insolubility in water, but many of its salts are, and three of them, the sulphate, hydrochloride, and acid hydrochloride are included in the British Pharmacopœia along with numerous preparations of cinchona-bark containing them. The sulphate is the most commonly used preparation, and it is popularly known as quinine. It occurs in small, silky, snow-white crystals, which have a purely and intensely bitter taste, and are sparingly soluble in water (1 in 800 parts); its solutions have a bluish or fluorescent colour even when very dilute. In alcohol or dilute sulphuric acid it is very soluble. The hydrochloride closely resembles the sulphate, but is much more soluble to water (1 in 36 parts), and its solutions are not fluorescent. The acid hydrochloride is more soluble still (less than 1 part water). When treated with excess of chlorine water and a few drops of ammonia solution, solutions of quinine give a clear emerald-green colour; if ferrocyanide of potassium be added, this changes to a ruby-red.

Preparations of quinine, and especially the sulphate, are very largely used in medicine. Locally applied, dilute solutions (1 or 2 per cent.) have a germicidal, antiputrefactive, and antifermentative action, hence they are used as lotions in hay-fever, diphtheria, cystitis, and similar diseases. As a bitter tonic, small doses ($\frac{1}{2}$ to 2 grains) are frequently given in general debility, atonic dyspepsia, anemia, scrofula, convalescence from acute diseases, and other conditions where tonic treatment is required. It is also of great value as an antipyretic and antiperiodic. In healthy persons it does not reduce the bodily temperature, but in typhus,

typhoid, rheumatic, and some other fevers it is extremely active in this respect. A dose of 3 to 15 grains may be given in these cases. In certain fevers it does not reduce temperature. In malarial affections of all kinds it is supreme, and at present no other known drug can compare with it in efficacy. In intermittent fevers and ague the best plan is to begin its administration about six hours before the attack is expected, and continue it in hourly doses for three or four hours until 1 to 2 grams have been given. It cuts short or aborts the recurring febrile attacks. It is also of great value as a prophylactic in persons who are exposed to the risks of malarial poisoning. In such cases 20 centigrams twice daily is usually considered a sufficient dose. Its action in malaria is due to a specific poisonous effect on the protozoan organism which is the cause of the disease.

Quinine is also given in neuralgia and in inflammations. Large doses are very apt to irritate the stomach, and sometimes produce a train of symptoms known as cinchonism. There is singing in the ears, dizziness, deafness, a feeling of fullness in the head, and disturbance of vision—all of which usually pass off without leaving any ill results. In some cases the effects are more severe, and may lead to dangerous depression and collapse, especially if the patient be already weakened by disease. Certain persons are very susceptible to the action of quinine, and suffer from cinchonism after small doses. In others skin eruptions, oedema of the face, irritation of the bladder and kidneys, and other disagreeable effects are sometimes seen. Workers in quinine-factories also occasionally suffer from skin eruptions. These accidents are, however, comparatively rare.

The sulphate of cinchonidine and sulphate of cinchonine have the same actions and uses as quinine, but are very much less used. They seem, however, to be efficacious, and are cheaper.

Quinoa (*Chenopodium Quinoa*), a valuable food-plant, a native of Chile, which much resembles some of the British species of *Chenopodium* (q.v.). In the countries in which it is indigenous it is much cultivated for its seeds, which form a principal food of the inhabitants. The meal made from some varieties of the seed has a somewhat peculiar flavour, but it is very nutritious, and is made into a kind of porridge and cakes. The plant is sometimes cultivated in British gardens for its leaves, which are a good substitute for spinach.

Quinoline, a pungent colourless liquid obtained by the distillation of bones, coal-tar, and various alkaloids. It is the base of many organic bodies, and is isomeric with Leucoline (q.v.).

Quinquagesima (Lat., 'fiftieth'), the Sunday immediately preceding Ash-Wednesday. The common explanation of the name Quinquagesima, and of Sexagesima and Septuagesima, the two preceding Sundays, is that the Sundays are, roughly speaking, about fifty, sixty, and seventy days respectively before Easter. Quinquagesima, indeed, is exactly fifty days before the Octave of Easter—i.e. Low Sunday (q.v.). But probably the terms were adopted without any intention of expressing definite numbers, and simply on a false analogy with Quadragesima, the Latin name of Lent.

Quinqueremes, vessels with five banks of oars, however arranged (see TRIEMES), may be regarded as the first-rates of the ancient navies.

Quinsy (originally *scrimancy*; Fr. *escrimancie*; from Gr. *kymanche*), known also as *Cynanche Tonsillaris* and *Tonsillitis*, or as 'inflammatory sore throat,' is an inflammatory affection of the substance of the tonsils, attended when fully developed by suppuration (see PALATE). The inflammation is seldom limited to these glands, but extends to

the uvula, the soft palate, and the pharynx. The disease usually manifests itself by difficulty in swallowing, and a sense of heat and discomfort in the throat, often amounting to considerable pain. On examination the throat at first exhibits unnatural redness, with enlargement of one or both tonsils. The uvula is enlarged and elongated, its end either dropping down into the pharynx, and, by exciting the sensation of a foreign body, giving rise to much irritation, or else adhering to one of the tonsils. The tongue is usually furred, and the pulse rapid, and there are the ordinary symptoms of that form of constitutional disturbance known as inflammatory fever. The inflammation terminates either in resolution (if the attack is not severe, and yields readily to treatment) or in suppuration, which may be detected by the occurrence of slight rigors, and by the increased softness of the enlarged tonsil. The matter which is discharged has sometimes a very fetid smell, and the fetor may be the first indication of the rupture. The pain almost entirely ceases with the discharge of matter, and recovery is then rapid. The disease usually runs a course of from three to seven days; but it may be prolonged if, as sometimes happens, the two sides are successively affected. It almost invariably terminates favourably. It is most common between the ages of fifteen and twenty-five. The ordinary exciting cause of this disease is exposure to cold, especially when the body is warm and perspiring; and certain persons (or even families) are so subject to it that slight exposure is almost sure to induce it.

The patient should remain in the house (or, in cold weather, even in bed), and should be kept on low, non-stimulating diet. At the beginning of the illness the favourite remedy is salicin or salicylate of soda in 10- or 20-grain doses with an equal quantity of bicarbonate of soda; or the latter may be taken alone and held for some time in the mouth before swallowing. Painting the outside of the neck with tincture of iodine or other counter-irritant in the early stages may help to prevent an abscess, but later should be avoided. The inside of the throat may be painted with glycerine of borax, or other mild antiseptic; and inhalations of steam containing eucalyptus oil or Friar's balsam give relief. Hot poultices to the outside of the neck or simply a warm woollen wrap are also soothing. When pus has definitely formed, as shown by redness and bulging of the tonsil or palate, opening of the abscess gives immediate relief. This should be followed by warm antiseptic gargles, such as permanganate or chlorate of potash, &c.

Quintain, an instrument used in the ancient practice of tilting on horseback with the lance. It consists of an upright post, surmounted by a cross-bar turning on a pivot, which has at one end a flat board, at the other a bag of sand. The object of the tilter is to strike the board at such speed that he will be well past before the bag of sand, as it whirls round, can hit him on the back. At Offham, in Kent, 7 miles WNW. of Maidstone, there are the remains of an old quintain; and at the May games held at St Mary Cray in Kent, near Bromley, in 1891 the quintain was also revived.

Quintal, a French weight corresponding to the English 'hundredweight,' was equal to 100 pounds (livres); on the introduction of the metrical system the same name was employed to designate a weight of 100 kilogrammes (see GRAMME). The metrical quintal, equivalent to 220 lb. avoirdupois, is thus more than twice as heavy as the old one.

Quintana, MANUEL JOSÉ (1772-1857), whose patriotic odes obtained for him the surname of the

'Spanish Tyrtæus,' was born at Madrid, studied at Salamanca, and established himself as an advocate in his native city, where his house became a resort of the advanced liberals of the time. Besides his Spanish Plutarch (*Vidas de Españoles Célebres*, 1807-34), a work which is reckoned one of the finest Spanish classics, he published one or two tragedies, and an excellent selection of Castilian poetry. On the restoration of Ferdinand VII. in 1814 Quintana's liberalism caused his imprisonment for six years; but he ultimately forsook the cause and held office.

Quintana Roo. See YUCATÁN; also MEXICO.

Quintett, or QUINTET, a musical composition for five solo voices, or for five instruments, each of which is *obligato*. Quintetts for strings have been written by Boccherini, Beethoven, Mendelssohn, Schubert, &c.; for other combinations of instruments, generally including the pianoforte, by Mozart, Schubert, Schumann, Brahms, and Raff. Of vocal quintetts, one of the most notable is that in Wagner's *Meistersinger*.

Quintilian. M. Fabius Quintilianus was born about 35 A.D. at Calagurris (*Calahorra*), in Spain, and attended in Rome the prelections of Domitius Afer, who died in 59. After this date, however, he revisited Spain, whence he returned in 68 to Rome in the train of Galba, and began to practise as a pleader in the courts, in which capacity his reputation became considerable. He was more distinguished, however, as a teacher than as a practitioner of the oratorical art, and his instructions came to be the most eagerly sought after among all his contemporaries, his pupils including Pliny the Younger and the two grand-nephews of Domitian. As a mark of this emperor's favour he was invested with the insignia and title of consul; while he also holds the distinction of being the first public teacher who benefited by the endowment of Vespasian, and received a fixed salary from the imperial exchequer. His professional career as a teacher of eloquence commenced probably about 72, but after twenty years of labour as advocate and teacher he retired into private life, and died probably soon after 96. His reputation rests securely on his great work entitled *De Institutione Oratoria Libri XII.*, a complete system of rhetoric, which he dedicates to his friend Victorius Marcellus, himself a court favourite and orator of distinction. It was written—as he tells us in his preface to his publisher Trypho—after he had ceased to be a public teacher, and was the fruit of two years' labour. In the first book he discusses the preliminary training through which a youth must pass before he can begin those studies which are requisite for the orator, and he gives us an elaborate outline of the mode in which children should be educated in the interval between the nursery and the final instructions of the grammarian. The second book treats of the first principles of rhetoric, and contains an inquiry into the essential nature of the art. The subjects of the five following books are invention and arrangement; while that of the eighth, ninth, tenth, and eleventh is style (*locutio*), with memory and delivery. Of these the eighth and ninth discuss the elements of a good style; the tenth, the practical studies requisite; the eleventh, appropriateness, memory, and delivery. The last, and in the author's view most important, book is devoted to the various requisites for the formation of a finished orator, such as his manners, his moral character, his mode of undertaking, preparing, and conducting causes, the style of eloquence most advantageous to adopt, the age at which pleading should be begun, and at which it should be left off, and other

allied topics. The entire work is remarkable for its sound critical judgments, its purity of taste, admirable form, and the perfect familiarity it exhibits with the literature of oratory. The condensed survey of Greek and Roman literature with which the tenth book commences has always been admired for its clearness, width of intellectual sympathy, and vigour. Quintilian's own style is excellent, for though he is not free from the love of florid ornament and poetic metaphor characteristic of his age, he was saved from its extremes by his good sense, which refused to sacrifice clearness and simplicity to effect, and still more, by his wholesome admiration for Cicero. The style of Seneca he discusses almost as fully as he does that of Cicero, denouncing it as a dangerous model for the orator to follow. He makes an obvious effort to be fair in balancing his praise and blame, but a careful reader detects an undertone of dislike, whether to Seneca's philosophy or his person. Nineteen longer and 145 shorter *Declamations* (ed. C. Ritter, 1885), which have been ascribed to him, are now believed to be spurious, as they evidently belong to different authors, and even different epochs.

There are editions by Burmann (1720), Spalding, completed by Zumpt and Bonnell (1798-1834), the last volume (vi.) containing a lexicon; Halm (1868-69); Meister (1886-87); Colson (bk. i., 1924). There are English translations by Guthrie (1805), Watson (1855-56), and Butler (with text, 1921-24).

Quintus Curtius. See CURTIUS.

Quipu, the language of knotted cords which was used by the Incas of Peru before the conquest of their country by the Spaniards. A series of knotted strings was fastened at one end to a stout cord; the other ends hung free. This was used for the purpose of calculation, recording numbers and apparently dates. The colours of the strings and the order of their arrangement, the character and number of the knots, their distance from the cord to which they were connected, and the methods of their interlacing were the principal elements in this 'knotty language.' They have been found in use by present-day shepherds to keep account of their flocks. A similar custom occurs in Central Celebes. See Nordenskiöld, *Comparative Ethnographical Studies*, vol. vi. (Göteborg, 1925-26).

Quirinus. See MARS.—The QUIRINAL (Lat. *Collis Quirinalis*) is one of the seven hills of ancient Rome (q.v.), and, next to the Palatine and Capitoline, the oldest and most famous quarter of the city. For *Quirites* also, see ROME, CURES.

Quiscalus. See GRACKLE.

Qui Tam actions are actions so called in the law of England from the first words of the old form of declaration by which informers sue for penalties, the plaintiff describing himself as suing as well for the crown as for himself, the penalty being divided between himself and the crown.

Quitch. See COUCH-GRASS.

Quito, the capital of Ecuador and of the province of Pichincha, lies 9351 feet above the sea in 0° 10' S. lat., on the east side of the great plateau of Quito, at the foot of the volcano of Pichincha (q.v.). It has been connected by rail with Guayaquil since 1908. Its site, cut up with numerous ravines, is very uneven; but the streets are laid out regularly at right angles, plunging into and scaling the sides of the valleys which come in their course. One of them is arched over. The appearance of Quito is very picturesque, and its beautiful environment of mountains, together with its clear, healthy, and temperate climate maintaining an eternal spring, renders it one of the most charming cities of South America; yet the

abrupt changes from the hot sun of midday to the chills of evening are found trying by some. The chief edifices are built of stone, the others of adobes or sun-dried bricks covered with tiles. In the great square (Plaza Mayor) stand the quaint cathedral, with its green-tiled dome, the archbishop's palace, the Jesuits' church, the municipal building, and the capitol, built of brick and stucco, with wine-shops on the ground-floor and the two halls of congress on the third story. Other public buildings of the city include the Central University (18th century; reorganised in 1895), a seminary, an observatory, museums, a theatre, libraries, hospitals, a score of churches, and many religious houses. Most of these last are in a very dilapidated condition, though they still retain their lands and revenues; and the offerings of the faithful, who are nearly all Indians, are as constant as ever. One of them (San Francisco) is among the largest in the world. Indeed, Quito is the paradise of priests, and the bells are jangling all day long; for Ecuador has been the most faithful province of the pope, and was the last state in the world to recognise the unity of Italy and the condition of affairs that resulted from the occupation of Rome. The manufactures include cottons, woollens, rugs, carpets, saddles, lace, and beer; the drying of humming-bird skins, the copying of religious paintings, and the production of images of the Virgin and of saints rank as important industries. Founded in 1534, Quito has suffered frequently from earthquakes (especially in 1797 and 1854) and from revolutions (as in 1877 and 1883). Pop. about 100,000, mainly Indians and mestizos. See B. Niles, *Casual Wanderings in Ecuador* (1923).

Quit Rent, a term used to denote various nominal rents; properly speaking, a quit rent is a rent reserved in lieu of all services, because on paying it the holder of the land goes quit and free. In old records it is called white rent, because it was paid in silver money, as distinguished from corn rents. The Conveyancing Act, 1881, empowers an owner of land to redeem any quit rent to which it may be subject.

Quoad Sacra. See PARISH.

Quod ubique. See CATHOLIC CHURCH.

Quoits, a game still popular in many districts of Great Britain, derived, perhaps, from the ancient game of throwing the *discus*. The discus was a circular plate of stone or metal, 10 to 12 inches in diameter, and was held by its farther edge with the right hand, and thrown at an angle of 45°, so as to give it as great a range as possible; the player who threw it farthest was the winner. The modern game of quoits differs very considerably from this. A quoit is a slightly concave ring of iron, generally about 8 inches in external diameter and between 1 and 2 inches in breadth; the weight accordingly varies a good deal, but may in any match be fixed beforehand. The mode of playing is as follows: Two pins, or 'hobs,' are driven into the ground from 18 to 21 yards apart; and the players, who are divided into two parties, stand at one hob, and in regular succession throw their quoits (of which each player has two) as near to the other hob as they can. The points are counted as in bowls or in curling. To facilitate the sticking of the quoits at the point where they strike the ground a flat circle of clay—about 1 or 2 inches in thickness, and 1½ feet in radius—is placed round each hob; this requires to be kept moist. The quoit, when thrown, is given a whirling motion, which causes it to strike the ground with its edge. Players acquire such dexterity in this game that they can very frequently 'ring' their quoit—that is, land it so that the quoit surrounds the hob.

Quorn, or QUORNDON, a village of Leicestershire, 2½ miles SE. of Loughborough, gives name to a celebrated kennel (and hunt) of foxhounds. See FOXHUNTING.

Quorra. See NIGER.

Quorum is a legal term denoting a certain specified number out of a larger number as entitled or bound to act for certain purposes. Thus, in statutes appointing commissioners or trustees of a public work, it is usual to name a certain number of the whole body as sufficient to discharge the business when it may be inconvenient for all to attend. For the origin of the expression, see JUSTICE OF THE PEACE.

Quotidian Fever. See MALARIA.

Quo Warranto, the title of a writ by which a person or corporate body is summoned to show by what warrant a particular franchise or office is claimed. In the reigns of Charles II. and James II. the writ was used oppressively, for the purpose of depriving cities and boroughs of their liberties. At the present day an information in the nature of a Quo Warranto may be filed, with the leave of the court; disputed questions in regard to municipal offices, &c., are sometimes brought to trial in this way. The information is now regarded as a form of civil process.

Qurân. See KORAN.

R



the eighteenth letter of our alphabet, descends from the twentieth letter of the ancient Semitic alphabet, named in Hebrew *rēsh*, and in Syriac *rīsh*. The meaning of the name is probably 'head' (Hebrew *rōsh*, Syriac *rīsh*, Arabic *rās*). The earliest known form is Δ . It

is curious that most of the early Semitic forms of the letter, including the Hebrew \aleph , have a very close resemblance to the form of D.

The Greeks adopted the letter in the upright form ρ , which occurs in Phœnician inscriptions. With the reversed direction of the writing this became β , afterwards rounded into P, whence the P, ρ , of printed Greek. The Greek name *rhō* is probably to be accounted for by the jingling sequence *α, ο, π, ρ, ρ, ρ*, into which the names of this and the three preceding letters were converted in the recitation of the alphabet.

The variety of the Greek alphabet adopted by the Romans had the letter in the form ρ , which was altered into R to prevent confusion with P. The Roman R was preserved with little alteration in the later varieties of the capital letter; but it is not easily written distinctly on a small scale, and in mediæval minuscule script it assumed a great variety of shapes, all very unlike their original. Our modern r descends from a very early type, in which the right-hand part of the letter was reduced to a curl at the top. An English form of the 8th century was n, hardly distinguishable from n (=n). In the Hiberno-Saxon hand the stem was continued below the line, ρ . Other common mediæval forms were γ , whence our

ordinary script γ , and γ , from which descends

the form γ , common in English writing in the

17th and early 18th centuries, and still used in German script. In mediæval handwriting the r before a vowel was often omitted, the vowel being written above the line, and other abbreviated modes of writing combinations of r with other letters were frequent. The sound expressed by the letter has usually been some variety of the voiced point-open consonant, i.e. a voiced sound produced by friction of the breath against the tip of the tongue in contact with the palate. This sound is often trilled, i.e. uttered with vibration of the tip of the tongue. The ancient designation of R as *littera canina* seems to indicate that the Latin r was trilled; the trill is normally absent in English, but is common in Scottish pronunciation. In several languages individual speakers substitute for the normal r sound another sound of somewhat similar acoustic effect, but very different formation, produced between the back of the tongue and the uvula. This 'uvular r,' one variety of which is the 'Northumbrian burr,' has of late years become the normal pronunciation of r in France and in a great part of Germany. A voiceless r sound exists in some languages, e.g. in the usual pronunciation of

the French *quatre, ancre*; in Welsh this is now written *rh*. In English the written r after a vowel in the same syllable is, in standard pronunciation (though not in some dialects), rendered under certain conditions by a voice-glide, and under other conditions is not sounded; but when final it resumes its consonantal sound before a word beginning with a vowel.

In Bohemian the character *ř* represents a palatal modification of the r sound. This was originally the value of the Polish combination *rz*, which is now pronounced *zh* (= s in *vision*).

The Roman name of the letter, *er*, is retained in the modern languages, but has become disyllabic in Italian and Spanish (*erre*). The English pronunciation of the name would be expressed in modern orthography by *ar*, the sound of *er* having undergone the same change as in *clerk, sergeant, Hertford*.

Ra. See EGYPT (*Religion*).

Raab (Hung. *Győr*), a town of Hungary, stands on an extensive plain at the confluence of the Raab and the Little Danube, a branch of the great river of that name, 67 miles WNW. of Budapest. It contains numerous religious edifices, among which is a beautiful cathedral. Pop. 50,000.

Raasay, one of the Inner Hebrides, lies between the Isle of Skye and the mainland of Scotland, and belongs to Inverness-shire. It is 13 miles in length from north to south, $3\frac{1}{2}$ miles in greatest breadth, and 24 sq. m. in area. The western side of the island is bare and uninteresting. On the eastern and more sheltered side there is some striking scenery. Dun Caan (1456 feet) is the highest point, and Brochel Castle, on the east shore—now a mere ruin—the chief object of interest. Iron mines (Upper Lias) were opened in 1911. Pop. 300.

Rabanus Maurus (or more correctly *Hrabanus*), a great Carolingian churchman and divine, was born of noble parents at Mainz about 776, and had his education at Fulda and at Tours under Alcuin, who surnamed him Maurus, after the favourite disciple of St Benedict. He was next placed at the head of his school at Fulda, where he trained scholars like Walafrid Strabo and Otfrid of Weissenburg. In 822 he became abbot, but resigned in 842 to retire to the neighbouring cloister of Petersberg, whence in 847 he was called to the archbishopric of Mainz. The chief event of his reign was his severity against the too logical monk Gottschalk for his views on predestination. He died in 856. His writings show erudition but little originality. They include Commentaries on the Old Testament, St Matthew, and St Paul's Epistles, homilies, doctrinal treatises, hymns, and a Latin-German glossary to the Bible (Graff's *Diutiskia*, vol. iii.). Among these are *De Institutione Clericorum*, and *De Universo Libri xxi.*, sive *Etymologiarum Opus*, a kind of encyclopædia of its time.

His *Opera Omnia* (so called) fill vols. cvii.-cxii. of Migne's *Patrologia Cursus Completus*—a reprint of the Cologne edition of Colvenerius (6 vols. folio, 1627), to which are prefaced the *Vives* by his disciple Rudolphus and by Joannes Trithemius. See the studies by Spengler (1856), Köhler (1870), and Richter (1882).

Tame rabbits are varieties of the wild form, modified by the artificial selection usually associated with domestication. Among the more important breeds are the 'silver rabbits' with bluish-gray silvery fur, the 'Russian rabbits' with gray body and brown head, the 'Angora rabbits' with short ears and very long silken fur. Albinos with white hair and red eyes are common. The domestic varieties, especially the last, are much less hardy than those which run wild. Some remarkable modifications have occurred among rabbits in which cross-breeding has been prevented by insulation. Thus there are local varieties in the Falkland Islands and in Jamaica. Most remarkable are the dwarf-rabbits of Porto Santo, one of the Madeiras, which are said to be the descendants of a

single litter left there in the beginning of the 15th century. That these are so much modified that they do not breed with other rabbits has been asserted, but is now denied.

In regard to the keeping of tame rabbits, it may be noticed that they eat almost any kind of vegetable food; the coarser blades of cabbages, turnip-leaves, celery-tops, carrot-tops, and other produce of the garden, not suitable for human use, are readily consumed by them, as well as chickweed, sow-thistle, dandelion, and many other weeds. When the rabbit-enclosure contains a plot of grass and clover it affords them an important part of their food. Great care is requisite to keep their boxes dry, neglect of which, and a too exclusive feeding with green and succulent food, cause diseases, often fatal, particularly to the young. Dry food, such as corn, ought to be frequently given; and aromatic herbs, such as parsley, thyme, and milfoil, not only tend to preserve the health of rabbits, but to improve the flavour of their flesh. It is usual to give no water to tame rabbits; but it is better to supply them regularly with it, and the females need it after producing young. See books by 'Cuniculus' (1889), Edwards (2d ed. 1887), Knight (1889), Rayson (2d ed. 1889), J. Simpson (1893), and J. E. Harting (1898).

It is believed by many that Spain was the original home of rabbits, and that they were, until comparatively recent times, confined to the Mediterranean region. It is certain that in Spain, and still more in the Balearic Isles, they did tremendous havoc in the 1st century B.C.; still it seems that bones of rabbits have been found in Quaternary deposits north of the Alps. Rabbits spread very rapidly. In some parts of Scotland they were hardly known in the 18th century, though elsewhere they abounded. Their introduction into Ireland is also recent. They are not able to stand great cold, and are therefore absent from Scandinavia and North Russia. The most signal instance of their rapid distribution is to be found in their present abundance in Australia and New Zealand, into the latter of which countries seven rabbits were first turned out near Invercargill, apparently about 1860. As to Australia, the agent-general for New South Wales writes (1891) that 'this department is unable to state the exact date when rabbits were introduced into the colony, but it is certain that they existed about forty years ago.' And according to the *Victorian Year Book* for 1887-88, tame rabbits were kept in Victoria during the early years of the colony (towards the middle of the 19th century); but rabbits were first turned out on an extensive scale by a landed proprietor in the western district. They bred rapidly, and for several years there was a demand for couples for breeding purposes in most districts, nobody guessing what a plague they were to become. In both Australia and New Zealand they have spread and multiplied to an extent which seriously affects the prosperity of farmers and rearers of stock. The climate and soil are suitable and their natural enemies are few. Many endeavours have been made to exterminate them, but without success. Trapping, poisoning, and hunting them down produce only a temporary reduction of numbers. Pasteur proposed to infect them with fowl-cholera, and to some extent this has been tried. It has been lately suggested that only the females should be killed, so that the predominance of males might result in unnatural conditions fatal to continued existence. Most practicable at present is the use of wire netting. Thus, if the pools where the rabbits drink are surrounded with netting, thousands die of thirst in a short time. California and Idaho have also suffered severely from the rabbit pest.

Besides eating up crops and pasture, rabbits often do great harm by barking young trees, and also by their burrowing. On the other hand, the white flesh of rabbits forms excellent food, the skin and the fur are much used, and, as Gilbert White noticed, rabbits by their nibbling make 'incomparably the finest turf.' The preserving of rabbits in tins is in some places an important industry. Rabbits are not technically game (see *GAME-LAWS*). The old English name for the rabbit is *cony*, but the cony of Scripture belongs to the genus *Hyrax*, anatomically a very different animal. See *HARE*, *RODENTS*.

RABBIT-SKINS have a regular commercial value in consequence of the hair being well adapted for felting purposes; its chief use is in making the bodies of felt hats and imitations of several of the more valuable furs. See *FELT*, *FURS*, *HATS*.

Rabelais, FRANÇOIS. According to the statements of those who wrote while his tomb was still standing with his name and age upon it, who had access to the church register of Meudon, and who visited the place of his birth while his memory yet lingered, in order to collect every fact that could be found concerning him, this great humorist was born in the year 1483. His father, proprietor of a vineyard called La Devinière, was an apothecary in the town of Chinon, where his house, which afterwards became a *cabaret*, is still shown. François was the youngest of five sons. Of his elder brothers nothing whatever is known. Bishop Huet, annotator of Rabelais, found an old woman of the name in a village near Chinon, and gathered a local tradition that the last male representative of the family, an apothecary, had died at Chinon in great poverty.

At the age of nine the boy was sent to the convent of Seuilly, near his father's estate. 'There are some mothers,' he wrote years afterwards, 'who cannot bear to keep their children about the house more than nine, or, still oftener, seven years. By only putting a shirt over their frocks and cutting off a little hair from the crown of their heads, and saying certain magical words, they transpose them into birds—i.e. put them into monasteries and make monks of them.' He was, in fact, made a monk at the age of nine, and remained a monk all the best years of his life. One result was that, when he came out again into the world and began to write, he wrote of the world as he remembered it—of Touraine and the Tourangeaux, the stories and songs of the drinkers, the gossip of the women, the merriment and happiness—the wild, the careless happiness—of the whole.

After some time at Seuilly, the boy was transferred to the convent of La Baumette, near Angers. Here was a school founded by King René of Anjou in the year 1464, for providing an education on more liberal principles than those of the old method. At this school he founded a life-long friendship with the three illustrious Du Bellay brothers. Nothing is known about the range of his scholarship while at La Baumette. We may, however, very well understand, from the continued protection which Jean du Bellay (afterwards Cardinal) extended to him, that as a young man he had shown promise and proved his abilities. At the close of his course he took the step for which, no doubt, he had been long prepared—i.e. he became a novice of the Franciscan order. It has been asked why he took a step for which he was eminently unfitted; why he became a Franciscan, one of the order which professed to despise learning, and why he exchanged his own smiling country for the barren heaths of La Vendée. The answer seems obvious: for a poor lad the church offered in some form or other, either as priest, monk, or servant of the cathedral or monastery, a livelihood that was certain although humble. It is manifest that the

youngest son of the Chinon apothecary could not expect a certain livelihood, with the power of continuing his studies, in any other occupation. He became a monk and entered the Franciscan convent of Fontenay le Comte simply because this was the convent where some kindly interest found him a place. It must not be supposed that the monasteries were at that or at any period willing to accept any lad who wanted to exchange a life of servitude and hard labour for one of ease. Not at all. Interest was required for the admission of a boy: in some houses he must be of good birth, in others he must have shown abilities beyond the common. Rabelais, in fact, had no choice at all but to become a monk if he could get into some convent, and he entered the house of Fontenay le Comte because it was the only convent which offered to receive him.

By this time the Franciscan contempt of learning had undergone some modification. It does not appear that Rabelais was hindered by the brethren in his studies. On the contrary, he had access to a large and well-furnished library, whether outside the House or in it is not known, and he read all the books that he could get; acquiring Greek, Hebrew, and Arabic; studying all the Latin authors within his reach, French of the 13th and 14th centuries, books of medicine, astronomy, botany, mathematics—everything in the omnivorous fashion of his time, when every scholar with a good memory wished to become a *Doctor Universalis*. He had companions in his ardour for learning, especially one Pierre Amy, a brother-monk. Also, the rules of the Franciscans, far less severe than those of the Cistercians, permitted the monks to go outside the house, and in the little town of Fontenay Rabelais found a friend, André Tiraqueau, lieutenant-general of the bailiwick, lawyer, scholar, and writer. Also his early and life-long friend, Geoffroy d'Estissac, Bishop of Maillezais, lived chiefly in his chateau of Ermenaud, close to Fontenay.

Many silly stories have been attributed to Rabelais in these years. They all tend to show him in the light of a monkey, mischievous and impish. We may dismiss them as childish; not, however, that we are to regard him—now a priest—as a person grave and serious, charged with the sense of his sacred responsibilities and his vows. Rabelais was at all times a mirthful man, more given to laughter than to tears, and if he did not play silly tricks upon the brethren he certainly laughed at them. We find him corresponding with the great Budé, as one scholar with another. He is on terms of intimacy with Tiraqueau and his brethren learned in the law. He is on terms of friendship with Bishop D'Estissac. Evidently a monk of repute and distinction, he is far above the heads of his nameless and obscure brethren of the monastery. Then we hear of trouble and persecution. The Franciscan jealousy of the old learning has been transformed into jealousy of the new learning. The brothers take their books away from Rabelais and Amy—perhaps lay the pair by the heels in the convent prison.

When they were released a loathing of the convent fell upon these two scholars. What to do? They opened the Book of Oracles—Virgil—and chanced upon the following line:

Hæu! fuge crudeles terras, fuge litus avarum!

What could this mean but a direct injunction to escape? They obeyed the oracle and fled—they ran away. Rabelais, returning to the world, was past forty years of age. He seems to have sought the protection of his friend Bishop D'Estissac, by whom he was received. Through him, or perhaps through the kind offices of Cardinal Du Bellay, he obtained the pope's permission to pass from the

Franciscan to the Benedictine order. But he was in no hurry to enter another cloister. He remained at Ligugé with the bishop for six years. It is said that during this period he took a small country living, but this is doubtful. Most likely he passed the whole time in study. Perhaps he paid visits to Paris and Bourges. He made the acquaintance of Marot, who wrote a sonnet for him. His reading had now ceased to be encyclopædic: its special aims may be inferred from the fact that on the 17th day of September 1530 he entered the university of Montpellier as a student. That he was already known as a scholar is also proved by the fact that two months afterwards he was excused the undergraduate course of three years, was admitted to the Bachelor's degree, and allowed to lecture on Hippocrates and Galen. He dissected publicly before the students, and left the university in the year 1532, returning in 1537 to take the Doctor's degree.

In 1532 Rabelais went to Lyons to get his first book, *Hippocratis et Galeni libri aliquot*, published. He remained there as physician to the hospital. At this time Lyons was as great an intellectual centre as Edinburgh about the beginning of the 19th century. Here the great printer Gryphe had his workshop, and issued no fewer than three hundred books, including the Latin Bible of 1550, remarkable for its correctness and for the beauty of its type, and the commentaries of the unfortunate scholar Dolet, in two folios of 1800 columns each, and only eight errata for the whole work. Round this printer was gathered a company of scholars and poets called the *Société Angélique*, a company of broad thought and advanced opinions. As regards religious opinions, it must be remembered that to the scholars of that period the Christian religion meant little more than the Roman ritual and the Roman discipline. They had no idea of Christianity apart from the superstitions they derided. It is not fair to call them atheists: they had adopted the vague but hopeful agnosticism of Cicero: they would not, being scholars, wholly die: they would, after death, be allowed still to watch the advance of learning. Men, for example, who were physicists, like Rabelais, would worship the Creator of the vast and wonderful cosmos. Dolet represents the scholars of Lyons, Despériers the poets, Rabelais the men of science. All three despised and hated the Church of Rome. Two of them felt the heavy hand of the church in life, the third after death. Dolet was strangled and burned at the stake; Despériers, starving and despairing, fell upon his sword; Rabelais, dying peacefully, has been assailed ever since as a buffoon and a reveller in foulness and filth.

It was at Lyons that Rabelais began the famous book, or series of books, by which he will for ever be remembered. In the year 1532 he brought out *The Great and Inestimable Chronicles of the Grand and Enormous Giant Gargantua*. Every Tourangeau knew this good giant. Rabelais had heard about him while a child. It was he who set up the dolmen at Poitiers and the *pierre couverte* of Saumur. When he scraped the mud from his shoes he made hills, which may still be seen. He drank at a ford and swallowed six bullocks, a loaded cart, and the driver. Once he swallowed a ship laden with gunpowder. In fact, Rabelais, who never invented anything, but embellished and adorned everything, did not invent Gargantua. In the sequel or second book, *Pantagruel*, the author departed from his first plan: he no longer wrote pure burlesque: serious ideas are set forth side by side with overwhelming nonsense, and the reader steps from unbridled fancy into regions of sense and wisdom. In order to make the first book correspond with the second, Rabelais

wrote it all over again, with the result that it is fuller of sense and wisdom than the second. Both books had a prodigious success. They were published under the anagram of Alcofribas Nasier.

At the same time he began his almanac, which he continued for eighteen years. These are all lost except a few fragments.

In 1534 he accompanied his old friend and patron, Cardinal Du Bellay, to Rome. He promised himself great things on this expedition. He would visit the Italian scholars; he would find new plants; he would dig and discover great things; he would study the topography of Rome. In the end he returned with Marliani's book on Rome, which he translated and published with notes of his own.

In 1535 new editions appeared of the *Gargantua* and *Pantagruel*. In 1536 Rabelais again went to Rome. Some of his letters from Italy to his friend Bishop d'Estissac have been preserved. He obtained absolution from the pope for having forgotten to go into a Benedictine house, for neglecting his Hours, and for practising medicine. He also received permission to go into any Benedictine house which would receive him—time being of course taken to find one. He was enabled to hold ecclesiastical offices, to practise medicine without fees, without the knife, and without fire. He now had nothing to fear from his old enemies of Fontenay le Comte. He amused himself in Italy with collecting curious plants—to Rabelais France first, and England next, owes the melon, artichoke, and carnation: he sent seeds to the bishop and bought curiosities for him.

In 1537 he is found in Paris at the great literary banquet held in honour of Dolet's escape from a charge of murder rising out of accidental homicide. From 1537 to 1539 he resided and taught at Montpellier. In the latter year he went to Lyons, where he stayed a short time only, removing to Paris in 1540. Once more he made things right with the church, obtaining absolution for not having found a Benedictine house, and permission to enter the Collegiate Chapter of St Maur des Fossés instead of a convent, and to hold any benefices which might be conferred upon him. In 1543 he was at Symphorien near Lyons—where he witnessed the death of Guillaume du Bellay—at Chinon, Ligngé, and Angers.

During this time he was writing his third book. It was a dangerous time for heretics. A whisper of heresy at the outset might not only ruin the book, but also bring the author to the stake. He caused the first two books to be read to the king, who was so pleased with them that he gave permission for a new edition, and granted a license for the publication of the third. Rabelais did not avail himself of the permission for a new edition. Already many impieties had been pointed out which he declared were due to the printers, interpolations, misreadings, and so forth. Best not to bring out a new edition. But he printed his third book. This was in 1546.

In 1547 the old king died, and a reaction against liberty of thought immediately began. They attacked Rabelais. Not content with finding impieties in the first three books, they printed a thing which they called his fourth book. Rabelais fled: he went to Metz, where he practised medicine. Cardinal Du Bellay, himself suspected of liberal tendencies, withdrew to Rome, whither he called Rabelais. On the birth of King Henry's eldest son great rejoicings were held in Rome. Rabelais wrote an account of these, and sent the little book to the Cardinal De Lorraine, a stroke of policy which enabled him to return, and gave him the living of Meudon.

From both sides, Catholic and Protestant, cries came that his book should be suppressed and the author burned. Nothing, however, was done. But

Rabelais did not dare to proceed further with the fourth book than the eleventh chapter. There it broke short off in 1549. The author, now growing old, lived quietly at his cure of Mendon, preached, catechised the children, and led an exemplary life. Early in 1553, a fortnight before the parliament allowed the sale of the book, he resigned his living and went to Paris. Here, in April of that year, he died. It was in the Rue des Jardins, parish of St Paul. They buried him at the foot of a tree, on which his name was carved. The tree was cut down a hundred years afterwards. Ten years after his death appeared the fifth and last book, which had been left in MS., unfinished and without the author's corrections.

These are the facts which have been gleaned concerning the life of this great humorist. The riotous license of his mirth, which is restrained neither by decency nor by reverence, has made him as many enemies as his wisdom has made him friends. This fault, which Rabelais shares with many writers of his age—our own dramatists were quite as bad—has been made the most of by his enemies. We may grant the blot: yet it is not inherent in the book; it is not woven in the web: and when it is removed there remains the most astonishing treasury of wit, wisdom, common-sense, and satire that the world has ever seen. All, however, assumes the form of allegory: those who have no taste for allegory cannot appreciate Rabelais.

Of the many modern editions of Rabelais may be named that by Ch. Marty-Laveaux (6 vols. 1868-1902). See Urquhart and Motteux's English translation (1653-94, reprinted 1892, 1900, 1921); W. F. Smith's trans. (1893); Sir Walter Besant's *Rabelais* (Blackwood's Foreign series, 1879), and his *Readings in Rabelais* (1881); A. Tilley's *Rabelais* (1907). French monographs include works by Gebhart (1876, 1893); Fleury (1877); Stapfer (1889); Heulhard, *Rabelais: ses Voyages en Italie, son Exil à Metz* (1891); René Millet, *Rabelais* ('Grands Écrivains', 1893); Bertrand, *Rabelais à Lyon* (1894); Coutaud, *La Pédagogie de Rabelais* (1899); Dr Brémond, *Rabelais Médecin* (3 vols. 1877-1901). In 1903 the *Société des Études Rabelaisiennes* began its *Revue*.

Rabies. See HYDROPHOBIA.

Rabutin, or BUSSY-RABUTIN. See SÉVIGNÉ (MADAME DE).

Racahout, a farinaceous food prepared from certain acorns. See OAK.

Racalmuto, a town of South Sicily, 13 miles by rail N.E. of Girgenti. Pop. 13,600.

Racconigi, a town of North Italy, 24 miles by rail S. of Turin, with a royal palace built in 1570; the park was laid out in 1755 from designs by Le Notre. Pop. 9000.

Raccoon, or RACCOON (*Procyon*), a genus of the Bear group (Arctidea), with four premolar and



Raccoon (*Procyon lotor*).

two molar teeth on each jaw; like other Arctoids, it is plantigrade, and has no retractile claws. There

are certainly two, possibly three, but not more than four species of raccoon, which are restricted to the American continent. In North America we meet with the 'coon' (*Procyon lotor*), so called from the habit of soaking its food in water. This animal prefers open woods, and is a good climber, making its home in trees. The raccoons, however, descend to the ground to search for their food, which consists chiefly of aquatic animals, fish, crayfish, and various shellfish; they will also feed upon corn. These animals are among the most strictly nocturnal of mammals; they hibernate during the winter. In South America occurs *P. cancrivorus*, and a well-marked variety which may be a distinct species, and has been named *P. nigripes* on account of its dark-coloured feet. For the Raccoon Dog, see DOG.

Race. See BREED, SPECIES, ETHNOLOGY.

Race, CAPE. See NEWFOUNDLAND.

Racehorse. See HORSE, HORSERACING.

Raceme. See INFLORESCENCE.

Racemic Acid. See TARTARIC ACID.

Rachel, ÉLISA (properly ÉLISA RACHEL FÉLIX), a great tragic actress, was born of poor itinerant Jewish parents at Mumpf, in the Swiss canton of Aargau, 8th February 1821. At last the family settled at Lyons, and here Rachel and her sister Sarah used to sing for chance gratuities in the streets and cafés. About 1830 the household was transferred to Paris, and here Étienne Choron gave her her first lessons in singing, Saint Aulaire in declamation; but later it was Samson from whom she learned most. Mademoiselle Mars divined her genius, but it was not till Véron and Jules Janin had written glowing criticisms that she took the playgoing world of Paris by storm. She made her first appearance at the Gymnase in the *Vendéenne* in 1837 with but moderate success, but on 12th June 1838 she appeared as Camille in *Les Horaces* at the Théâtre Français. From this time forward, in the great parts supplied by the classic masterpieces of Corneille, Racine, and Voltaire, she shone without a rival; her fame may be said to have culminated in her appearance as Phèdre in Racine's tragedy in 1843. In *Adrienne Lecouvreur*, a piece expressly written for her by MM. Legouvé and Scribe, she had also immense success, though in other more modern parts her popularity was somewhat less. The *furor* excited in Paris in 1848 by her public recitation of the *Marseillaise* will continue to connect her name with the history of the Revolution. In 1849 she made the tour of the French provinces; before or afterwards she also visited Belgium, London—where Charlotte Brontë saw her—Berlin, and St Petersburg, everywhere meeting with enthusiastic applause. Her health now began to fail; in 1855, in the course of a professional visit to America, it altogether gave way, and she returned utterly prostrated. A residence at Cairo failed to restore her to strength; and on the 3d January 1858 she died at Cannet, near Toulon. As an artist, within the limits prescribed by her genius, Rachel has probably never been quite equalled. Of the burning intensity which characterised her rendering of passion in its fiercer concentrations no words can give an adequate image. 'She does not act—she suffers,' one observer well said of her. Her Phèdre—by common consent her masterpiece—was an apocalypse of human agony, not to be forgotten by any one who ever witnessed it. In character Rachel was neither exemplary nor altogether amiable. She gave her first love to a Jew, who used her shamefully, publishing her letters after the rupture; in 1844 she bore a son to Count Walewski, himself a son of Napoleon by a Polish mother. In her pro-

fessional relations she was notoriously grasping and avaricious, although she could be royal in her munificence. She lavished her love upon her family, and heaped them with the wealth that she had gained. Her immense popularity enabled her to dictate her own terms to managers without scruple or generosity. She made over four millions and left one and a half million of francs. Her elder sister Sarah (died 1877) failed as an actress, but lived to make a fortune by the sale of the cosmetic 'eau des fées.'

See French studies by J. Janin (1858); D'Heylli (1882, 1902); Mme de Faucigny-Lucinge (1910); V. Thomson (1910); Fleischmann (1910); Mrs Kennard's Life (1885); and Gribble's monograph (1911).

Rachmaninov, SERGEI VASSILIEVICH, Russian pianist and composer, was born in the government of Novgorod in 1873. He had a brilliant career at the St Petersburg and Moscow conservatories, at the latter winning the gold medal for his one-act opera *Aleko* (1892). He began his career as a conductor, but it was as a pianist that he became known at all the principal centres of Europe. In 1909-10 he visited America, and in 1918 settled in New York. The popularity of the 'inevitable' *Prelude* in C sharp minor has unfairly detracted from the worth of his other compositions, which include two one-act operas, *The Miser Knight* and *Francesca da Rimini*, three symphonies, four piano concertos, a symphonic poem *The Island of the Dead*, an Elegiac trio, and different pieces of chamber music, chiefly in the longer forms. Rachmaninov is much the most western of all the Russian composers, not basing his art on popular folk-tunes, nor on exotic Asiatic colours and rhythms, but adhering more to classical idioms and forms. In his case it has led sometimes to a certain coldness and restraint, but there is a big-ness about his work, with its usual far-flung melodic lines, which at times can be singularly dignified and impressive.

Racine, capital of Racine county, Winconsin, is situated on Lake Michigan, and on both sides of Root River, which is crossed by five swing-bridges, and whose mouth here forms an excellent harbour. By rail the city is 62 miles N. of Chicago and 25 S.E. of Milwaukee; steamers ply on the lake to Chicago and the north. Racine contains a handsome post-office and city hall, a hospital, the Taylor Orphan Asylum, and the University of the Northwest (Episcopalian, founded in 1852, and formerly called Racine College). A large trade is carried on in coal and lumber, and, besides flax, flour, and woollen mills, boiler works, and linseed-oil works, there are manufactories of farm implements, pumps, wagons, fanning mills, hardware, wire-work, cordage, furniture, refrigerators, boots and shoes, dairy products, gloves. Sugar beets are grown in the neighbourhood. Pop. 58,000.

Racine, JEAN, the greatest tragic dramatist of France, was born at La Ferté-Milon, in the modern department of Aisne, in December 1639, and was baptised on the 22d of that month. His father was a *procureur* or solicitor by profession, and held, like his father before him, the office of comptroller of salt at La Ferté. His mother died while he was still a child, whereupon his father married again, but soon after died also. The boy was taken care of by his maternal grandfather, and was sent for his education to the college of Beauvais, whence he passed to Port Royal in October 1655, being, indeed, closely connected, both on the father's and mother's side of the family, with the famous abbey. Here he studied hard under the especial care of Claude Lancelot, Nicole, and Le Maître, and at an early age discovered a faculty for verse-making and, still worse, a liking for romance that caused

his good teachers no small uneasiness. He was almost nineteen when he left Port Royal to pursue the course of philosophy at the Collège d'Harcourt, and here he appears to some extent to have exchanged the severity of his Jansenist upbringing for the libertinism of the world of his day, as well as to have first felt the attraction of the life of letters. Naturally his Port Royal friends saw spiritual ruin in his worldliness and his intimacy with the abhorred actors and actresses. Meantime he had written an ode, *La Nymphé de la Seine*, on the marriage of Louis XIV. (for which he received 600 livres), finished one piece and begun another for the theatre, and made the acquaintance of La Fontaine, Chapelain, and other men of letters. About this time he lived a while under the care of his cousin, N. Vitart, fifteen years his senior, and gave him some kind of assistance in his work as financial secretary to the Duc de Luynes. Many letters of this period to Vitart, the Abbé Le Vasseur, and La Fontaine are extant, and show how the lessons of Port Royal were fading into forgetfulness, as his true vocation opened itself up before his eyes. The great dispersion of the *solitaires* of Port Royal took place in 1661, and, from Racine's contemporary letters to the Abbé Le Vasseur, it troubled him but lightly. In November 1661 he went to Uzès in Languedoc, hoping, but in vain, to get a benefice from his maternal uncle, the vicar-general of the diocese, and here he divided his time between St Thomas, Virgil, and Ariosto. Again in Paris before the beginning of 1664, he obtained in August of that year another grant from the king of six hundred livres for a congratulatory ode. But indeed he received almost to the end of his life handsome rewards in money—'gratifications'—from the court. An ode of gratitude to the king for one of these, *La Renommée aux Muses*, gained him the life-long friendship of Boileau, and from about this time began the famous but much over-estimated friendship of 'the four'—Boileau, La Fontaine, Molière, and Racine. Unfortunately from about this point there is a break in his correspondence, so that we lack satisfactory evidence about the most doubtful and, at the same time, interesting points in his career—his singular spite against Molière, his bitter attack upon Port Royal, and his final conversion and retirement from dramatic work. His earliest play, *La Thébaïde ou Les Frères Ennemis*, was acted by Molière's company at the Palais Royal theatre in June 1664; his second, *Alexandre le Grand*, in December 1665. After the sixth performance the latter was without explanation represented by the rival actors at the Hôtel de Bourgogne—a fact which of course involved a complete breach of friendship between Molière and himself. This famous quarrel is difficult beyond most to clear up, but there is at least light enough to see that the wrong did not rest with Molière. Racine showed himself as hostile to Corneille, most probably only because the older dramatist judged the younger's work somewhat severely. But he soon plunged into a yet more discreditable quarrel. Stung by one of Nicole's *Lettres Visionnaires* (January 1666) condemning the romancer or the dramatic poet as an 'empoisonneur public' in accordance with the ethics of Port Royal, he published a clever and stinging letter to the author, in which he heaped disgrace on his own head by indecent personalities upon Nicole and even his dead teacher Le Maître. Boileau's advice alone saved him from further shaming himself with a second. 'This letter,' said Boileau, 'may do credit to your intellect, but certainly none at all to your heart.' Later in life Racine himself said he would give his heart's blood to wipe out the most disgraceful blot upon his life. His repentance made noble atonement for the

wrong—as for the literary quality of the letters, for brilliant wit and delicate irony they were not unworthy of the hand of Pascal.

During the next thirteen years Racine produced his greatest work, seeking relaxation from labour in at least one liaison with an actress. His plays followed in this order: *Andromaque* (1667), with its charming character Hermione; *Les Plaideurs* (1668), a delightful little comedy of satire against lawyers, which Molière was the first to appreciate; *Britannicus* (1669), which Voltaire styled 'la pièce des connaisseurs'; *Bérénice* (1670), written unconsciously in competition with Corneille, the same theme having been given to both poets by Henrietta of Orleans; *Bajazet* (1672), admirable, but anything rather than oriental; *Mithridate* (1673), produced almost at the moment of his admission to the French Academy; *Iphigénie* (1675), a masterpiece of pathos; and *Phèdre* (1677), a marvellous representation of human agony, which afforded a subject adequate even to the powers of Rachel. With the last ended abruptly his thirteen years of unbroken playwriting. A few days after its production the Troupe du Roi introduced an opposition *Phèdre*, by Pradon, which, though worthless by comparison, was eagerly supported by a powerful party, including the famous Duchess of Bouillon. Whether from disgust and mortification, or from the conversion attributed to him just at this period, Racine turned at once from dramatic work, made his peace with Port Royal, married on June 1, 1677, and settled down to twenty years of domestic happiness. His wife brought him money, if she bore him five daughters and two sons; and he himself had found ample profit in the drama, besides enjoying an annual *gratification* that grew gradually from 800 to 2000 livres, not to speak of the office of treasurer of France at Moulins, at least one benefice, and from 1677, jointly with Boileau, the office of historiographer-royal of France, with a salary of 4000 livres a year. The last involved the duty of accompanying the king on several of his expeditions, but in the case of both poets bore little historical fruit beyond a crop of good intentions and a few fragments. In January 1685 Racine emerged from his retirement to pronounce the discourse at the reception to the Academy of Thomas Corneille, and at last did himself honour by his admirable eulogium upon his greater brother.

In 1689 he wrote *Esther*, in answer to a request from Madame de Maintenon for a play suitable for her girls at Saint-Cyr. She had tried *Andromaque*, but found that the girls acted it 'a great deal too well.' Its success was great, but entirely warranted by the exquisite art of the poem. *Athalie* followed in 1691 with much less success, though it perhaps deserved even a greater. Four *cantiques spirituels*, and an admirably written *Histoire abrégée de Port Royal*, make up the whole remainder of Racine's literary work. In his later years he lost the favour of the king—how is not by any means clearly understood. He is said to have prepared a memoir on the miseries of the people, and the king, finding Madame de Maintenon reading this, expressed his displeasure in some harsh words that broke the sensitive heart of the courtier-poet. On 4th March 1698 he wrote a long letter to Madame de Maintenon, to clear himself from the crime of Jansenism, but he never recovered the king's favour, and his acute mortification appears to have hastened his death. He said to Boileau, with the sweet graciousness of his nature, as he embraced him for the last time, 'Je regarde comme un bonheur pour moi de mourir avant vous.' He died 21st April 1699, and was buried by his own desire in Port Royal.

In France it remains an article of patriotism

to claim Racine as the greatest of all masters of tragic pathos, yet this estimate does not very greatly exceed the truth. He took the conventional French tragedy from the stronger hands of Corneille, and added to it all the grace of which it was capable, perfecting exquisitely its versification, and harmoniously subordinating the whole action to the central idea of the one dominant passion. But he was a far greater poet even than a dramatist, and the tender sweetness and beauty of his rhythm, the finished perfection and flexibility of his cadence, and the indefinable yet ever present stamp of distinction that informs his style, combine to add a charm of its kind beyond almost anything else in the whole poetry of France. It may be that the highest poetry of all is beyond his reach, and that his verses are only for a sensitive ear, but such they haunt with a peculiar charm beyond the art of a Lamartine or a Hugo. Within its limits his poetry attains the perfection of the classic in the highest as well as severest sense of the term; it sums up in its content all that was noble in the royalism of the 18th century, and in the spiritual aspirations out of which grew a *Mère Angélique* and a Pascal; and it attains the Olympian height of distinct originality as well in the balanced proportion and harmony of all its elements as in the grandeur and sublimity of which it is capable of rising in a *Phèdre*, an *Esther*, and an *Athalie*. These high creations transcend and crown with the glory of completion his habitual tenderness and beauty, but into this empyrean also the poet soars no less naturally on the same strong and steady wing. Voltaire, when asked to write a commentary on Racine, answered, and with truth: 'Il n'y a qu'à mettre au bas de toutes les pages—beau, pathétique, harmonieux, admirable, sublime.'

The first collected edition appeared 1675-76; the last within his life-time in 1697. Of more important editions may be named the splendid folio of 1805, those of La Harpe (with commentary, 1807), Geoffroy (1808), Aimé Martin (1820), A. France (5 vols. 1874), and especially the splendid edition by Paul Mesnard in 'Les Grands Écrivains de la France' (8 vols. 1865-73). The first volume of the last contains a Life; the eighth, a Lexique by Marty-Laveaux. Of English translations are the *Distressed Mother*, by Ambrose Philips (1712), the *Phædra and Hippolytus*, by Edmund Smith, brought out at the Haymarket in 1707; and a complete metrical version by R. B. Boswell (1889-91). See vol. vi. of *Sainte-Beuve's Port Royal*, and vol. i. of *Portraits Littéraires*; books on Corneille and Racine by H. M. Trollope (1881) and Canfield (1904); the monographs by Larroumet (1898) and Lemaître (1908); and Mary Duclaux, *The Life of Racine* (1925).

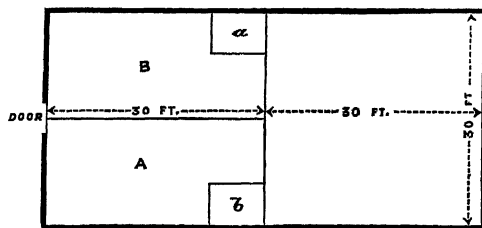
Racing. See ATHLETIC SPORTS, HORSE-RACING, ROWING, YACHT.

Rack, an instrument of Torture (q.v.) used for extracting confessions from actual or suspected criminals, consisted of an oblong frame of wood, with a windlass arrangement at each end, to which the sufferer was bound by cords attached to his arms and legs. The unfortunate being was then stretched or pulled till he made confession, or till his limbs were dislocated. The rack was known to the Romans in Cicero's time, and in the 1st and 2d centuries A.D. was applied to the early Christians. According to Coke, it was introduced into England by the Duke of Exeter, Constable of the Tower in 1447, whence it came to be called the 'Duke of Exeter's daughter.' Its use first became common in the time of Henry VIII., but could only take place by warrant of council, or under the sign-manual. Under Elizabeth it was in almost constant use. In 1628, on the murder by Felton of the Duke of Buckingham, it being proposed by Charles I. to put the assassin to the rack, in order that he might discover his accom-

pllices, the judges resisted the proceeding as contrary to the law of England. In various countries of Europe the rack was much used both by the civil authorities in cases of traitors and conspirators, and by the Inquisition to extort a recantation of heresy. It is no longer in use in any part of the civilised world.

Rackets, or RACQUETS (M.E. *raket*; Span. *raqueta*, 'racket,' 'battle-dore'; Arab. *râhat*, 'palm of the hand'). No reference is made to the game of rackets before the early part of the 19th century, and the game as then played differed materially from that of the present day. From Dickens's account in *Pickwick* we should gather that the racket-court in which the insolvent debtors disported themselves in the Fleet boasted of more than one wall, but the usual game was played against a single wall, the ball having to rebound into a court marked out with paint. The erection of the courts at Prince's Club in 1853 showed that the four-wall game was coming into favour, and since covered courts have been adopted by the universities and public schools the old game has become practically obsolete. When the site of Prince's Club was invaded by the builder in 1886 the headquarters of rackets were transferred to the Queen's Club, Kensington.

The modern court is about 60 feet long by 30 feet broad and about 40 feet high. It is enclosed by four walls, and covered by a roof with a double row of skylights. The walls and floor are coated with cement, usually coloured black, and marked out by white lines as shown in the plan. A line $9\frac{1}{2}$ feet from the ground painted across the front wall is called the 'service line.' Below this at 2 feet is the 'play line,' which is made of wood, so as to enable the players to judge by the sound whether a ball is 'up' or not. The racket has a small head with tightly strung gut and a long handle. The average weight is 9 oz. The ball is very hard, and 1 inch in diameter. The server strikes the ball alternately from the two serving boxes *a* and *b* in such a manner that it flies direct from his racket to



Plan of Racket Court.

some part of the front wall above the service line, and rebounds into that quarter of the court opposite to him—viz. from *a* into *A*, from *b* into *B*. If the ball hits the wall below the play line, or goes 'out of court,' the server's 'hand is out,' and his opponent has the privilege of serving. If it strikes the wall between the play line and the service line, or falls on some part of the floor other than that indicated, it is a 'fault,' and the servee may refuse to take it. Two faults put the hand out. The servee must return the service above the play line. The game consists of fifteen aces, and the server scores an ace when the striker out fails to return his service or any ball in the subsequent 'bully.' The variant known as *Squash Rackets* originated at Harrow, and is played on a smaller but similar court, with a shorter racket and a ball of india-rubber. See a book in the 'Badminton' series (1890), one by Eustace Miles (1902), and Weigall, *Squash Racquets*.

Raccoon. See RACCOON.

Racoonda, the fur of the Coyupú (q.v.).

Racow (*Raków*), a Polish village in Kielce county, was in the 16th century a centre of the Socinians, who printed their Catechism (q.v.) there.

Radcliffe, a town of south-east Lancashire, on the Irwell, $2\frac{1}{2}$ miles SSW. of Bury and 7 NNW. of Manchester. It has an 11th-century parish church (restored 1873), a ruined tower, a market-hall (1852), a co-operative hall (1878), cotton-mills, bleachfields, dyeworks, paper-mills, chemical and engineering works, and coal-mines. Pop. 25,000.

Radcliffe, ANN, novelist, was born in London, 9th July 1764. Her maiden name was Ward, but at twenty-three she married William Radcliffe, who became proprietor and editor of the weekly *English Chronicle*. In 1789 she published *The Castles of Athlin and Dunbayne*, which was followed by *A Sicilian Romance* (1790), *The Romance of the Forest* (1791), *The Mysteries of Udolpho* (1794), and *The Italian* (1797). From this time she published no more novels—'like an actress in full possession of her applauded powers,' says Scott, 'she chose to retreat from the stage in the full blaze of her fame.' She died 7th February 1823. A sixth romance, *Gaston de Blondville*, with a metrical tale, 'St Alban's Abbey,' and other poems, and a short life, was published in 1826. As novelist she stands between Horace Walpole and Clara Reeve on the one hand and Sir Walter Scott on the other. She was mistress of every art of awakening the curiosity and enchainning the attention of a reader. And though her figures are shadows without reality, and her pages are unrelieved by humour or wit, she was dear to our great-grandfathers, dearer still to our great-grandmothers. Crabb Robinson preferred her stories to *Waverley*; Miss Rossetti was a warm admirer; and Andrew Lang suggested that the *Sicilian Romance* contains the germs of Byron's *Giaour*, of Jane Austen's *Northanger Abbey*, and of Charlotte Brontë's *Jane Eyre*.

See Clara F. McIntyre, *Ann Radcliffe in Relation to her Time* (1921).

Radcliffe, JOHN (1650–1714), born at Wakefield, studied at University College, Oxford, became a fellow of Lincoln, took his M.D. in 1682, and in 1684, removing to London, became the most popular physician of his time. A Jacobite, he yet attended William III. and Mary; from 1713 he was M.P. for Buckingham. He bequeathed his property to the Radcliffe Library, Infirmary, and Observatory, and University College at Oxford, and to Bartholomew's Hospital, London. See a book by J. B. Nias (1918).

Radclyffe. See DERWENTWATER.

Radetzky, JOHANN JOSEPH, COUNT (1766–1858), born at Trzebnitz near Tabor in Bohemia, fought against the Turks in 1788–89 and in nearly all the wars between Austrians and French. Commander-in-chief in Lombardy from 1831, in 1848 Field-marshal Radetzky was driven out of Milan by the insurgents, but held Verona and Mantua for the Hapsburgs. Defeated at Goito, he won a victory at Custoza. In March 1849 he almost destroyed the Sardinian army at Novara, forced Venice to surrender, and till 1857 again ruled the Lombardo-Venetian territories with an iron hand.

Radhanpur, chief town of a protected state in Bombay Presidency, India, 150 miles NW. of Baroda; pop. 9900. The state has an area of 1150 sq. m. and a pop. of 68,000.

Radiation, Radiant Energy. See ENERGY, HEAT, LIGHT, RADIUM, RÖNTGEN RAYS, VACUUM-TUBES.—Millikan in 1925 proved the existence of radiation of very high frequency seemingly due to nebular sources outside even our universe of stars.

Radić, STEFAN, leader of the Croatian Peasants' Party, contended for federal republican government against the centralised monarchy of Belgrade. Imprisoned more than once, he won all Croatia for his party, which at first refused to attend the Skupština (1920–22), and later was able to force M. Pašić into compromise. Dr Radić was released in 1925, and his nephew and other members of his party taken into the government, in which he himself took office later as minister of education.

Radical (Chemistry) is a group consisting of two or more elementary atoms which is capable of entering into a series of different compounds without itself undergoing change or decomposition. In this respect a radical resembles an atom of an elementary substance. Radicals are, in a sense, incapable of a separate existence, and must be in combination with other radicals or elements; but two similar radicals can combine with each other, and then the compound produced has been looked upon as the radical in the free state.

Radical, in English politics, is often used to denote the advanced wing of the great Liberal party. The name came into use in the reign of George III. in the phrase 'radical reform.' But modern radicals are descendants of the French Revolutionists of 1789, and began to be called radicals about 1816. Their principal objects have been chiefly concerned with parliamentary reform, the extension of the franchise, the enlargement of the public privileges of the people, and with endeavouring to weaken and curtail the exclusive privileges and prerogatives of the oligarchical ruling classes. The radicals of England were the pioneers of the democratic movement, and sought to achieve their ideals almost exclusively through the agency of parliamentary government. See W. Harris, *History of the Radical Party in Parliament* (1885); S. Bamford, *Life of a Radical* (1842); and the articles CHARTISM, DEMOCRACY, HUNT (HENRY), WHIG.

Radiography. See RÖNTGEN RAYS, RADIUM.

Radiolaria, a class of marine Protozoa, represented in all seas, with the living matter divided by a perforated chitinous 'central capsule' into a central mass surrounding the nucleus or nuclei, and an outer vacuolated and somewhat gelatinous zone from which thread-like processes or pseudopodia radiate outwards, never forming a network. The skeleton of the majority is siliceous, either coherent or of loosely disposed spicules; in others it consists of definitely arranged spicules of a protein material called acanthin. A few are without skeleton. Radiolarians multiply by division or by forming spores within the central capsule. Most are minute (under $\frac{1}{2}$ inch); a few form colonies of considerable size, over an inch. The majority form part of the surface Plankton (q.v.); others occur at varying depths or near the bottom (abyssal). Almost all have partner Algae (see SYMBIOSIS). Many of the shells are of extraordinary beauty. Fossilised Radiolarians form deposits of 'Barbados earth' and 'Tripoli powder,' just as modern Radiolarians are forming siliceous ooze on the floor of the deep sea. See Haeckel, *Challenger Report*, xvii. 1887.

Radiometer, an instrument consisting of four horizontal arms of very fine glass, carefully poised so as to revolve easily on a point; the tips of the arms having pith discs blackened on one side. The whole is contained in a glass vessel almost but not quite exhausted of air. When exposed to light or heat the arms move round, more or less swiftly according to the strength of the rays. The blackened sides of the vanes are warmer: the molecules of air striking those sides are more heated by the

vaness: they rebound after impact with greater velocity: the vanes are driven back by a greater recoil on the blackened sides. The radiometer was invented in 1873-76 by Crookes (q.v.).

Radiotelegraph, Radiotelephone. See WIRELESS TELEGRAPHY, WIRELESS TELEPHONY.

Radish (*Raphanus*), a genus of plants, of the family Cruciferae, with yellow, red, or purple flowers. The Common Radish (*R. sativus*) has thick, round, tapering, and pointed pods, little longer than their stalks, and has been cultivated from time immemorial in China, Japan, India, and Europe. Some varieties of the Wild Radish found on the Mediterranean coasts resemble so closely the Garden Radish as to suggest that the latter may be but a cultivated race of it. Radish is a well-known salad root, much appreciated for its succulent roots with their warm, pungent taste; the young and tender leaves were also formerly used. The extremely numerous varieties of radish in cultivation are generally classed under the two heads of *Long-rooted* and *Turnip-rooted* Radishes, the roots of the former resembling the carrot in shape, and the latter the turnip. The varieties differ also greatly in colour and size, a red colour generally prevailing. Some of the darker-coloured turnip-rooted radishes, such as the black Spanish, grow to a large size under good cultivation, and are grown in gardens chiefly for their usefulness in winter. Radishes are sown at different seasons, and are generally used when young and small. Radish-juice, mixed with sugar-candy, is a German remedy for hoarseness and cough. The Oil Radish, which has a slender—scarcely fleshy—root, a short much-branched stem, and many-seeded pods, is cultivated in China for the oil of its seeds. To this genus belongs the Jointed Charlock of the cornfields (*R. Raphanistrum*), a troublesome weed, whose seeds may, however, be advantageously crushed for oil. The Sea Radish (*R. maritimus*) is a rarer British species, the roots of which are of fine quality and great pungency.

Radium, the most characteristic of those substances which possess the property of radio-activity—i.e. have the power of producing photographic or electric effects by a process identical with or analogous to radiation. The property was first observed in uranium by Becquerel in 1896—hence the name 'Becquerel rays.' He at first connected it with the property of phosphorescence, in virtue of which a substance continues to emit rays for some time after it has been illuminated by a bright light; but he found that a piece of the double sulphate of uranium and potassium which had not been previously exposed to the light affected a sensitive photographic plate near which it was placed in the dark. In 1898 Schmidt and Madame Curie discovered almost simultaneously that the compounds of thorium had the same radio-active property; and further elaborate investigations on the part of the latter, in conjunction with her husband and Bémont, led to the discovery of polonium and radium as new substances with radio-active properties. The year following, Débiérne added to the list by the discovery of actinium. The new field of research opened up by Becquerel and Madame Curie was entered by other experimenters, notably Rutherford, formerly of the University of Manchester, whose previous work at Cambridge in relation to cathode rays and ionisation admirably fitted him for elucidating the complicated phenomena connected with uranium, thorium, and radium. Important work has also been done by Crookes, Ramsay, Soddy, Huggins, and others.

Radium, which is a million-fold more radio-active than uranium, is derived from Pitch-blende (q.v.), in which it exists in very small quantities. It is finally

obtained associated with barium. After a long-continued process of fractional crystallisation it has been prepared in the form of a tolerably pure salt. Its atomic weight is high, 225 according to Madame Curie. The atomic weights of the other radio-active substances are also high, a fact which has an important bearing upon the theory of the process. When compounds of radium are first prepared they become self-luminous, glowing in the dark with a soft light like that of a glow-worm. This luminosity decays gradually in time, and is probably a secondary action due to the impacts of the true radium radiations upon the associated material. Another curious property of the radium salts established by the Curies is their power of giving forth heat apparently indefinitely, without any appreciable change in the substance itself. In other words, radium is able to maintain itself and matter in the immediate vicinity at a temperature a little higher than that of surrounding matter. It is estimated that one gramme of it gives out in one hour an amount of heat capable of raising 100 grammes of water 1° C. This is evidently the result of energetic changes going on in the atom—those changes, in fact, which give rise to the various kinds of radiations and emanations which characterise radium and radium compounds. The radium rays also produce effects on organic matter, and it is possible that certain of these rays may have an influence in destroying malignant tumours.

The most delicate method for studying radio-activity is electrical, depending upon the property the rays have of ionising the air and rendering it a conductor of electricity. When, for example, the rays pass near a gold-leaf electroscope, the electroscope rapidly loses its charge. In this respect the rays are similar to the Röntgen rays. By means of elaborate forms of apparatus made on this principle it has been established that uranium, thorium, and radium give off (at least) three distinct kinds of rays. These have been called the α , β , and γ rays. They differ markedly in their powers of penetrating through aluminium and other substances, the α rays being least penetrating and the γ rays by far the most penetrating. The α rays were examined by Rutherford, and were found to be charged atoms of helium, since under a very powerful magnetic field they are slightly deviated by an amount which proved them to be positively charged particles of mass two or four times the hydrogen atom, projected with a velocity comparable with that of light. Since then Ramsay and Soddy have collected helium thus generated in sufficient quantity to observe its spectrum, and have thus confirmed the anticipation of Rutherford. The β rays are easily deviated in a weak magnetic field, and their deviation is in the opposite direction to that of the α rays. They are thus shown to be negatively charged particles identical with the cathode rays in a vacuum-tube, the mass of each negatively charged particle being about the 1/1850th part of the mass of a hydrogen atom—i.e. they are Corpuscles, or Electrons (q.v.). The γ rays, which are very penetrating, are similar to the Röntgen Rays (q.v.), and do not experience deviation in a magnetic field. They are of the nature of disturbances in the ether akin to light.

Radium and thorium have the power of exciting in neighbouring bodies the same radio-active power, which, however, exists only for a time. This is due to a deposit from a material emanation which has all the properties of a heavy gas. These first emanations diffuse like gases, can be condensed to a solid state at low temperatures (-120° C. to -150° C.), and are themselves fiercely radio-active; wherefore they are short-lived.

These and many other facts suggest that the atoms of radium and the other radio-active sub-

stances are in process of disintegration; and this view, which is probably accepted by most scientific minds, has been elaborated by Rutherford into a fairly consistent theory. The theory is that the radio-activity of radium, thorium, and uranium is accompanied by the continuous production of new kinds of matter which possess temporary activity, and which constitute a whole series of temporary chemical elements, with properties that may be investigated. When the rate of production of each of these kinds of matter balances its rate of decay there is equilibrium, and the process continues at a steady rate.

Radio-activity has been discovered in certain mineral waters and deep wells, and is probably possessed, though in a very minute degree, by substances other than those which are conspicuously radio-active. Thus, freshly fallen snow and freshly fallen rain, when evaporated to dryness, leave a radio-active residue. Also, when a wire is kept negatively charged in air for some time it becomes radio-active. The fact that the phenomenon is strongly marked in substances with high atomic weight indicates a comparative instability in such complex atoms; and the breaking up of complex atoms would seem to mean the final disappearance of the radio-active substances as chemical elements. In their place will be found ultimately the inactive constituents of the emanations, together with argon or helium. But although radio-activity is thus a process of decay or disintegration, it is clear that radio-active substances must somehow be born, as well as die, or they would already be extinct. Uranium is the parent of some of them, and a genealogical tree can be now made out for many of the products. They are elements, in the sense of being able to form salts and of having a characteristic spectrum, but they are short-lived elements—some of them lasting only a few minutes, others a few weeks, and some a thousand years. Those which have a high death-rate and low birth-rate are necessarily rare, on the same principle as is familiar in the population question. It is possible that every kind of matter has some slow rate of decay, but that the commonest substances are the most stable—plentiful because so comparatively stable.

The disintegration of atoms furnishes a new source of heat, which must play a large part in determining the temperature of the earth's crust, and probably also in producing the local elevation of temperature displayed by hot springs and volcanoes. The amount of helium or disintegration-product occluded in a rock of measured radio-activity has been found by the present Lord Rayleigh to furnish an indication of its age, and measurements made by him are now treated as evidence of the age of geological formations. Calculations concerning the earth's age, which had become invalid owing to addition to the data, may thus perhaps be resumed with greater precision.

Radius. See CIRCLE.

Radley, a Berkshire village, near the right bank of the Thames, 5 miles S. of Oxford. The Bowyers' seat here was in 1847 converted by Professor W. Sewall into a High Church public school—St Peter's College. It has a fine chapel.

Radnorshire, a border county of South Wales, bounded by the counties of Montgomery, Salop, Hereford, Brecon, and Cardigan. Measuring 36 miles by 30, and 470 sq. m. in area, it is the tenth in size and twelfth in population of all the twelve Welsh counties. The beautiful Wye traces all the south-western and southern boundary, the Teme the north-eastern; and the surface generally is hilly or mountainous, in the Forest of Radnor attaining a maximum altitude of 2163 feet. Of

half-a-dozen mineral springs, those of Llandrindod are in most repute. The rocks are mainly Lower Silurian, and the soils poor, less than half of the total area being in tillage. The rearing of stock is the principal industry. Radnorshire returned one member till 1918; thereafter Brecon and Radnor together. Pop. (1801) 19,135; (1841) 25,458; (1881) 23,528; (1921) 23,528. See Williams's *History of Radnorshire* (Tenby, 1858).

Radom, an old but uninteresting town of Poland, on a sub-tributary of the Vistula, 60 miles S. of Warsaw. It is the seat of an active trade. Pop. 61,600.

Radowitz, JOSEPH MARIA VON, Prussian statesman, born 6th February 1797 at Blankenburg, was the son of a nobleman of Hungarian descent, and in 1813 entered the Westphalian army as an officer. After the peace in 1815 he taught in the military school of Cassel; but in 1823 he entered the Prussian service, and in 1830 became chief of the general staff of artillery. By his marriage he became connected with the Prussian aristocracy, and soon became the leader of the anti-revolutionary party. In 1836 Radowitz was sent as Prussian military commissioner to the German Diet at Frankfurt, and held diplomatic posts at Carlsruhe, Darmstadt, and Nassau. He was the confidant and adviser of King Frederick-William IV. in his endeavours to bring about a reform of the German Diet. After the revolution of 1848 the endeavours of Prussia to give a constitution to Germany, by means of the alliance of the three kings, was principally his work. He wrote several works, mainly political, and died 25th December 1853.

Rae, JOHN, Arctic traveller, was born in Orkney in 1813, studied medicine at Edinburgh, and went to Hudson Bay as doctor of the Company's ships. In 1845 he undertook an exploring expedition, and in 1846-47 a more extensive one, wintering in Repulse Bay. He was second under Richardson in 1848 on a Franklin search voyage. In 1853-54 he commanded an expedition that proved King William's Land to be an island. In his various journeys nearly 1800 miles were travelled over for the first time. In 1860 he surveyed a telegraph line to America by the Faeroes and Iceland, and visited Greenland; and in 1864 he made a telegraph survey from Winnipeg across the Rocky Mountains. He died 24th July 1893.

Raeburn, SIR HENRY, R.A., portrait-painter, was born 4th March 1756, at Stockbridge, then a village near Edinburgh, where his father was a manufacturer and mill-owner. His parents died when he was about six years old; and he was educated in George Heriot's Hospital, and apprenticed to James Gilliland, a goldsmith and jeweller in the Parliament Close. While in this employment his turn for art attracted the attention of David Deuchar, the etcher and seal-engraver, who gave him some instruction; and he afterwards studied under David Martin, producing at first water-colour miniatures with such success that he was soon able to devote himself exclusively to portraiture in oils. A careful miniature of Deuchar, still preserved, forms a curious example of Raeburn's earliest style. At the age of twenty-two he married one of his sitters, Ann Edgar, widow of Count Leslie, a lady of means; and, after practising his art for a time in Edinburgh, he resolved to study in Italy. In passing through London he visited Reynolds, who received him kindly, recognising his talent, and furnished him with introductions to Pompeo Battoni and other leading painters in Rome. After remaining two years in Italy he returned and settled in Edinburgh in 1787, the date of his fine portrait of the second Lord President Dundas. He soon received full employ-

ment as a portrait-painter, and before long attained acknowledged pre-eminence among the artists working in Scotland. In 1812 he was elected president of the Society of Artists in Edinburgh; in 1814 Associate of the Royal Academy, London; and in the following year full Academician. He was knighted by George IV. during that monarch's visit to Scotland in 1822, and was appointed king's limner for Scotland a few days before his death in Edinburgh on the 8th of July 1823.

Raeburn's style was, to some extent, founded upon that of Reynolds. Like Sir Joshua, he aimed at breadth of effect, a result attained by massing together the lights, and keeping them as far as possible distinct from the shadows, and so making each respectively effective; but he attained his aim in a manner and with a feeling that was characteristic and original. He seldom attempted to produce texture and luminosity of effect by thick impasto and semi-transparent painting, but adopted the opposite mode of painting, in a low tone, with a crisp, definite touch, working his colours with little admixture of any unctuous medium. In its decision and power of handling his style has been justly compared to that of Velázquez. In his portraits of men, in particular, the heads are most vigorously modelled, and the characteristic expression is seized in a singularly simple, direct, and effective manner; but works like the seated portrait of his wife and the portraits of the two Misses Grant Suttie sufficiently prove that he could portray the grace and dignity of comely womanhood. His reputation, always high in his native country, is becoming more widely spread, and his works are now much sought after. Among his sitters, who included almost all the celebrated Scotsmen of his day, were Sir Walter Scott, Lord Melville, Sir David Baird, Henry Mackenzie, Neil Gow, Harry Erskine, Dugald Stewart, Principal Robertson, Lord Jeffrey, and Lord Cockburn. Technically, one of his finest is the bust portrait of James Wardrop. His art is well represented in the Scottish National Gallery and National Portrait Gallery, and there are good examples in the National Gallery and National Portrait Gallery, London, in the Glasgow Gallery, and in the Louvre.

See Life by his great-grandson, W. R. Andrew (1886); *Sir Henry Raeburn, a Selection from his Portraits* (photogravures, edited by W. E. Henley, 1890); books by Pinnington (1904), J. Greig (1911).

Raemaekers, LOUIS, Dutch artist and cartoonist, was born at Roermond, Holland, in 1869, the son of a publisher. Educated at Roermond, also at Amsterdam and Brussels, he became director of a drawing school at Wageningen, and achieved some distinction as an artist. During the Great War, horrified by the barbarity of warfare, he issued his famous cartoons, volumes appearing in 1916, 1917, and 1919. Executed with consummate technical skill and full of bitter meaning, these cartoons, or *projets de tableaux* as they have been called, were profoundly influential as anti-German propaganda.

Raff, JOACHIM, composer, was born at Lachen on the Lake of Zürich on 27th May 1822. He began life as a schoolmaster, but, encouraged by Mendelssohn, he devoted himself to music. From 1850 to 1856 he lived near Liszt in Weimar, then taught music at Wiesbaden until 1877; and from that year until his death, on 24th June 1882, he was director of the Hoch Conservatory at Frankfurt-am-Main. From the time he turned to music down to the end of his life Raff poured forth an incessant stream of musical productions, more than 200 in all. In *Die Wagnerfrage* (1852) and numerous papers contributed to the *Neue Zeitschrift für Musik* he advocated the works and aims of the new German musical school.

Raffaelli, JEAN FRANÇOIS, realist impressionist painter of Parisian suburban life, born in Paris in 1850, worked in an office, sang bass in the Théâtre Lyrique and in a church choir, studied with Gérôme at the École des Beaux Arts, and travelled in Europe and Algeria.

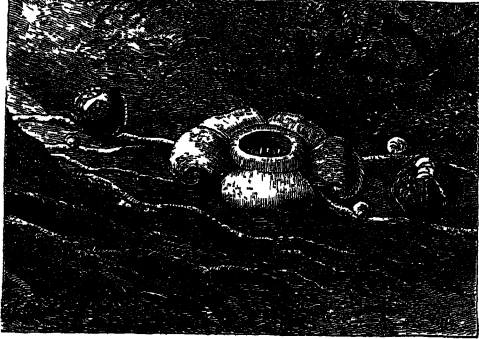
Raffaello. See RAPHAEL.

Raffia. See RAPHAIA.

Raffles, SIR THOMAS STAMFORD, British administrator, was born, a sea-captain's son, off Port Morant in Jamaica, on 5th July 1781. In 1795 he was appointed to a clerkship in the East India House, and in 1805 assistant-secretary to a new establishment at Penang; eventually he was made principal secretary. In 1808 he made a voyage to Malacca, respecting which place, and the East Indies in general, he collected much valuable information. In 1811 Raffles accompanied the expedition against Java (q.v.) as secretary to the governor-general, Lord Minto, who himself took the chief command. The island was captured, and Raffles appointed lieutenant-governor of it and its dependencies. Much had to be done in the way of conciliating the native princes and chiefs to the British rule. He appointed British residents at the native courts, and framed rules and regulations for their conduct. He ordered a general survey to be made of the whole island, and checked the attempt of the native sultan of Jokjokarta to expel the Europeans from Java. His efforts were, however, chiefly directed to effecting a complete reform in the internal administration. By frequent personal interviews with the natives he sought to become acquainted with their manners and character, and to educate them and civilise them; and by them he was regarded with great esteem and affection. But his health had been failing for some time, and in 1816 he returned to England, stopping by the way at St Helena, where he had an interview with Napoleon. On his arrival in England he wrote his *History of Java* (2 vols. 1817). Java having by this time been restored to the Dutch, Sir Stamford Raffles was appointed lieutenant-governor of Bencoolen, a settlement upon the coast of Sumatra, where he landed in March 1818. Shortly afterwards, to paralyse or combat the commercial prosperity of the Dutch in the eastern seas, and to repress the piratical propensities of the Malays, he was sent to form a new settlement at Singapore. In 1824 he was again compelled by ill-health to return to England. But the vessel in which he set sail took fire 50 miles out from Sumatra, and the crew and passengers escaped with difficulty in the boats. By this accident Sir Stamford Raffles lost the greatest part of his effects, including a fine collection of natural history, materials for various East Indian grammars and dictionaries, and for a history of Borneo, Celebes, Singapore, &c. After his arrival in England he lived to carry out what had been one of his favourite projects—namely, the formation of the Zoological Society of London, of which he was named president. He died on 5th July 1826. See *Memoir* by his widow (1830), and the Lives by D. C. Boulger (1898), Egerton (1900), Cook (1919), Coupland (1926).

Rafflesia, a remarkable genus of plants belonging to the small family Rafflesiaceæ, a family composed entirely of parasitic plants, which consist merely of a flower, and cellular threads in the tissues of the host. The Rafflesiaceæ are natives of the tropics. The genera include *Pilostyles*, *Cytinus*, *Mitrastemon*, *Brugmansia*, and others. The genus *Rafflesia* has enormous flowers seated upon the roots of species of *Vitis* and *Tetrastigma*, making their appearance at first as a hemispherical swelling of the bark of the root, and, after the bark has broken, rising up in the form of a head of

cabbage, whilst the perianth is covered with imbricated bracts, which are more or less recurved after it has opened. The perianth is thick, fleshy, and 5-partite. The ovule is inferior, and contains many ovules; and the anthers, which are numerous, are seated under the revolute margin of the top of the style column. After the flower has expanded it diffuses a carrion-like smell, that even attracts



Rafflesia Patma.

flies, and induces them to deposit their eggs and pollinate the flowers. The largest and first-discovered species, *R. Arnoldi*, was discovered in 1818 in Sumatra by Dr Arnold, and was sent to the eminent botanist, Robert Brown, by Sir Thomas Stamford Raffles (q.v.). Its flower measures fully 3 feet in diameter, is capable of containing almost 2 gallons of fluid, sometimes weighs 15 pounds, and is the largest of all known flowers. A smaller species, *R. Patma* (on *Tetrastigma*), whose flowers are 16 inches to 2 feet in diameter, is highly prized by the Javanese as a medicine, for its strong styptic powers. *R. Horsfieldii*, another Javanese species, is still smaller, its flowers being only 3 inches broad.

Rafn, KARL CHRISTIAN, critic and archæologist, was born at Brahesborg in Fünen 16th January 1796, and educated at the university of Copenhagen, of which he was appointed sub-librarian in 1821. It is to Rafn's unwearied exertions that Denmark owes the foundation (1825) of the 'Society for Northern Antiquities.' As its secretary he edited and published a great many ancient Scandinavian MSS., occupying about seventy volumes. He was named professor in 1826, and died at Copenhagen 20th October 1864. Among his numerous important works a Danish translation of Norse Mythic and Romantic Sagas (1821-26), and *Antiquitates Americane* (1837), in which he showed that America was discovered by Norsemen in the 10th century (see VINLAND).

Ragatz, a spa of Switzerland, in the south-east corner of the canton of St Gall, by rail 68 miles SE. of Zürich and 13 N. by W. of Chur (Coire); it stands at the mouth of the ravine leading to Pfäfers (q.v.), from which town it gets its healing waters by means of a pipe (1838-40) 2½ miles long. Schelling, the German philosopher, is buried in the parish churchyard.

Ragged Robin. See LYCHNIS.

Ragged Schools. The Ragged School, as distinct from the Certified Industrial School, is a voluntary agency providing education for destitute children, and so preventing them from falling into vagrancy and crime. Vagrant children, and those guilty of slight offences, are provided for in the Certified Industrial School; but the two institutions are frequently combined. John Pounds, a poor shoemaker at Portsmouth, has the honour of

originating the idea of the ragged school. For twenty years, up to the time of his death in 1839, he gathered the ragged children of the district round him as he sat at work. They came freely, and were taught gratuitously. The success attending his humble efforts soon led many more influential friends of the 'outcasts' to engage in the same work. In 1838 London had a Ragged Sunday School, and in 1844 was formed the Ragged School Union, under the presidency of the seventh Earl of Shaftesbury. The first ragged feeding-school was opened in 1841 by Sheriff Watson in Aberdeen, and a similar school in the Vennel, Edinburgh, in 1845 by the Rev. Dr. Robertson. Soon afterwards Dr Guthrie's famous *Plea for Ragged Schools* gave an irresistible impetus to the movement, and caused the author to be generally regarded as the father of ragged schools. A ragged school was founded at the Castle Hill in 1847 (since 1887 at Liberton, the girls' school later at Gilmerton). After this ragged schools were established in almost every town of any importance. Other activities were often connected with them—e.g. penny banks, Sunday schools, shoeblack brigades, even parent meetings. The Education Acts—England, 1870, and Scotland, 1872—introduced the principle of compulsory school attendance; accordingly a large number—especially in England—of such as were merely free day-schools became public schools. Where the system has been efficiently conducted, juvenile crime has sensibly diminished. See REFORMATORY AND INDUSTRIAL SCHOOLS.

Raghuvamśa, the greatest of Kālidāsa's epics, deals with the history of the kings of the line of Raghu, ancestor of Rāma, whose story is told as in the *Rāmāyana* (q.v.) in cantos ix.-xv.; the poem ends in canto xix. abruptly, perhaps owing to the death of the author. It was edited with a Latin translation by A. F. Stenzler (London, 1832) and translated into English by P. de Lacy Johnstone (London, 1902).

Ragi, or KURAKKAN, a tropical cereal (*Eleusine coracana*). See ELEUSINE.

Raglan, LORD. Fitzroy James Henry Somerset, eighth son of the fifth Duke of Beaufort, was born 30th September 1788. He entered the army in his sixteenth year, and in 1807 served on the staff of the Duke of Wellington in the expedition to Copenhagen. He went to the Peninsula as aide-de-camp to the duke, and in 1812 became his military secretary. As Lord Fitzroy Somerset his name became a household word. He was present at all the great actions of the Peninsular campaign, being among the first to mount the breach at the storming of Badajoz; and it was to him that the governor gave up his sword. On the return of Napoleon from Elba he served under the duke in Flanders, and lost his sword-arm in the crowning victory of Waterloo; and the very next day he was seen practising writing with his left hand. He was minister-plenipotentiary at Paris in 1815, and secretary to the embassy there from 1816 to 1819. The duke was appointed in 1819 Master of the Ordnance, and Raglan then became his secretary; and in 1827, when the former became commander-in-chief of the British army, Raglan was called to the Horse Guards as his military secretary. This office he held until the death of his chief in September 1852. He was then made Master-general of the Ordnance, and in October was created a baron. He had sat in the Commons for Truro in the parliaments of 1818 and 1826. He was sent as Commander-in-chief of the English forces to the Crimea in 1854 (see CRIMEAN WAR). The desperate infantry battle of Inkermann obtained for Raglan the baton of field-marshal; but, as the campaign proceeded, unfavourable comments began to be made upon

his conduct of the war. During the winter of 1854-55 his soldiers suffered unspeakable privations, and hundreds perished in camp and on board transports for want of the food, clothing, and medicines which were in store, but could not be found in the confusion and mismanagement that prevailed—the fault mainly of the home authorities. The siege continued without much apparent success until June 18, when a general assault was ordered, and when Raglan's troops, as well as the French, received a terrible repulse. Raglan had been suffering from a slight attack of dysentery, and the disaster weighing upon his mind, he suddenly became worse, and died of exhaustion, 28th June 1855. He was a skilful tactician, although it may be doubted whether he had the qualities of a great general. His personal bravery won universal admiration; and his courteous and noble bearing, his gentleness of temper and firmness of mind, and his constant worship of 'duty,' invest his character with something of the chivalrous. See Kinglake, *Invasion of the Crimea* (1863-87); and Hamley, *The War in the Crimea* (1891).

Ragman Rolls (*ragman*, a word of uncertain origin, used in ancient diplomatic language for an indenture or legal deed), the name given to the collections of instruments which record the acts of fealty and homage performed by the Scottish nobility and gentry to Edward I. of England in 1291-92, and afterwards during his progress through Scotland in 1296, and at the parliament at Berwick. The original instruments of homage under the seals of the parties were deposited in the Royal Treasury of England, and have almost entirely perished; but the rolls in the Record Office preserve a record of them. Their contents were given in an abridged form in Prynne's *Records*, and afterwards printed *in extenso* by the Bannatyne Club in 1834. An especial value attaches to the Ragman Rolls as containing the largest and most authentic enumeration extant of the nobility, barons, landholders, and burgesses, as well as of the clergy of Scotland, prior to the 14th century, and the only genuine statistical notices of Scotland of the period.

Ragnarök (Ger. *Götterdämmerung*), the end of the world, when the gods (Odin, Thor, &c.) shall be overcome by their enemies and the world be burned up. See SCANDINAVIAN MYTHOLOGY.

Rags. Fragments of almost all kinds of textile materials have now a commercial value. In the middle of the 19th century all white papers were made of rags, but the great demand for printing-paper for newspapers, &c., necessitated the use of other materials, as esparto, wood-fibre (see PAPER). Linen and cotton rags alone are still, however, used for bank-note and other fine and strong papers, and are mixed with other materials, such as wood-pulp, for inferior kinds. These rags furnish the manufacturer with a material already half made into paper, so to speak, because the preliminary processes of boiling out the silica, &c., from straw or esparto are not required in the case of woven linen or cotton. Hence rags of vegetable fibre will always be valuable for paper-making. Old woollen clothes or shreds of such are called, in the manufacturing districts where they are worked up, 'Old Mungo' (see SHODDY). These rags are torn up, or 'ground up,' as it is termed, and re-manufactured into coarse flannels, &c. Some are actually ground into a sort of powder for flock wall-papers.

Rag-stone, an impure limestone, consisting chiefly of lime and silica, much used in Kent. It breaks up into pieces about the size of a brick, and is hard and flat bedded. The name is also

applied to the hard irregular rock which frequently overlies better building materials. It is used for building purposes, also for making hones or sharpening-stones for scythes, &c.

Ragtime, an American negroid development of syncopation in music, originating late in the 19th century. Ragtimes are generally in quick time, the broken and ragged rhythms, with varying types of syncopation, being emphasised by a liberal use of percussion. Jazz (q.v.) is a later development. Ragtime is usually written in the form of dance music, but Stravinsky and other composers have investigated its possibilities as a branch of serious music.

Ragusa (Slav. *Dubrovnik*), a decayed city of Dalmatia, stands on the east shore of the Adriatic, 100 miles SE. of Spalato and opposite the Gulf of Manfredonia in Italy. It is surrounded with strong walls, and has a very picturesque appearance when seen from the sea. The city seems to have been colonised by refugees from Epidaurus (now Old Ragusa, a few miles to the south-east), Salona, and other Græco-Roman towns destroyed by the Slav invaders of the Balkan peninsula. For some centuries a Roman outpost on the edge of the Slav states, Ragusa flourished greatly under the suzerain protection of Byzantium, but towards the end of the 12th century she was made to acknowledge the supremacy of Venice, though she retained a large share of autonomy. In 1358 Venice ceded her Dalmatian possessions to Hungary, and from that time down to the era of the Napoleonic wars Ragusa generally looked to Hungary (i.e. the German empire) for help against her enemies, although from the beginning of the 15th century she was a free and independent republic. At the same time she became a prominent trading state of the Mediterranean, her prosperity being due to her position between the Christian powers and the empire of the Turks, and the privileges she enjoyed of trading freely with the subjects of the sultan. Her 'argosies' (i.e. 'vessels of Ragusa') traded as far as the Baltic; and a contingent joined the great Armada when it set sail for the invasion of England. Ragusa was the home from the middle of the 15th century of a remarkable literary movement, stimulated by the Renaissance (see SERBIA). In 1805 the French entered the city; this led the Russians to bombard it. In 1808 Napoleon declared the republic of Ragusa to be at an end, and in the following year he incorporated it in the kingdom of Illyria. From 1814 to 1918-19, like the rest of the Dalmatian seaboard, it belonged to Austria. Ragusa, however, had long been declining. The town suffered repeatedly from fires, plagues, and earthquakes, and its harbour, now sanded up, is of little use; as a port it has had to give way to Gravosa, a short distance to the north. Yet Ragusa still contains several striking and interesting buildings, chief amongst them the palace of the rectors (chief-magistrates), built in the Gothic and Classic Renaissance styles between 1435 and 1464; the custom-house and mint, dating from before 1312 and finished in 1520; the Dominican church (1306) and monastery (1348), the former containing a picture by Titian; the Franciscan church and monastery (1317); the church of San Biagio (Blaise), the patron saint of the town, built in 1348-52, but rebuilt in 1715; and the churches of San Salvatore and Alle Dancie. The earthquake of 1667 destroyed the old cathedral, which tradition says was founded by Richard I. of England on his way home from Palestine; its successor (1671-1713) possesses some valuable silver ornaments and curiosities. There is also a large Jesuits' church (1699-1725). The town has a naval college, tanneries, and soap factories, and there is considerable work in drawn-

thread, silver, and silver-filigree. It is the centre of a district important for its dates, vines, olives, and cheese. Pop. about 10,000. See Luigi Villari, *The Republic of Ragusa* (1904).

Ragusa, a town in Sicily, 31 miles WSW. of Syracuse, stands on the right bank of the Ragusa, 14 miles from the sea. In the cliffs below the walls and around the town ancient tombs have been excavated. A neighbouring grotto yields stones impregnated with bitumen. Ragusa is supposed to occupy the site of the ancient *Hybla Heræa*. It consists of two communes—an upper, with 37,204 inhabitants in 1921, and a lower, with 10,801, now called Ragusa Ibla.

Ragwort, the common English name of those species of *Senecio* (q.v.) in which the heads of



Common Ragwort (*Senecio Jacobæa*).

flowers have a spreading ray, the involucre has small scales at the base, and the leaves are pinnatifid. The British species are large coarse weeds, with erect stem and yellow flowers; one species, the Common Ragwort (*S. Jacobæa*), a perennial, is too plentiful in many pastures. It is refused or disliked by horses, oxen, and sheep. It is the cause of Pictou cattle disease in Nova Scotia, where it is called 'cattle-kill.' To sheep it is injurious but not fatal. It generally disappears from thoroughly drained

land, at least after a little labour has been expended in grubbing up its roots. The fresh herbage has been used to dye wool green, but the colour is not permanent.

Rahel, the wife of Varnhagen (q.v.) von Ense, a woman of great intellectual abilities and wide intellectual sympathies, might almost be called the foster-mother of German genius. Her name was RAHEL ANTONIE FRIEDERIKE LEVIN; she was a Jewess by birth, a sister of the poet Ludwig Levin (afterwards Robert-Tarnow), and she was born in Berlin on 19th May 1771. The first half of her life was spent in various towns of Germany, in Paris, and in Prague. Her first love having been killed in battle against Napoleon's army, Rahel became a Christian and married (in 1814) Varnhagen von Ense. Her house in Berlin was a gathering-place for men of genius—philosophers, poets, artists, and writers. She herself was greatly influenced when a girl by the writings of W. von Humboldt and F. Schlegel, and especially by Goethe, whom she called her *god*; and she in her turn recognised and encouraged the genius of Jean Paul, Tieck, De la Motte Fouqué, F. von Gentz, Fichte, Hegel, Gans, Heine, Thiers, Benjamin Constant, and others, but especially the writers of the Romantic school. Into the patriotic struggle against Napoleon she threw herself heart and soul. She died in Berlin on 7th March 1833. Her husband published a collection of her writings and letters as *Rahel* (1833), and three years later another collection. See also her correspondence with Veit (1861) and with Varnhagen (1875); and books on her by Schmidt-Weissenfels (1857),

Assing (1877), Mrs Jennings (1876), and Ellen Key (trans. 1913).

Rahere, founder of St Bartholomew's Hospital (q.v.). See *Book of the Foundation* (ed. Moore, E.E.T.S. 1923).

Rahway, a city of New Jersey, manufacturing textiles and chemicals, on the Rahway River, 4 miles from its mouth, and 20 miles W. of New York; pop. 11,000.

Rai Bareli, or RAI BAREILLY, a town of Oudh, India, 48 miles SE. of Lucknow, has a magnificent palace and some fine mosques; pop. 16,000.

Raiffeisen, FRIEDRICH WILHELM (1818–88), born at Hamm, near Coblenz, held various posts in the Prussian government service, but is known as the founder of the agricultural banks on a principle similar to the people's banks of Schulze-Delitzsch (q.v.) now found all over Germany, Austria, Switzerland, and Italy. He wrote several books in exposition of the system. See CO-OPERATION.

Raikes, ROBERT, a pioneer of the Sunday-school movement, was born at Gloucester, 14th September 1735. He succeeded to the business of his father as printer and proprietor of the *Gloucester Journal*, keeping it till 1802. He loved children all his days, and his pity for the misery and ignorance of many in his native city led him about 1780 to start a school where they might be taught to read and to repeat the Catechism. Accounts of the scheme in the columns of his journal attracted attention, the movement grew, and Raikes himself lived to see his schools widely spread over England. He died 5th April 1811, and was buried in the church of L'Mary de Crypt, Gloucester, all the children that attended his funeral being given by his directions a shilling and a plum-cake. See *Lives* by Gregory (1877), Eastman (1880), and Harris (1899).

Rail (*Rallus*), a genus of birds typical of the family Rallidæ, represented in Europe by the Water-Rail (*Rallus aquaticus*). This is a resident, or, more strictly, a partial migrant in Britain, a shy creature, slow to take wing. Its colours are mostly brown and gray; its length is 11½ inches; its food consists of aquatic plants, worms, slugs, and snails. The nest is made among sedges and grasses near water; there are 7–11 eggs, pale creamy-white, sparsely flecked with reddish-brown and ash-gray; there may be two broods in the season. At the breeding time the birds have



Water-rail (*Rallus aquaticus*).

a loud harsh call. The Corn-crake or Land-rail is a near relative, and the Moorhen is also allied. There are several well-known North American species of *Rallus*, such as the King-rail and the Clapper-rail. Wallace's Rail (*Habroptila wallacei*), from the Moluccas, and the Weka Rails (*Ocydromus*), of New Zealand, have lost the power of flight, and will probably suffer extinction, as has already happened in the case of some of their relatives.

Rails (Rallidæ) in the wide sense are characterised by compressed bodies well suited for rapid movement in thick vegetation, by colouration adapted for concealment, and by retiring, often crepuscular, habits.

Railways. The addition to tractive power through the diminution of friction to be obtained by the use of rails upon a roadway is so obvious a fact in mechanics that it is not surprising to find records from very early times of the employment of various materials with this object (see TRAMWAYS). Stone or wood was first used, but towards the end of the 18th century the improvements in the production of iron permitted the substitution of that metal on lines laid down in collieries and quarries. The employment of steam-power for locomotion on ordinary roadways was the subject of numerous experiments in various countries during the 18th century, but the credit of producing the first practical working engine is ascribed to Nicolas Joseph Cugnot (1725-1804), a native of Void in Lorraine. His carriage, constructed in 1769 at the French National Arsenal at the cost of the Comte de Saxe, ran on three wheels, and had two single-acting cylinders turning the front wheel. In the United States Oliver Evans (1755-1819) in 1804 constructed a steam dredging-machine which propelled itself on wheels to the river, a distance of $1\frac{1}{2}$ mile. The improvements in the steam-engine effected by the inventions of James Watt soon led to better forms of locomotives, and comparatively successful models were produced by William Murdock; by William Symington of Dumbarton, the pioneer of steam navigation; and later by Richard Trevithick, whose steam-carriage was exhibited in London in 1803. The development of the high-pressure engine was largely due to Trevithick's numerous experiments and inventions. The first railway locomotive was tried, it is said, on the Merthyr tramroad in 1804, but the experiment was not successful, though it is usual to regard Richard Trevithick as the 'father of the locomotive engine.' Otherwise, to the venerable 'Puffing Billy,' patented in 1813 by William Hedley, and now to be seen in South Kensington Museum, must be ascribed the honour of being the progenitor of the enormous stud of iron horses now existing in all quarters of

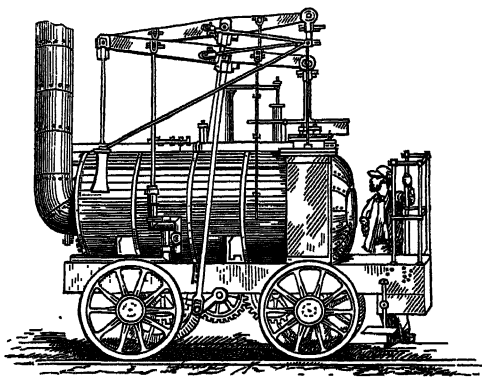


Fig. 1.—'Puffing Billy.'

the world. In previous experimental lines rack rails and toothed wheels had been provided under the mistaken notion that the adhesion of a smooth wheel to a smooth rail would not be sufficient. 'Puffing Billy,' after many trials and alterations, commenced regular working at the Wylam Colliery, near Newcastle-upon-Tyne, in 1813, and was kept in constant use until 1872, when it was purchased by the government.

A standing difficulty with the earlier forms of engine was the want of adequate and uniform steam-power, various devices being employed to secure the requisite draught to the furnace. The problem was first solved by George Stephenson. In 1815, after many previous experiments made while acting as colliery engineer, it occurred to him that the waste steam might be utilised as a blast to stimulate combustion, and from this idea, with the subsequent invention of the multitubular boiler (by Booth), securing enormously increased heating surface, the present form of locomotive was evolved. Other improvements made by Stephenson comprised the direct communication between the cylinders and the wheels, and joint adhesion of all the wheels by the use of horizontal connecting-rods. An engine constructed by him was the first to run on the Stockton and Darlington line, opened for public traffic on 27th September 1825. The engine weighed about 8 tons, and could make a speed of nearly 16 miles an hour. This engine for many years occupied a stand on the platform of Bank Top Station, Darlington. In 1924 it was shown at the British Empire Exhibition at Wembley, where it attracted great public interest. In 1925 it participated in the railway centenary celebration at Darlington, being propelled by a petrol engine fitted to a duplicate tender provided to enable it to run in the procession. The Stockton and Darlington line was constructed for mineral traffic; and it was not until the opening of the Liverpool and Manchester Railway that the vast possibilities of the new form of transport were proved beyond cavil. The directors of that company, with a view to settle the method of traction on the line then approaching completion, offered a £500 prize for the best locomotive engine. Stephenson's 'Rocket,' comprising the improvements above mentioned, was the only one that complied with the conditions laid down, and at the competition which took place at Rainhill in October 1829 its superiority was at once manifest. It drew a coach with thirty passengers along the prescribed course at the rate

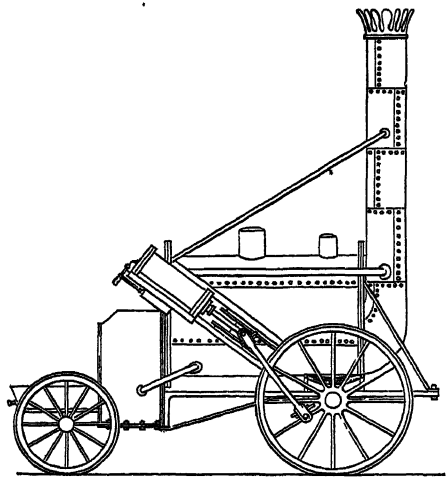


Fig. 2.—The 'Rocket.'

of 30 miles an hour. The 'Rocket' went into regular service on the opening of the railway in the following year. It weighed, with its supply of water, only $4\frac{1}{2}$ tons, and long after it had been superseded by heavier engines, on one occasion is said to have run 4 miles in $4\frac{1}{2}$ minutes. It was later used on the Brampton Railway in Cumberland, but has for many years occupied a stand in the

South Kensington Museum. All the many changes which have since been effected in the appearance and size of the locomotive have been more matters of detail than of principle. The 120-ton express passenger-engine, which runs at a speed of a mile per minute for miles together, does not differ materially in principle from George Stephenson's pioneer engines.

Dimensions have, of course, vastly increased, steam pressures then undreamt of are systematically used, and availability of high grades of steel has solved many constructional and operating problems, while substantially new systems of boiler, valve gear and motion design have superseded the early low-pressure non-expansion, relatively elementary and comparatively crude methods. Of later origin are the principles of compounding, applied in various ways, and still favoured to some extent, and for particular classes of engines; and superheating, which has become a characteristic of practically all modern locomotives. Mechanical and other lubricators, feedwater heating, special forms of valve gear, and various appliances and fittings are now in extensive if not general use. In essentials, however, the 'Rocket' included the features of successful locomotive design, though developed almost out of recognition.

Considerable diversity has hitherto existed in the type of locomotive on various lines; but the policy now adopted by nearly all the leading companies of manufacturing their own rolling-stock, and the obvious advantage of having interchangeable parts, has led of late to the gradual adoption of a more uniform style of construction for the different kinds of service required. As a general rule inside cylinders are in use in the British Isles, though many modern engines have them outside (three and four-cylinder engines necessarily have both inside and outside cylinders), and this is now almost invariably the case in foreign practice.

At one time the four-wheeled bogie was regarded as practically characteristic of American locomotives. Now, however, practically all express passenger locomotives have leading bogies, and this applies also to many mixed-traffic and express goods engines, though some of these have a two-wheeled 'pony' or 'bogie' truck instead. The ordinary six-coupled goods engines, together with some of the powerful eight-coupled mineral engines, still have, on most lines, only the coupled wheels, though there are many of the large classes with a two-wheeled truck leading the coupled wheels.

British railways have adhered systematically to the plate frame, and this applies generally in other countries except where the American bar-frame is used, and that, as a rule, in connection chiefly with American-built locomotives. Many railways still use the ordinary round-topped firebox, sometimes in combination with a wide grate of the Wootton type, as on the Great Northern section of the London and North Eastern Railway. The Belpaire firebox (flat-roofed, and more or less square) is, however, extensively employed, as it possesses many advantages, particularly in regard to staging and the provision of generous steam space above the crown of the firebox. Oil fuel is extensively used in the oil districts, and has gone ahead in countries where coal is expensive and has to be brought overseas. Otherwise, however, coal is still the general fuel for locomotives.

For purposes of easy reference engines are regarded as having wheels of three classes—leading (carrying), coupled (driving), and trailing (carrying). The number of each is given thus (a cipher indicates the absence of wheels of a particular class): 4-4-2, 0-6-2, 2-8-0, 0-6-0, &c. Special engines having two (or more) sets of coupled wheels necessarily require the middle figure (for coupled or driving

wheels) to be duplicated, while some special designs require six figures (carrying, coupled, carrying, carrying, coupled, carrying) to denote the arrangement.

The usual wheel types (frequently with long large-diameter boilers) for express passenger traffic are those known as the 4-6-2 ('Pacific'), 4-6-0, 4-4-2 ('Atlantic'), and 4-4-0, with some instances of the 4-8-2 ('Mountain'), and 2-6-0, 2-6-2, 2-8-0, 2-8-2 and other types for mixed traffic or steep gradient duty. In the mountains there are some instances of the use of ten-coupled and even twelve-coupled locomotives.

For goods and mineral service the usual types are 0-6-0, 2-8-0, 4-6-0, 0-8-0, 2-8-0, 2-8-2, and a few 0-10-0, 2-10-0 ('Decapod'), and 2-10-2 ('Santa Fe') engines. During recent years a large number of special types have been introduced, having two, or even three sets of coupled wheels, one or both sets being in pivotal relation to the engine as a whole. Some of these engines are compound, particularly the Mallet class, steam being used first in one set of cylinders and then in the other. These special types may be briefly classified thus:

Fairlie.—Two sets of coupled wheels in pivoted frames, one double boiler or two separate boilers in one frame. Usual types, 0-4-4-0 and 0-6-6-0.

Meyer and Mallet.—One boiler, rear set of coupled wheels in main frame, and leading set in frame connected to rear frame by hinged connection. In the Mallet type the rear cylinders use boiler steam, and the leading cylinders low-pressure steam from the rear set. Usual types, 0-4-4-0, 2-4-4-2, 0-6-6-0, 2-6-6-2, 0-8-8-0, 2-8-8-2, and 2-10-10-2. Also one of two special adaptations including three sets of coupled wheels extending under the tender, 2-8-8-8-2.

Garrett.—Two engine bogies carrying the main frame between them, so that the boiler is, as it were, slung between the pivots and is not restricted in dimensions by wheels and axles below it. Usual types, 0-4-4-0, 2-4-4-2, 2-6-6-2, and special forms, 4-4-2-2-4-4, 2-6-2-2-6-2, &c., together with a few eight coupled classes.

Kitson-Meyer.—An adaptation of the Meyer type above mentioned, with features introduced by Kitson & Co., Ltd., of Leeds.

These and other attempts to combine a large number of coupled wheels in an engine of limited size, or of well-distributed weight, and, at the same time, to obtain flexibility of wheelbase, are now extensively employed abroad, though there is little need for them in the British Isles (one or two classes are, however, in service or under construction), and, particularly in the United States, engines of tremendous size and power have been placed in service, in recent years, of these special types. 'Articulated' designs, as they are generally classified, are adapted in both tender and tank engine forms.

So far as tank engines are concerned, general use is made of them in the British Isles, and many interesting classes have been placed in service, some being intended for working express trains for runs of moderate length. The usual types now in use are: 0-4-4, 0-6-0, 2-4-2, 0-6-2, 0-6-4, 4-4-4, 4-6-2, 4-6-4, 0-8-0, 2-8-0, 0-8-2, and occasional instances of the 0-8-4 and 4-8-0, and (abroad) some with ten-coupled wheels. Some of these engines are actually adaptations of main line tender designs in tank engine form, and in some cases three and four cylinders are fitted.

With the development of electric traction numerous types of electric locomotives have been introduced, some of them including mechanical features derived from steam locomotive practice. On 'tube' and electrified suburban lines, however, the trains are usually made up of electric motor

and trailer cars, separate locomotives being used only (if at all) for working trains consisting of ordinary vehicles, so that they can be hauled on other stages by steam locomotives. In London, Paris, Berlin, New York, and, more recently, Madrid there are now systems of 'underground' or 'tube' lines all operated electrically, while the New York, Boston, and Chicago 'elevated' railways, and the Liverpool Overhead Railway, also many suburban lines in the vicinity of large cities, are now operated electrically. Electricity is now also often utilised for rack railways.

This type of railway has been adopted with advantage for the working of lines having steep grades. The Mont Cenis (1865) and Rigi Railway (1871) in Switzerland are among the best-known instances of this form of construction. The Zermatt Railway, 22 miles in length, opened in 1891, is a good example of 'combined' working, though many other, and in some respects more notable, lines of this kind have since been opened, especially in South America. A similar line ascends Pike's Peak in Colorado to a height of 14,134 feet. The highest points reached by the locomotive are Galera, a village in Peru, 15,635 feet, and those touched by a line from Galera rising 215 feet higher. The railway crossing the Andes in South America, from Buenos Aires to Valparaiso, is worked on this system for some 17 miles.

The Lartigue system of light railways, of which several short lines were constructed—one in Ireland (now dismantled) and others in France—comprises only a single rail. The carriages or receptacles for goods are balanced on either side, pannier fashion, on a pyramidal structure of wood or iron, 3 or 4 feet in height, which carries the rail. A 'bicycle' railway was proposed, and an experimental line constructed in the United States, the engine and carriages being retained on the single rail by an overhead support held between small horizontal wheels. Other forms of railway include the German suspended line from Barmen to Elberfeld, a distance of 9 miles, the Behr mono-rail sanctioned but not constructed between Liverpool and Manchester, and the Brennan patent, in which equilibrium on a single rail is maintained by a high-speed gyrostatis.

Carriages.—The builders of the earliest railways did not intend them for passenger so much as for goods traffic. On the Stockton and Darlington line ordinary coaches placed on suitable wheels were used for the small passenger business which was encouraged, and for many years the coach was the model for railway-carriage builders. Third-class passengers were accommodated in open wagons, with or without seats. So late as 1845 many of these vehicles had no windows, light and ventilation being provided by Venetian blinds. On several of the lines no lamps were supplied in third-class carriages even for the night journeys. The first-class passengers booked their tickets as in coaching days, and their luggage was packed on the roof of the carriage to which they were allotted. As the passenger traffic increased the public became more exacting in their demands, and gradually more attention was given to the comfort of travellers, and the tendency of modern management is to add to the luxuriousness of the carriages, especially in long-distance trains. On account of the gradual decrease of second-class passengers practically all railways have now abolished that class. Carriages for first and third-class in most express trains are now fitted with lavatories and every comfort for both classes. Drawing-room, luncheon, and dining-cars are also provided for day expresses; and sleeping-cars for night trains are fitted with all the luxury of a first-class hotel.

British Railway Statistics.—At the end of 1925 the railways of Great Britain had a route mileage

of 20,392 miles, of which over 11,000 miles were laid with at least two tracks. Including sidings, this represented a total track mileage of 52,231. For operating traffic there were 24,165 steam locomotives, 42 electric locomotives, 6 petrol locomotives, together with 133 locomotives for departmental and other purposes. There were 47,532 passenger-carrying vehicles normally worked by steam power, 2061 electric cars, 103 rail motor vehicles, and 21,585 other coaching vehicles, making a total of 72,823. For merchandise and mineral traffic, a total stock of 721,359 vehicles was available, with, in addition, 53,137 allocated for railway service purposes. In the same year the railways had 303 motor and 38 horse-drawn road vehicles for passenger traffic, and 2282 motor, 31,662 horse-drawn, and 70 miscellaneous road vehicles for parcels and goods traffic.

Brakes.—The supply of brake-power has been the subject of many ingenious patents, and is dealt with in a separate article in this work. The use of continuous brakes of some approved form on all passenger-trains in the United Kingdom was made compulsory by the Railway Regulations Act of 1889. See the article BRAKES.

Railway Construction.—The cost of constructing railways is dependent on many conditions, such as cost of labour, the nature of the district traversed, and value of the land required. In England the last-named item has been a very serious one, and heavy parliamentary expenses have also added largely to the cost per mile, which, including equipment, has averaged over £50,000 for the United Kingdom. The most expensive railway system in the world is the underground system known as the 'Inner Circle' line of London. A circular railway of this description was recommended by a parliamentary committee in 1864. The scheme was carried out by two companies, the Metropolitan and the Metropolitan District, which have since extended their respective systems into the suburbs. This circle, including the purchase of land, which was the heaviest item, cost from £600,000 to nearly £1,000,000 per mile. The Metropolitan line from Bishop's Road to Farringdon Street was opened on 10th January 1863, but the circle, owing to financial and other difficulties, was not completed until October 1884. Another very costly section of railway is that of the Southern system between Charing Cross and Cannon Street, London, which includes two large stations with hotels and two bridges over the Thames in its length of two miles. The cost of this short piece of line was over £1,000,000 per mile. Some of the recently constructed 'tube' and other lines, especially those built since the Great War, have involved expenditure on a very large scale. In other countries the land acquired has been of much less value, and in many cases has been given by the government. Moreover, the traffic has not been so heavy, and consequently lighter works have sufficed than those which the Ministry of Transport requires in Great Britain. The average cost of railways in the United States is thus under £12,000 per mile, and in Western Australia the railways have been built and equipped at about £4400 per mile. In flat tracts, such as the prairies, where the traffic is light, the rails can be laid with but little prepared roadway; but this is an exceptionally favourable condition, engineers in most cases having to span rivers (see BRIDGES), pierce hills or mountains (see TUNNELS), cut through elevations, and carry the line over low-lying ground on embankments. The roadway having been completed, a substantial bedding of gravel, burned clay, or other suitable material is laid, and in this are imbedded the 'sleepers,' to which the rails are fixed. In laying out a line it is of great importance that heavy gradients and

sharp curves should be avoided, as the former add to the cost of working and the latter interfere with speed. Some of the sharpest railway curves in the United Kingdom are on the narrow gauge Festiniog line, where there are curves as sharp as the sweep of Oxford Circus—of but 116 feet radius—for short lengths. This line runs to a point 700 feet above Portmadoc in less than 12 miles, giving an average gradient of one in 92, and a maximum gradient of one in 80. On the Sleaford and Bourne section of the London and North Eastern Railway the line, on the other hand, is practically level, the gradients averaging about one in 400. Before the Ministry of Transport will sanction the opening of a line it has to be satisfied as to the strength of the bridges, that a minimum distance of 6 feet has been left between the lines, and as to other conditions.

The form of 'permanent way' has altered considerably since the laying of the first railways. The first wrought-iron rails used on the Stockton and Darlington weighed 23 lb. to the yard. The cheapening of steel which followed the invention of the Bessemer process has led to the use of that material for rails throughout the world, and the size of the rails has been successively increased until between 85 and 100 lb. per yard is the usual weight. In British railway practice the rails are supported in cast-iron chairs held by wooden wedges, and the chairs are spiked on to transverse wooden sleepers. On American and colonial lines chairs are dispensed with, and the rails are spiked direct on to the sleepers. The joints are made by 'fish plates' bolted on each side of the rails, and the bolt-holes are made oblong or elliptical to permit of the expansion and contraction of road under changing temperatures. Blocks of stone were sometimes used in the early history of railways to support the metals, but the rigidity obtained was found to be very destructive of rolling-stock, and wooden sleepers lying on gravel ballast are now almost universally employed. Iron sleepers have been found serviceable in some countries where wood is liable to the attacks of insects.

Light Railways.—In order to benefit the agricultural and other interests in districts too poor to make or support a railway on the usual terms, the Light Railway Act was passed in 1896 to empower the construction of lines of cheaper construction and simpler working than the ordinary. To avoid the heavy parliamentary expenses, the bill gave power to a Light Railway Commission (now dealt with by the Ministry of Transport) to make inquiry, and, if it were satisfied, to issue orders (subject to the approval of the Board of Trade) for the construction of such railway. County, Burgh, and District Councils were empowered to initiate such railways, or to advance part of the necessary capital, and the Treasury could also advance a like sum at 3½ per cent. not exceeding one-fourth of the whole capital. About 750 applications have been received by the commission.

Signals.—At a very early stage of railway working a system of signals was found to be necessary. In 1830, when the Liverpool and Manchester line was opened, a flag by day and lamp by night were adopted; but this soon proved inadequate for the traffic, and in 1837 the managers of the Grand Junction Railway erected poles about 12 feet in height, with discs and lamps turned through a quarter circle by the pointsman working a lever at the base. About 1842 a semaphore signal, somewhat similar to those now in use, was introduced. Up to 1846 there were no 'distant' signals, but in that year this extra precaution was adopted. The successful concentration and interlocking of the levers working both points and signals was effected in 1856 at the Bricklayers' Arms Junction, and

in 1859 the first interlocking frame was fixed at Willesden Junction. Since that date the interlocking and concentration of signal and point levers has made rapid progress. The signals now in use may be classified as 'home,' 'distant,' 'starting,' 'advanced starting,' and 'disc,' the last named used on goods sidings. By the interlocking of points and signals, if the signalman has, for instance, moved a lever that opens a pair of points to enable a train to come out of a siding on to the main line, the 'home' and 'distant' signals must be at 'danger' to stop any train from approaching on the main line, and it is impossible for him to lower them.

During recent years pneumatic, electro-pneumatic, and all-electric signalling have been extensively introduced, and on many of the 'intense' traffic suburban and practically all underground and 'tube' lines automatic signalling is employed. In many instances the signals are entirely of 'light' type, in that shaded red and green lights are shown without a moving semaphore arm being employed at all. Similar light signals, but of greater power, intended for use also under daylight conditions, are used to some extent, and are known as daylight colour light signals. Such signals consist merely of combinations of red, green, and yellow lights in one casing, the respective colours being switched on or off as required, or more usually by the automatic signalling equipment, according to the presence or absence of trains in their respective sections. On some lines in Great Britain, and to a large extent in the United States, 'upper quadrant' signals are now used, these working upwardly instead of downwardly. Frequently, too, three-position methods are adopted, in that the arm is horizontal (red light) for 'stop,' inclined upwardly at 45° (yellow light) for 'caution,' and pointing vertically upwards (green light) for 'all clear.' The same principle applies to light signals utilising the three colours, yellow having been adopted in many cases for the 'caution' indication. In some instances the 'caution' indication and the yellow light are used for 'repeating' the next signal ahead, and not necessarily as an actual equivalent to a true 'distant,' which implies that the line is clear through the whole of the section ahead, and possibly past the complete series of 'stop' signals under the control of a particular signal box. A system wherein a 'double yellow' indication precedes a single yellow, thus combining to some extent the 'distant' and the 'repeater,' is now in use on parts of the Southern Railway.

In the working of a railway the telegraph plays a very important part. By its means trains are started and protected throughout their journey; the signalmen are placed in communication with each other, and are warned if the signals are not acting properly. Before the introduction of telegraphy, signals were placed at certain points, and kept fixed at 'danger' for a certain time before another train was allowed to pass. In 1853, however, the absolute block-telegraph system was introduced, and was made imperative on all railways by the act of 1859. Under the absolute block there can be only one train in a given section at the same time, while under the 'permissive' system there may be more than one train in each section. Taking A and B as the stations at each end of the section, the working of the absolute block system is thus arranged: the signalman at station A gives to station B what is called the 'Be Ready' signal, which indicates the nature of the approaching train. The man at station B, if the previous train has passed his cabin, and he knows that the section between A and B is clear, repeats this signal to the next box. The train is then

despatched from A, the signalman at that box giving the warning 'Train on Line,' which the man at B acknowledges, and at once gives the 'Be Ready' signal to C, and so on. As soon as the train has passed B, the man in that box telegraphs 'Line clear' to A, who acknowledges the message. Practically all running lines on double track sections in the United Kingdom are now controlled by block-working. On many single lines the 'train-staff and ticket' system is adopted. In this case, supposing there are two trains at one end of a line or section to proceed to the other end, the first would start with a ticket, the second carrying a staff which is the only key for the box in which the tickets are placed. No train is allowed to enter the opposite end of a section until the train staff arrives, so that it is impossible for two trains to meet.

On all busy single lines electric train tablet or train staff apparatus is now employed. The principle is the same in each case, though the apparatus differs. At each end of a section is a tablet or staff instrument, and, when required, a staff or tablet can be obtained from either, providing that no other tablet or staff is already in use. As a tablet or staff can be replaced in either instrument, it follows that, so long as one has not already been withdrawn, it is possible to send trains in either direction through the section as required. This system overcomes certain drawbacks of the ordinary train staff (and ticket) system, while the issue of tablets or staffs is governed by the instrument. Where fast trains are systematically run, it is now usual to provide apparatus on the engines and alongside the track, so that the pouches used for containing the tablets, or the train staffs themselves, by means of a ring attached thereto, can be exchanged at speed. Obviously, it is always necessary for drivers to ascertain, on receiving a tablet or staff, that it is the correct one for the section they are entering. Failure to do so has accounted for one or two accidents; otherwise, single lines are probably as safe as, if not safer than, double lines in regard to accidents arising out of signalling.

Mechanical details of signalling have on occasions to be superseded by manual work. In case of fogs a man, generally one of the platelayers, is stationed at the foot of each 'distant' signal, and as the semaphore is raised to 'danger' he places on the rails two detonating signals, which are exploded by the engine as it passes over them. If the engine-driver hears no explosion he knows the line is clear. Fog-signalling machines are now frequently installed, by which a fogman is able to place detonators on the rail without having to go on to the track himself. By this means one man is often able to fog-signal several lines. Similar repeating signals are usually placed adjacent to fog-signalmen's huts to inform them as to the indications of the signals they are looking after. On some lines fog-lights are now used, consisting of powerful electric lights repeating the indications of the signals to which they apply. They are placed at a level which can be conveniently seen by drivers (or motormen on electric railways), and have enabled fogmen to be dispensed with altogether on some of the busy suburban lines. These fog-lights are, of course, switched in only when weather conditions call for them.

Gauge.—In deciding upon the gauge to be adopted the constructors of the first railways naturally adopted that of the tramroads then in existence—viz. 4 feet 8½ inches, that standard having been fixed upon as being in common use for the ordinary vehicles of the country. On all the lines built by George Stephenson, and most of the other leading engineers in the United Kingdom, this 4

feet 8½ inches gauge was adopted; but in 1838 Brunel, in his desire to secure double the attained speed and capacity of the then constructed railways, determined upon a 7-foot gauge for the Great Western Railway. This brought about the now historic battle of the broad and narrow gauges. The Eastern Counties (the late Great Eastern), opened for traffic in 1843, had a 5-foot way, the Caledonian 5 feet 6 inches, and in Ireland there were 5 feet 2 inches and 6-foot gauges. So long as lines of different gauges serving separate districts did not come into contact the inconvenience of breaks of gauge were not felt, but when the broad and narrow gauges met at Gloucester in 1845, and at other points later on, the evil effects were soon felt. Goods and passengers had to be transferred from the one set of carriages to the other, and no through services were possible until at a later period the Great Western laid a third rail to accommodate the narrow-gauge trains. So serious became the difficulties which arose through the breaks of gauge that in 1845 a commission was appointed; it reported in favour of the narrow gauge, and in August 1846 an act was passed enacting that thereafter it should not be lawful to construct any railway for the conveyance of passengers on any gauge other than 4 feet 8½ inches for Great Britain and 5 feet 3 inches for Ireland. It was, however, provided that railways constructed before the passing of the act on any other gauge should be allowed to maintain their independence. The Great Western, therefore, continued to maintain its broad gauge until its final disappearance on 20th May 1892. Parliamentary sanction has, however, been given to various exceptionally narrow gauge lines. In most European countries the gauge adopted has been about the same as the British standard. In Spain, however, the gauge is 5 feet 3¾ inches, and in Russia, for military reasons, 5 feet was adopted. In India and on the South American systems 5 feet 6 inches is the gauge. The Australian states have varying gauges, and 3 feet 6 inches is the prevailing gauge in South Africa.

According to the Ministry of Transport report for 1924, 24 passengers only were killed, and 502 injured, in accidents to trains on the railways of Great Britain. Of the servants of railway companies, 225 were killed, either in accidents to trains or (the larger proportion) due to the movement of railway vehicles, while those injured totalled 3886. In addition, 3 contractors' servants were killed and 17 injured. Seeing that the total estimated number of passenger journeys made was, approximately, 1,744,000,000, the proportion of deaths arising from railway accidents, in the case of passengers, was one in about 73,000,000, and, of injured, one in about 3,400,000.

Speed.—Many old records of notable speed performances could be referred to, but it will be sufficient to consider only some of the more outstanding instances on record and to pay some attention to the work normally demanded of express passenger engines. Many claims for exceptional speed have been made on behalf of United States railways. It is doubtful, however, whether these can be accepted as entirely beyond question, but there are several records on British railways which were so carefully compiled as to be generally accepted as proved. The most remarkable run was one made in 1904, when a Great Western engine touched a speed of 102 m. p. h., while another, with a light load, covered 118½ miles in 99 minutes 46 seconds, start to stop, average 71·3 m. p. h., and incidentally completed the last 81½ miles in 62 minutes 55 seconds. These records were made with a light mail special. In the 1895 race to Aberdeen a London and North Western engine, again with a

light load, averaged 66 m.p.h. between Crewe and Carlisle, a by no means easy section. On many other occasions, various notable speed performances have been recorded on various lines. It is, however, in regard to daily schedules that the subject has most interest. So far as highest speeds are concerned, the fastest runs on British railways scheduled at over 60 m.p.h., start to stop, are:

Great Western Railway	... 77.3 miles in 75 minutes,	61.8 m.p.h.
London and North	{ 44.1 " " 43 " "	61.5 m.p.h.
Eastern Railway	{ 22.6 " " 22 " "	61.5 m.p.h.

There are also one or two other runs at almost, if not quite, the 60 m.p.h. average, though in view of the record performances indicated they have to take second place. Certain longer runs probably rank even more highly, although the over-all average may be somewhat less, particularly when loads are greater than those usually associated with the record runs mentioned. Thus, the Great Western Railway has two trains booked from Paddington to Bristol, 118.3 miles in 120 minutes, average 59.2 m.p.h. These trains, moreover, each convey a slip portion for Bath, booked to arrive in 105 minutes for the 106.9 miles. There are also two up expresses between Bristol and Paddington (*via* the Badminton route, which is slightly shorter though rather harder than that *via* Bath) in 120 minutes for 117.6 miles. The Great Western Railway has also trains booked between Paddington and Exeter, 173.7 miles in 179 minutes, average 58.2 m.p.h., not to mention a large number of other trains averaging at least 55 m.p.h. for distances ranging from 100 to 226 miles. On the L.M.S.R. the highest average is given on a short run between Birmingham and Coventry, 19 minutes being allowed for a distance of 18.9 miles, start to stop. Another Birmingham express gives, however, an average of 59.2 m.p.h. for a distance of 107.5 miles to Willesden Junction, 109 minutes being allowed. On this system there is also a large number of runs exceeding 100 miles in length and giving average speeds above 50 m.p.h., and in many instances above 55 m.p.h. The L.N.E.R. has, in addition to the 61.5 m.p.h. average runs above mentioned, a Great Northern section fastest run of 57 m.p.h., applying to a distance of 105.5 miles between Grantham and King's Cross in 111 minutes, besides non-stop journeys, ranging up to 198 miles, at averages of from 50 to 57 m.p.h. The fastest schedule on the Southern Railway is between Waterloo and Salisbury, 91 minutes being allowed for a distance of 83.8 miles by three trains. In the case of the grouped railways, while there may be one or more outstanding runs which rank as the fastest throughout the system, each section usually has a number of runs which are not much, if at all, inferior thereto. The Great Northern Railway of Ireland has one train booked to cover a distance of 8.2 miles in 9 minutes, average 54.7 m.p.h.; while the Cheshire Lines Committee has a train booked to cover 15.7 miles in 18 minutes, average 52.3 m.p.h. These are the only lines where average speeds exceeding 50 m.p.h. between stops are made, though there are numerous trains on all lines not much below the 50 m.p.h. standard.

So far as length of run is concerned, the Great Western Railway leads with an extreme distance of 225.7 miles between Paddington and Plymouth, still the world's record in this respect, the L.M.S. longest being the 205.5 miles between Euston and Prestatyn, and the L.N.E. longest the 198.4 miles between King's Cross and Harrogate. In regard to numbers of trains booked to cover more than 100 miles without stop, the L.M.S.R. leads with 68 such runs, followed by the L.N.E.R. with 50, and the G.W.R. with 26. The Southern Railway offers little scope for runs of extreme length, though during the summer there are certain trains,

running on Saturdays only, between Waterloo and Boscombe or Bournemouth (Central), 106.8 or 108 miles. On several sections of the grouped railways runs which come slightly below the 100 mile standard are made, the most notable being 14 trains between St Pancras and Leicester booked to cover 99.1 miles in 107 or a few more minutes. From the point of view of locomotive performance, runs such as those between London and Brighton, 50½ or 51 miles in 60 minutes, and between Charing Cross and Folkestone, 70 miles in 80 minutes, take a high place.

To the general traveller, however, the principal consideration is the time occupied in journeys between principal cities, and the following table shows distances and best times between London and certain large towns.

Town.	Distance from London. Miles.	Fastest Time.		Railway.	Section.
		h.	m.		
Aberdeen	523.7	11	40	L.N.E.R.	E. Coast.
"	589.7	11	40	L.M.S.R.	W. Coast.
Birmingham	112.9	2	00	L.M.S.R.	L.&N.W.
"	110.6	2	00	G.W.R.	—
Bristol	118.3	2	00	G.W.R.	—
Cardiff	145.1	2	40	G.W.R.	—
Chester	179.2	3	30	L.M.S.R.	L.&N.W.
"	195.2	4	08	G.W.R.	—
Edinburgh	392.7	8	10	L.N.E.R.	E. Coast.
"	399.7	8	07	L.M.S.R.	W. Coast.
"	407.2	9	10	L.M.S.R.	M.&N.B.
Glasgow	401.4	8	15	L.M.S.R.	W. Coast.
"	424.5	9	20	L.M.S.R.	Midland.
"	440.0	9	30	L.N.E.R.	E. Coast.
Hull	196.6	3	58	L.N.E.R.	G.N.
Inverness	558.4	18	20	L.N.E.R.	E. Coast.
"	567.8	18	25	L.M.S.R.	W. Coast.
Leeds	185.7	3	25	L.N.E.R.	G.N.
"	198.0	3	55	L.M.S.R.	Midland.
Liverpool	198.7	3	40	L.M.S.R.	L.&N.W.
Manchester	188.5	3	30	L.M.S.R.	L.&N.W.
"	189.9	3	57	L.M.S.R.	Midland.
" (a)	208.0	4	10	L.N.E.R.	G.C.
Newcastle	268.3	5	20	L.N.E.R.	E. Coast.
Nottingham	123.5	2	14	L.M.S.R.	Midland.
"	126.5	2	16	L.N.E.R.	G.C.
"	128.7	2	22	L.N.E.R.	G.N.
Plymouth (b)	225.7	4	07	G.W.R.	—
" (b)	280.9	5	12	S.R.	L.&S.W.
Sheffield	164.7	2	57	L.N.E.R.	G.C.
"	158.5	3	10	L.M.S.R.	Midland.
Southampton	79.3	1	32	S.R.	L.&S.W.
York	188.2	3	30	L.N.E.R.	G.N.

(a) London Road.

(b) North Road.

In the United States there are several runs at about 60 m.p.h., notably those made by trains between Philadelphia and Atlantic City by the respective routes, and in France there are several schedules approximating to this level (there were many more before the war). For long journeys between the great cities of the United States and of Europe it is obviously impossible to expect more than 30-35 m.p.h. as a throughout average for several hundred or a thousand miles or more, this including stops *en route*, and the slower times necessarily taken on the mountainous stages. Apart from the United States and France, there are not many instances of averages above 50 m.p.h. for long distances, though this figure is attained in Germany, Italy, Belgium, Holland and other European countries, as also in India, South America, Canada, Australasia, and elsewhere. On the long, narrow-gauge railways of South Africa, to attain 30-35 m.p.h. throughout is very creditable work, especially when the severe gradients usual on such railways are taken into account.

Fares and Rates.—The whole question of rates and charges on British railways is still unsettled, but the standard for passenger fares may be taken at about 2d. per mile first class, and 1½d. per mile third class. The experience over a series of years has shown a constant increase in the volume of third class travel, which now accounts for about 85 per cent. of the whole passenger business in the United Kingdom. In 1872 the Midland Company

decided on the abolition of the second class, and other companies in England and Scotland gradually adopted the same policy. In the United States the average fare may be taken at 1½d. per mile, extra charge being made for drawing-room and sleeping cars.

With regard to goods, the charges on British railways are higher on the whole, but the speed of the goods trains and the character of the service are superior. In the United States a great deal of the goods traffic is handled by express companies making additional charges for their services. With long hauls in some foreign countries, of course, lower mileage rates can be charged. The grain rates in America had been reduced to about ¾d. per ton per mile, and on Indian railways, with cheap labour and fuel, a standard of ¾d. per ton per mile was reached, but figures are now necessarily higher in both cases.

Capital, Revenue, &c.—The act of parliament authorising the construction of the Stockton and Darlington Railway, the first used for passenger traffic, received the Royal assent on 19th April 1821. The first rail was laid on 23rd May 1822, and on 27th September 1825 the railway was opened with great ceremony. Four hundred and fifty passengers were conveyed in the first train. The train arrived at Darlington, a distance of 8½ miles, in 65 minutes. When fifty years later the jubilee of the railway system was celebrated there were 16,449 miles of railway working in the United Kingdom, representing a capital cost of £600,895,000, and producing from traffic a revenue of £56,898,000, of which £24,893,000 was received from passenger fares and £32,005,000 from the conveyance of goods and minerals.

At the close of 1925 there were, as already mentioned, 20,392 route miles of railway in Great Britain. The total capital return created after adjustments following upon the amalgamations which became effective as from 1st January 1923, was £1,170,258,632. The total capital expenditure (in round figures) is £1,198,600,000. Gross receipts during the year were £199,600,000; expenditure, £165,000,000; and net receipts, £34,600,000. Numbers of passengers with ordinary tickets conveyed on a single journey basis were: 1st class, 20,788,000; 2d class, 2,772,000; 3d class, 900,729,000. Adding 308,272,000 workmen's tickets, this makes a total of 1,232,561,000. Season tickets were thus allocated on an equivalent annual basis: 1st class, 117,900; 2d class, 48,900; 3d class, 684,000—total, 850,800. Including allowances for an average number of passenger journeys made by season-ticket holders, these together represent about 1,743,000,000 passenger journeys annually. Goods and mineral traffic statistics for the year were: General merchandise, 59,712,000 tons; coal, coke, and patent fuel, 193,623,000 tons; other minerals, 62,513,000 tons—total, 315,848,000 tons. Head of live-stock carried during the year numbered 18,661,000.

The railway system of the United Kingdom has not been developed according to any plan previously marked out, nor does it owe any of the position which it now holds to support or assistance given to it by the state. It is the outcome of private enterprise carried on in very many instances under great difficulties, in spite of much national and local prejudice, and at an expenditure of capital greatly in excess of that which would have been required under more favourable conditions. In 1830 the Duke of Wellington, then at the head of the government, was asked to appoint some engineers to lay out four or more main lines which would form the great highways for the locomotive. The duke's reply was that he did not like railways; and Mr Goulburn, the Chancellor of the Exchequer, declined to take any action in the matter, on

the ground that interference with vested interests would create an amount of opposition which the government could not withstand. Private enterprise speedily supplied the impetus to railway development which the national government refused to give. The Liverpool and Manchester Railway was opened for traffic in 1830, and in 1838 there was a completed line between London and Birmingham. During the interval of the opening of these two lines—now absorbed in the London, Midland, and Scottish system—fifty-six acts of parliament were passed authorising the construction of 1800 miles at a total estimated cost of 45 millions.

The Railway Mania.—A later period, marked with greatly increased activity on the part of promoters and engineers, culminated in the 'Railway Mania,' followed by a great financial collapse. Parliament had required as a condition precedent of considering any new railway bills that a deposit of 10 per cent. of the estimated cost should be lodged with the accountant-general by the promoters, and 5 per cent. for parliamentary expenses. On the 30th of November in 1845, the latest date at which the Board of Trade would receive plans of new railways, there had been lodged 1263 bills, with plans and sections for new railways, representing a capital of 563 millions, and requiring the deposit of a total sum of 59 millions. The amount required for payment of the deposit exceeded by more than 20 millions the whole amount of gold and coin in the Bank of England and notes in circulation. The publication of these figures created alarm, and a panic ensued, the stocks of existing railways were greatly depreciated, and the premiums on the shares of the newly-promoted companies, which had been created by a wild spirit of speculation, disappeared, and widespread ruin and commercial disaster ensued. The result was that, of the 1263 companies which were promoted, 120 only survived the ordeal of parliament.

Railway Administration.—In order to compensate to some extent for the lack of original design and system in connection with the railways, the companies resorted at various times to numerous plans for amalgamation, fusion, purchase, or working agreements between themselves. There were in 1922, after numerous changes and dissolutions, about 290 railway companies in the United Kingdom, including light railways. Of the railways owned by these companies 97 were worked or leased by other companies. The situation is now, however, altered in material respects, arising mainly from the new conditions created by the Great War.

Post-War Developments.—During the war period British railways were administered (under the Regulation of the Forces Act, 1871) on behalf of the government by the railway executive committee, consisting of general managers of principal railways, railway revenue being guaranteed while these conditions continued. After the war control and guarantee were continued for some time, so that it was not until August 1921 that the railways were returned to independent operation. By that time, however, proposals for amalgamating into a few big companies had so far developed that, under the authority of the Ministry of Transport, a bill was brought before parliament, and eventually passed as the Railways Act of 1921, providing for the amalgamation of all the larger railways and many of the smaller ones into four big companies. As from 1st January 1923, therefore, nearly all the old companies were merged in one or other of the four new companies—the London, Midland, and Scottish, London and North Eastern, Great Western, and Southern. In Ireland, following upon the setting up of the Irish Free State, proposals were advanced in 1923-4 for amalgamating all the railways

in the latter into one concern, and except for the Great Northern Railway and railways in Northern Ireland, all except a few minor concerns are now combined as the Great Southern Railways.

Receipts for traffic in which more than one railway is concerned are allocated by the Railway Clearing-house (see CLEARING-HOUSE). In 1888 an act was passed giving to the Board of Trade authority to call for returns, and deal with the schedules of rates and classifications of the companies. This work is now in the hands of the Ministry of Transport, in view of the Ministry of Transport Act of 1919 and the Railways Act of 1921.

The earliest railways were authorised on the supposition that they would, like canals, be highways for the use of carriers. A scale of maximum tolls was prescribed in each act, and the canal classification of goods adopted. Later on the railway companies prepared a new classification. Each railway act also contained a clause authorising the railway company to charge a reasonable sum in addition to the maximum tolls, in order to cover carriers' services, risks, and profit.

Although the companies had thus power to charge certain rates, the *maxima* were seldom enforced; but even with the lower level of actual charges the traders were dissatisfied, and demanded frequent inquiries into the working of railways. Three such inquiries were held between 1866 and 1884, but the companies were on the whole acquitted of the charges brought against them. As the result of the inquiry of 1872 a Railway Commission of three members was appointed, for five years, to deal with disputes between traders and the railways. This commission was renewed in 1878 and 1883, and as the result of further inquiry the act of 1888 appointed a permanent commission to sit in England, Scotland, and Ireland to decide all questions arising under the various acts, and as to rates. Renewed dissatisfaction as to rates led to another inquiry by a select committee in 1893; and this resulted in the act of 1894, further regulating the powers of the companies as to rates, which has worked in a fairly satisfactory manner. Under the Railways Act of 1921 a Railway Rates Tribunal was set up to deal with the whole question of rates and charges. Its sittings were still in progress at the time of writing.

Results of Railway Working.—At the time when the Liverpool and Manchester Railway was completed, ten miles an hour travelled by the fast stage and mail coaches was about the limit of speed attainable. At the opening of the London and Birmingham Railway there were 3026 stage-coaches, 54 four-horse and 49 pair-horse mail-coaches in use. The full seating capacity of these vehicles, each being licensed to carry fifteen passengers, would represent 16,500,000 individual journeys in the course of the year, and it may be safely assumed that not more than 10 millions of such journeys were made. The extent of correspondence among the population was officially stated at 82 millions of letters. In 1924 the number of passengers carried on the railways was nearly 1743 millions. On the basis of work done by stage-coaches in 1837, we should require nearly a million of these vehicles to move the passengers now conveyed over the 20,000 or so miles of railway. On 30th November 1839 the first of Her Majesty's mails was transferred from the mail-coach to the railway. The increased facilities thus afforded converted a uniform penny post from a theory into a reality when that system came into operation on 5th December 1839. The news in those days was carried at an average speed of $8\frac{1}{2}$ miles per hour. The railways carry the mails at an average speed of over 45 miles per hour.

There are now about 680,000 employees on the railways of Great Britain, the most numerous classes being: clerks about 85,000; enginemen, 85,000; guards, 26,000; labourers, 38,000; permanent way men, 64,000; porters, 28,000; cartage men, 20,000; signalmen, 30,000. In view of difficulties which arose largely from the railway strike of 1911, a system of Conciliation Boards was set up in that year, and, although modifications have since been made, the general system still obtains, elaborated by Central and National Wages Boards to decide matters in dispute. In 1919, in view of conditions which had arisen during the war period, an eight-hour day was standardised throughout the greater part of the railway service, and, in conjunction with arrangements by which wages were governed by the official cost of living figures, a system of grading with minimum wages for employees in each grade or class was set up. Slight modifications have since been made, but, in the aggregate, these arrangements still obtain.

State Ownership of Railways.—It may be assumed in general that railway construction and development has been less hampered by state interference in the British Islands and in the United States than in any other parts of the world, and it is precisely in these countries that railways have attained their highest development. In the Railway Act of 1844, power was given to the state to acquire the lines in the United Kingdom at 25 years' purchase of the annual divisible profits estimated upon the average of the three next preceding years, conditioned, however, on right being reserved to those companies which were not receiving dividends equal to 10 per cent. on the capital stock to require that the purchase price should be left to arbitration. The question of state purchase was left an open question by the act, and, moreover, some 2300 miles of line previously sanctioned were not covered by its provisions. In most of the British colonies the government has either built or subsequently purchased the lines. Railway construction in France was undertaken in a much more methodical manner than in Great Britain. The country is partitioned out among six great companies, and competition has thus been entirely avoided. The government owns about one-third of the capital invested, and will ultimately about the middle of the 20th century become the absolute proprietor of the various systems. The state has the right to fix fares and charges, and to determine the amount of new mileage to be constructed from time to time. So far as technical skill is concerned, the railways of the country are well managed, but, except for the chief expresses, the accommodation provided is far inferior to that in Great Britain or the United States; passenger-trains, other than the fast through and international trains, are comparatively few and crowded, and the freight service is very slow. The main lines are very remunerative in their operations, but the local roads are mostly worked at a loss. In Germany the roads were owned and managed by the government, and political and military considerations were paramount in the working of the system. They are now administered by a specially formed company with international control. The lines were cheaply constructed, the cost being less than half per mile than in Great Britain. The tendency in most other European countries is towards state ownership or control of railways.

Railways in the United States.—By far the greatest and most rapid development of railway construction in proportion to population has taken place in the United States, and the working of railways in all parts of the world owes much to the characteristic inventive genius of Americans. The building of railways has not been hampered in the

United States by undue legislative restrictions, and it is only recently that state ownership has been seriously discussed; land has been cheap or free for occupation, and the distances to be traversed are great. Before the date of the celebrated locomotive trial which evolved the 'Rocket' an engine was run in America called the 'Stourbridge Lion,' a machine made in England, and imported by the Delaware and Hudson Canal Railroad Company. The first railroad in the United States was, however, begun in 1828 by the Baltimore and Ohio Company, a section of 15 miles from Baltimore to Ellicott's Mills being opened in May 1830. Horse-traction was first used on this line. American engines are now found competing with English-built machines in many parts of the world.

It is, however, in the matter of carriage construction that the American railroad engineer has marked out an independent path and obtained the most striking results. For many years European railway carriages adhered closely to the model of the old stage-coach. The longer distances travelled on the American continent, and the republican spirit which objected to the division of classes, led to the adoption across the Atlantic of the long railroad car, with a central passage between the seats. The great size and weight of these structures necessitated increased attention to such details as springs, couplings, and brakes, and in the provision of such accessories for comfort and safety American railroad practice was for long in advance of that in any other part of the world. Republican simplicity notwithstanding, the demand for improved accommodation gave rise to drawing-room, sleeping, and dining-room cars, and the stock turned out for these purposes by the Pullman and other companies challenged comparison with the provision made for the travel of royalty in the Old World. The 'Vestibule' trains running on most of the trunk-lines for long distances—say between New York and Chicago—represent the highest ideal yet obtained of luxurious travelling. Railway stock of this character is partly owned by independent companies, whose officials collect the extra fares for the accommodation.

In the United States, from 1830 to 1923, a total of 265,000 miles has been constructed, about one-third of the railways of the world. Previous to 1850, the greater portion of the railroads made were in the states bordering on the Atlantic, and were for the most part isolated lines employed for local traffic. A great development to this form of enterprise was given by the discovery of gold in California, and lines were rapidly pushed towards the centre of the continent. The great civil war at the commencement of the next decade emphasised the necessity of direct communication with the growing Pacific states to cement the Union, and government assistance was freely given both in land-grants and money to the two companies, the Union Pacific and Central Pacific, which, building respectively from the east and the west, met near Salt Lake City in May 1869, the total length from the Missouri River to San Francisco being 1700 miles. Since that date other transcontinental lines have been completed, including the Canadian Pacific and Canadian National routes across Canada. The rate of general railroad construction has varied considerably, but the most active period was that between 1880 and 1890. In 1882 11,569 miles were built, and in 1887 no less than 12,878. A large extent of this mileage was built in advance of the necessities of the districts traversed, and in other cases existing lines were paralleled to the heavy loss of the interests concerned. These periods of over-construction and resulting competition, combined with a necessary reduction of mileage rates as the centre of agricultural production moved westward across the

continent, caused at times much depression in railroad securities. The system of finance under which the companies borrow money on mortgages with foreclosure powers (not possessed by owners of British railway debentures) has also been the cause of heavy loss to investors in American railroads, many of which have passed through the ordeal of reorganisation with the accompanying 'assessment' or 'wiping out' of junior securities.

To remedy the effects of over-competition, a system of 'pooling' receipts was adopted by the various trunk-lines. Under this plan the receipts from any given description of traffic were made into a common purse, and divided among the companies concerned in an agreed ratio. The State railroad commissions were powerless to deal with traffic originating or passing out of their respective territories; but in 1888 the Interstate Commerce Commission was appointed with federal authority to deal with questions affecting railway traffic. Under the law appointing the commission, 'pooling' receipts was made illegal, and the well-known 'long and short haul' clause, establishing uniform mileage rates, was, contrary to the result, expected to produce disastrous results to railway revenues.

During following years many developments occurred, but the placing of the railways under federal control when the United States entered the Great War, and for some time after its conclusion, introduced new conditions, and a new railway era is in process of evolution. During 1921-22 a proposed Transportation Act introduced new features, and its passing has given rise to a number of schemes for amalgamations on varying principles. It is practically certain that such amalgamations will occur in due course, but it is not yet clear how they will be carried out. Meanwhile, the creation of a Railway Labour Board and anti-railway political action, together with the conditions occasioned by the high ratio of expenditure to revenue and the post-war trade depression, have rendered it difficult to provide for the 'standard' revenue indicated by the Transportation Act, and at the same time to carry passengers and freight at reasonable though necessarily increased rates.

Capital invested in United States railways amounts to some \$20,000,000,000, applying to about 260,000 route miles. Revenue for twelve months is in the neighbourhood of \$6,300,000,000. Operating expenditure is about \$5,000,000,000, the ratio to revenue being approximately 80, while the return on valuation is about 4.53 per cent. The equipment includes about 70,000 locomotives, 60,000 passenger cars and 2,500,000 freight cars (average 42.5), together with 110,000 service vehicles. There are about 1,800,000 railway employees. During twelve months some 1,050,000,000 passengers are conveyed by United States railways, while freight tonnage amounts to some 2,000,000,000. The average passenger journey is 36 miles and the average freight journey 178 miles. The average tonnage of freight trains is about 640.

While by far the greater proportion of passenger trains do not reach high average speeds, largely owing to the fact that in the country districts even the expresses have to do much intermediate work, while routes are largely single track and gradients frequently very severe, in the neighbourhood of the great cities and connecting them very creditable express trains are run. On a few particular services, such as those between Philadelphia and Atlantic City, there are, indeed, expresses averaging over or substantially 60 m.p.h., and a number of the inter-town expresses, such as those between Philadelphia, New York, Boston, Washington, &c., average 55 m.p.h. or even more. In general, however, speeds do not usually reach 50 m.p.h.,

and for the long runs very creditable work is required to haul lengthy and heavy trains of all-steel cars at averages of between 30 and 40 m.p.h., including stops, for several hundred or a thousand miles.

Colonial and Foreign Railways.—Canadian railways adopt methods more or less akin to those of the United States, and it is, indeed, a practical necessity that they should do so, in that physical connection is made with United States lines in many places. Certain Canadian train services are through to places beyond the frontier, and both passenger and freight cars have necessarily to circulate to some extent in both countries. Until recently the two great railways were the Canadian Pacific and the Grand Trunk Railway of Canada, there being also the Grand Trunk Pacific, Canadian Northern, Inter-Colonial and a few other lines. During 1921-23 the Grand Trunk Pacific was first combined with the Canadian Northern, Inter-Colonial and other lines, to form a new National system, and the Grand Trunk was then added, so that these lines together form what are now known as the Canadian National Railways, leaving the Canadian Pacific as the principal, if not the only, railway not under direct government control. The Canadian National Railways are, however, organised as a company, in which practically all the stock is held by the government. Together, these railways provide a route mileage of approximately 40,000 miles, the Canadian National system being slightly the larger. Capital cost is approximately \$300,000,000. During a recent year some 45,000,000 passengers were carried an average journey of 64·8 miles, while some 103,000,000 tons of freight were carried an average haul of 296 miles. Total receipts annually are about \$450,000,000, and operating expenditure \$390,000,000. Employees number about 160,000. For traffic purposes there are approximately 6100 locomotives, 6800 passenger vehicles, 232,000 freight cars, and 17,500 service vehicles.

In the case of Indian railways there is considerable diversity in the relations of the state to the various lines in respect of ownership and control. Five of the large systems in which the government of India is interested are owned and worked by the state; six are owned by the state, but worked on its behalf by companies enjoying a guarantee of interest from the government; three others, and many of less importance, are the property of private companies, some being worked by the owning companies and some by the state or by companies that work state-owned systems; and several minor lines are the property of district boards or enjoy a guarantee of interest granted by such boards. In the case of all railways, however, the government of India exercises certain general powers, and under the provisions of contracts, exercises detailed control over management, and by virtue of financial interests (preponderating in the case of most of those of first importance) has considerable power and influence in the working of virtually all railways. A majority of the contracts with earlier companies provided for acquisition by the state on specified dates, and many systems have been thus taken over, though in several instances new leasing or working contracts have been made, so that present conditions are essentially different from the earlier ones they succeeded, even where they bear the same titles. These new contracts have often been associated with a degree of re-arrangement; other systems, or parts thereof, being associated in such new contracts.

In the early days of railway enterprise in India the agency of private companies guaranteed by the state was exclusively employed, and nearly all the great trunk-lines of the country were made under

this system. The government gave the land for the lines free of charge, and guaranteed interest generally at 5 per cent. on the share capital and a lower rate upon the debentures for ninety-nine years. Any surplus earnings after the guaranteed rates were paid were divided equally between the government and the companies. Moreover, the government retained the right of buying the undertakings at specified dates on payment of the value of the stock calculated at its market price on the average of the three preceding years. In this way the East Indian Railway was acquired in 1880, the Eastern Bengal in 1884, the Sind, Punjab, and Delhi in 1885-86, the Oudh and Rohilkund at the end of 1888, the South Indian in 1890, the Great Indian Peninsula in 1900, the Bombay and Baroda in 1906, the Madras in 1908, and the Indian Midland in 1910. In 1870 a new policy of railway development by the direct agency of the state was inaugurated; and in 1880-81 the system of encouraging private enterprise by state assistance was again adopted. Both agencies are now employed. In some instances—notably the Bengal and North-Western line—railways have been constructed without any direct pecuniary assistance; in others a subsidy or limited guarantee has been granted. The agency of private companies has also been employed by the government both in the construction and working of state lines. In all cases the government has the power of taking over the railways at specified periods on stated terms, and in 1925 the East Indian and Great Indian Peninsular Railways were thus taken over. In 1884 a select committee reported in favour of a more rapid extension of railways than had been taking place, and recommended the broad gauge—i.e. 5 feet 6 inches—except in tracts where the metre or smaller gauge was already in successful operation, and for local lines where the traffic could only be light. A valuable and comprehensive report was prepared by Mr Thomas Robertson, the special commissioner appointed by Lord Curzon to inquire into the working and administration of Indian railways. The first railway opened in India was that of the Great Indian Peninsula Company from Bombay to Tannah, traffic being commenced on 4th May 1853. There is a total railway mileage of approximately 38,000. Some 550,000,000 passengers are conveyed annually an average journey of 38·66 miles, while freight tonnage is about 90,000,000, the average haul being 32 miles. Total receipts are about £65,000,000, and operating expenses £40,000,000. Railway employees number about 712,000. There are approximately 9100 locomotives, 25,000 passenger vehicles, and 197 freight vehicles.

In South Africa practically all the railways are now in the hands of the Union railway system, except as regards Rhodesia and certain other districts, where, however, relations are very close. The South African Government Railways operate approximately 12,000 miles of railway, with 1900 locomotives, 3100 passenger vehicles, and 33,000 freight vehicles, while the number of passengers carried annually is about 66,000,000, and freight tonnage approximately 19,000,000. In Cape Colony the first railway was opened 26th June 1860.

In Australasia practically all the railways are owned and operated by the respective states. More recently, the Commonwealth government has also undertaken the construction of railways in various districts where the individual governments could hardly be expected to do so. A vexed question in Australia is that of gauge, which offers important hindrances to the working of through traffic. Thus, while New South Wales and the Commonwealth itself use the ordinary gauge of 4 feet 8½ inches, in Victoria and South Australia

the Irish gauge of 5 feet 3 inches is used. South Australia has also a considerable mileage of 3 feet 6 inch gauge, which is also the gauge of Queensland and Western Australia. Tasmania and New Zealand use the 3 feet 6 inch gauge, but as they are islands this occasions no particular difficulty. A few general particulars may be given in tabular form.

	Route Mileage.	No. of Loco-motives.	No. of Passenger Vehicles.	No. of Freight Cars.	Annual No. of Passengers.	Annual Freight Tonnage.
New South Wales	5530	1375	2194	21,928	128,000,000	6,500,000
Queensland	6040	713	920	15,599	29,535,981	4,273,926
South Australia	3452	486	724	9,350	25,177,933	3,565,307
Tasmania	673	96	232	1,797	2,959,887	706,961
Victoria	4443	747	1894	19,235	167,861,864	8,809,543
Western Australia	3629	406	665	9,974	18,133,163	3,023,299
New Zealand	3053	655	1527	26,195	13,836,311	6,925,517

The dates of opening of the first lines of each colony are: Victoria, 13th September 1854; New South Wales, 29th May 1855; Queensland, 31st July 1865; South Australia, 26th April 1856; Western Australia, 21st January 1864; Tasmania, 10th February 1871; New Zealand, 1st December 1863.

In Europe many changes have occurred during recent years as a result of re-arrangement of territory in certain districts as a consequence of the war. Conditions are, moreover, in a transitory state, while the railways are in many instances in process of re-equipment. It will, therefore, be sufficient to indicate briefly the approximate present-day mileage in the principal countries.

	First Railway opened.	Mileage	
Austria	—	4,000	
Belgium	5th May 1835.	6,900	Including local railways
Bulgaria	—	1,630	
Czechoslovakia	—	8,500	
Denmark	18th September 1844.	620	
Estonia	—	2,700	
France	1st October 1828.	33,300	
Germany	7th December 1835.	36,200	
Greece	18th February 1869.	1,860	
Hungary	20th September 1828.	4,400	
Italy	3d October 1839.	13,600	
Latvia	—	1,780	
Lithuania	—	1,950	
Netherlands	13th September 1839.	2,400	
Norway	14th July 1853.	2,100	
Poland	—	9,900	
Portugal	9th July 1854.	2,100	
Rumania	—	7,260	
Spain	30th October 1848.	9,560	
Sweden	9th February 1851.	9,360	
Switzerland	15th June 1844.	3,400	
Turkey	4th October 1860	680	
Yugoslavia	—	5,600	

In the case of Russia, figures remaining after the formation of new countries indicated are too indefinite to be stated. Prior to dissociation the proper mileage for Russia, Siberia, Finland, &c., was in the neighbourhood of 55,000. The total European mileage is approximately 237,000, of which about half is state-owned. North and South America have some 380,000 miles, of which about 51,000 are state-owned. In Asia there are approximately 75,000 miles of railway, about two-thirds being state-owned. In Africa there are about 33,000 miles, of which approximately 18,000 are state-owned; and in Australasia the total of about 25,000 miles is almost entirely state-owned.

For completeness, the approximate mileages in a few other countries may be mentioned, as follows:

	Opening date.	Mileage.
Argentina	14th December 1864.	23,200
Brazil	30th April 1854.	17,800
Chile	January 1852.	5,500
China	—	7,000
Egypt and Sudan	26th January 1856.	4,500
Japan	—	9,800
Mexico	8th October 1850.	16,200
Peru	20th May 1851.	2,000

See Francis, *History of the English Railway* (1851); W. Galt, *Railway Reform* (1865); Smiles, *Lives of George and Robert Stephenson* (1868); Colburn, *Locomotive Engineering* (1871); Arthur Helps, *Life of T. Brassey* (1872); Francis Trevithick, *Life of Trevithick* (1872); *Railway Year Book*; *Universal Directory of Railway Officials*; R. Maxwell, *George Stephenson* (1920); J. Tatlow, *Fifty Years of Railway Life* (1920); C. J. Allen, *Modern British Permanent Way* (1915); W. H. Cole, *Permanent Way Material, Plate-laying and Points and Crossings* (1920); Wm. Hepworth and J. T. Leeds, *Railway Permanent Way Dimensional Theory and Practice* (1922); F. A. Talbot, *Making of a Great Canadian Railway* (1912); Lord Monkswell, *French Railways* (1911); C. H. Grinling, *History of Great Northern Railway* (1903); E. A. Pratt, *History of Inland Transport and Communication in England* (1912); W. L. Steel, *History of London and North-Western Railway* (1914); C. E. Stretton, *History of Midland Railway* (1901), *Modern Railway Working*; W. W. Tomlinson, *North-Eastern Railway* (1914); W. J. Gordon, *Our Home Railways* (1910); E. A. Pratt, *Rise of Rail Power in War and Conquest* (1915); W. E. Simmet, *Railway Amalgamation in Great Britain* (1923); J. F. Gairns, *Railways for All* (1923); G. G. Jackson, *Railways of Great Britain* (1923); G. L. Boag, *Railways of Spain* (1923); E. Protheroe, *Railways of the World*; W. T. Jackman, *Transportation in Modern England* (1916); J. P. Griffiths, *Transport* (1919); C. H. Grinling, *Ways of our Railways* (1915); *Wonder Book of Railways* (12th ed. 1925); G. Hughes, *Construction of the Modern Locomotive*; E. L. Ahrons, *Development of British Locomotive Design*; Hodgson and Williams, *Locomotive Management, from Cleaning to Driving* (1920); *Locomotive of To-day*; W. F. Pettigrew, *Manual of Locomotive Engineering* (1901); E. L. Ahrons, *The Steam Locomotive* (1922); J. F. Gairns, *Locomotive Compounding and Superheating* (1907), *Superheating on Locomotives* (1913); G. L. Boag, *Manual of Railway Statistics* (1912); C. P. Mossop, *Railway Operating Statistics* (1911); C. B. Byles, *First Principles of Railway Signalling* (1910); A. E. Tattersall, *Modern Developments in Railway Signalling*; F. Raynar Wilson, *Railway Signalling: Automatic* (1922), *Railway Signalling: Mechanical* (1923); C. P. Mossop and F. H. Graveson, *Railway Operating Statistics* (2d ed. 1923); G. Bulkeley, *Mechanical Appliances for Handling Railway Traffic* (1921); Travis, Lamb, and Jenkinson, *Practical Railway Working* (1915); P. Burt, *Principal Factors in Freight Train Operation* (1923); W. H. Jarvis, *Railway Stores Methods* (1918); E. S. Hadley, *Railway Working and Appliances* (1909).

Raimondi. See MARCANTONIO.

Rain. Whatever lowers the temperature of the air below the point of saturation, or the dew-point, may be regarded as a cause of rain. Various causes may conspire to bring about this change of temperature, but by far the most important of these originate in winds and other movements of the atmosphere. The more prominent principles of the connection of the winds to the rainfall are these: (1) When the winds have traversed a considerable extent of ocean before reaching land the rainfall is large; (2) when the winds, on arriving at the land, advance into higher latitudes or into colder regions the rainfall is largely increased, for the simple reason that the air is now more rapidly brought below the point of saturation; (3) if the winds, even though they arrive directly from the ocean, have not traversed a considerable breadth of it, the rainfall is not large—indeed, in the case of the sea-board of Lower California the mean annual amount, as at San Diego, is only 10 inches; (4) if the winds, even though they have crossed a great extent of ocean, yet on arriving at the land at once advance into lower latitudes or into warmer regions, the rainfall is small; (5) if a range of mountains lie across the onward course of the winds, the rainfall is largely increased on the side facing the winds, but reduced over the region on the other side of the range; the reason being that, as the air on the windward side of the ridge is

suddenly raised to a greater height in crossing the ridge, the temperature is still more reduced by mere expansion, and a more copious precipitation is the consequence. On the lee side, as the air descends to lower levels, it gradually gets drier, and hence the rainfall of necessity diminishes with every stage of the descent to lower levels.

Attention may be here drawn to the diminished velocity of the wind over land as compared with the open sea. The observations of the *Challenger* Expedition (q.v.) in 1872-76 proved that an envelope of stiller air, or air of less velocity as compared with that of the ocean, broods over the land, and by its presence forces the wind blowing across the land to a greater height, thus augmenting the rainfall. This dragging effect of the land on the wind, and the important consequences resulting from it, explain how it is that during north-easterly storms of rain the foreshores of the Firth of Forth, Moray Firth, and Pentland Firth, which look to the north-east, receive a much heavier rainfall than other parts of Scotland in these circumstances. On the Ayrshire coast the annual rainfall at Ayr is 38 inches, but at Girvan it rises to 51 inches. Both stations are close to the coast, the only difference being that the hills to the eastward approach much nearer the coast at Girvan.

For short periods the heaviest rainfalls occur with thunderstorms, and with tornadoes, waterspouts, and other forms of the whirlwind, for the reason that there is rapid expansion due not only to the rapid ascent of the air, but also to great rarefaction produced by the extreme velocity of the gyrations of the air round the axis of the whirlwind. One of the heaviest rainfalls yet recorded in the British Islands was 2.24 inches in 40 minutes at Lednathie, Forfarshire, during a severe thunderstorm on 18th June 1887. At Camberwell, London, 3.12 inches fell in 2 hours 17 minutes on 1st August 1846. Of heavy falls during one day the following may be mentioned: Bruton, Somersetshire, 9.56 inches, 28th June 1917; Cannington, Somersetshire, 9.40 inches, 18th August 1924; Kinlochquhich, Inverness, 8.20 inches, 11th October 1916; Seathwaite, Cumberland, 8.03 inches, 12th November 1897; Ben Nevis Observatory, 7.74 inches, 6th February 1894; Brundall, Norfolk, 7.31 inches, 26th August 1912; Angerton Hall, Northumberland, 6.70 inches, 7th September 1898; Doncaster, 6.06 inches, 17th September 1913.

In the United States, where severe thunderstorms and tornadoes more frequently occur, the daily rainfalls repeatedly exceed these amounts. Thus, during the years 1885-89 the following heavy rainfalls of one day were recorded: Brownsville, Texas, 12.94 inches in September 1886; Pensacola, 10.70 inches, June 1887; Key West, 7.80 inches, September 1889; Chattanooga, 7.61 inches, March 1886; Shreveport, 7.54 inches, January 1885; and a day's rainfall of from 5 to 7 inches is repeatedly recorded in the United States. These amounts are greatly exceeded in lower latitudes. In 1906, 41 inches fell in 13 hours at Suva (Fiji Islands); while on the Khasi Hills, India, 30 inches on each of five successive days have been recorded; at Bombay, 24 inches in one night; and at Gibraltar, 33 inches in 28 hours.

As regards the ocean little is yet known from observation. This, however, is clear, that in the equatorial belt of calms between the regions swept by the two trades the rainfall of the ocean reaches the maximum; and the parts of the Atlantic and Pacific which are longest within the belt of calms as it shifts northward and southward with season have the heaviest ocean rainfall. But, though the cloud-screen is unquestionably dense and the rainfall frequent and heavy, the observations of the *Challenger* and the *Novara* showed that the state-

ments generally made as to these are very greatly exaggerated. Over the open sea in the regions of the trades the rainfall is everywhere small, owing to the circumstance that these winds are an immediate outflow from anti-cyclonic regions, their dryness being further increased since their course is directed in regions that become constantly warmer.

The trades, however, deposit a larger rainfall over islands and other land-surfaces which they traverse; the amounts being proportional to the height of the land, but more particularly to the degree in which the high land ranges lie across the paths of the winds. Thus, at Ascension, which is within the south-east trades the whole year round, the annual rainfall is 5.16 inches on the low ground, but it increases to 26.02 inches on Green Mountain; at St Helena on the coast it is 5.47 inches, but on the high land in the interior of the island it rises to 40 inches. In the western division of the Pacific, for some distance on each side of the equator, the rainfall is very slight, and extensive guano deposits are formed on Malden and other islands scattered over that region. In Mauritius, on the weather shore of the island, the annual rainfall is about 50 inches; but at Cluny, 16 miles inland, it is 146 inches, the latter place being in the neighbourhood of extensive forest-clad mountains.

The heaviest rainfalls of the globe are brought by the winds which have traversed the greatest extent of ocean within the tropics. These conditions are most completely fulfilled from June to September by the winds which, beginning their course from about 30° S. lat., blow north on southern Asia as the south-west monsoon, which accordingly distributes a heavier rainfall over a larger portion of the earth's surface than occurs anywhere else in any season. On these summer winds the rainfall of India chiefly depends, and the 'lie' of the mountain-systems with respect to the winds intensifies the effects. The following in inches are the annual amounts at different points in the west from Surat southward: Surat, 41; Bombay, 71; Mahabaleshwar, 263; Banca, 251; Honawar, 139; Calicut, 117; and Cochin, 115. In the west of Ceylon the rainfall is also large, being at Colombo 83, at Galle 92, at Ratnapura, inland among the hills, 151; but in the east of the island, before reaching which the monsoon is deprived of much of its moisture, it is considerably less, being at Mannar 39, at Jaffna 49, and at Trincomali 63. The rainfall is also very large in Burma, being at Akyab 196, Sandoway 214, Diamond Island 118, Rangoon 99, Tavoy 215, Mergui 163, and Port Blair 117. In the north-east angle of the Bay of Bengal, and thence north to Bhutan, the rainfall is great, rising at Cherrapunji, in the Khasi Hills district, to 424 inches—or about 35 feet—being one of the largest known rainfalls anywhere on the globe. Owing to this diversion in the course of the monsoon the valley of the Ganges enjoys a generous rainfall. On the other hand, the rainfall is small over the plains of the Punjab, being at Multan 6.92 and at Karachi 7.64, increasing over the higher parts of the province, at Lahore 20, Umballa 31, Simla 63, and Dharmasala 122.

The key to the distribution of rainfall over the East Indian Archipelago and Australia is the distribution of pressure from south-eastern Asia to Australia, with the resulting prevailing winds. During the winter months pressure diminishes rapidly from Asia southwards, and northerly winds prevail. Now, as these winds have travelled a great breadth of ocean, they arrive in a highly saturated state and deposit a heavy rainfall over these islands and the north of Australia. The degree to which these rains penetrate into Australia depends entirely on the strength of the

winter monsoon. On the other hand, during the summer months pressure increases from Asia southwards, and southerly winds set in from Australia to Asia, distributing in their course a very large rainfall over the islands of the Eastern Archipelago, rising at several places to 30 inches a month. The small rainfall in such islands as Timor, which are more immediately sheltered, as it were, by Australia during these southerly winds, impresses on the region well-marked dry and wet annual seasons. These marked differences among the climates of this archipelago really depend on the geographical distribution of land and sea in this part of the globe, and must therefore be regarded as permanent differences, and as having played no inconspicuous part in the unique distribution of animal and vegetable life which is so characteristic of the archipelago. Since in the summer of the southern hemisphere the winds blow from the sea inland, and in the winter from the land seaward, it follows that generally the summer is the rainiest season. In the interior, along the Murray River and its affluents, the rainfall everywhere is necessarily small. In the north of New Zealand the winter rainfall is the heaviest, but farther south, where the wet westerly winds prevail with some constancy at all seasons, the rainfall is distributed pretty equally through the year, and is of course largest on the western slopes of these islands. Thus, while in the east it is at Dunedin 37 and at Christchurch 25 inches, in the west it is at Hokitika 116, and at Beaby, inland, 106 inches.

Europe as regards its rainfall may be divided into two regions—the countries bordering on the Mediterranean, and the rest of the continent. A vast ocean on one hand, a great continent on the other, and a prevalence of westerly winds, rule the distribution of the rainfall in western and northern Europe. Now, since these westerly winds have traversed a vast extent of ocean before arriving at the land they distribute a large rainfall, particularly on hilly regions opposing their course. Thus, over a large part of the Highlands of Scotland more than 80 inches fall annually, and over fully one-third of the British Islands the annual amount exceeds 40 inches. On the other hand, in eastern districts on the lee side of the great mountain-ranges, the rainfall does not exceed 30 inches over a large portion of England and in some of the best agricultural districts of Scotland. In the west of Norway it is 68 inches at Bergen, 46 inches at the Lofoden Isles, and 10 inches at the North Cape; over large portions of Sweden it is 21 inches, and in Russia and Siberia it varies from below 10 to 23 inches. Spain presents great extremes, from 70 in the north-west to 13 inches at Saragossa. In the plains of France and Germany it varies from 20 to 35 inches, rising, however, on approaching the Alps to more than 100 inches. In western Europe the greater part of the rain falls in winter, but in the interior of the continent in summer. The summer climates of the extreme south of Europe and in the north of Africa, situated at comparatively low levels, are practically rainless.

The summer winds in the south-east of the United States are southerly; and, as they have previously traversed a considerable extent of ocean, they arrive well but not supersaturated, and pour down a monthly rainfall of 6 inches or more from Louisiana to Chesapeake Bay. The comparative equableness of the rainfall over the eastern states is the result of the absence of mountain-ridges lying athwart their path, and of the winds passing into higher latitudes and therefore cooler regions. Again, the distribution and amount of the summer rainfall in the west and north of the United States is really determined by the low atmospheric pres-

sure which has its centre in the region of the Rocky Mountains. To the west of this low pressure winds are generally north-westerly, and as they thus pass into hotter regions the summer rainfall in these parts of the United States and Canada is either nothing or very small; whereas on the east side winds are southerly, and the rainfall consequently equals, or even exceeds, that of the finest agricultural districts of Great Britain.

As regards the rainfall of the two months, January and July, the following show in inches the average amounts for various places: Vera Cruz, 1.59 and 7.84; Pará, 12.52 and 5.91; Manaos, 8.50 and 1.50; Buenos Aires, 3.15 and 2.21; Corrientes, 5.24 and 2.67; and in Africa—Alexandria, 2.13 and 0.00; Algiers, 4.02 and 0.12; Senegal, 0.28 and 3.00; Sierra Leone, 0.41 and 35.58; Cape Town, 0.70 and 3.65; Durban, 4.57 and 1.24; and Zanzibar, 3.07 and 2.44. The explanation of these and similar differences is found in the seasonal changes of the wind. South Africa presents the strongest contrasts of climate so far as the rainfall is concerned, its climates being divided into two totally distinct classes, the climates of the Natal coast and of the inland regions where the rains occur during the summer months, and the climates of the other regions where the rains fall chiefly during the winter months. The driest region of Africa is doubtless the Sahara, and the wettest the coast of Sierra Leone, Liberia, and the Bight of Biafra.

See Hann's *Climatological Atlas*, and the *Physical Atlas* by Buchan, Bartholomew, and Herbertson (1899); Herbertson's *Distribution of Rainfall over the Land* (1901); H. R. Mill's annual *British Rainfall*; M. de C. S. Salter's, *The Rainfall of the British Isles* (1923); Loomis's *Meteorology* (new ed. 1889). See also METEOROLOGY, RAIN-GAUGE, BLOOD-RAIN, SHOWERS.

Rain-birds, any birds popularly supposed to foretell rain by their cry—many of them cuckoos of various species in North America, India, and the Malay Peninsula. It is doubtful whether any reliable forecast of the weather can be thus obtained.

Rainbow. The rainbow is the best known of all optical meteorological phenomena, consisting of a coloured arch formed opposite the sun on falling raindrops, and visible whenever the necessary conditions of a passing shower on one side and a clear and not too high sun on the other occur. Two bows are frequently seen, each exhibiting the full spectrum of colours from red to violet; but in the inner or primary bow the red is the outer edge and violet the inner, while in the outer or secondary bow the

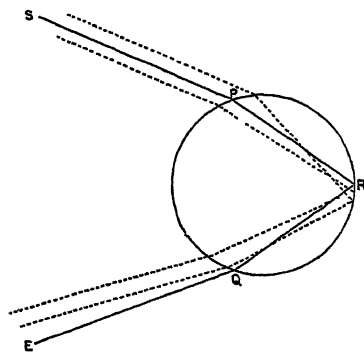


Fig. 1.

order is reversed, the red being inside and the violet on the exterior. The colours are always arranged in a definite order, that of the solar spectrum—viz. red, orange, yellow, green, blue, indigo, and violet, but shade imperceptibly into

each other. The cause of this breaking up of the sunlight into its constituent colours is explained in most physical and meteorological text-books (see *Light*, by Professor Tait, chap. x., or *Meteorology*, by F. Loomis, par. 416), but may be briefly summarised as follows:

For the primary bow (fig. 1), let PQR represent the section of a raindrop, and SP a ray of light falling on it. The ray enters the drop at P, meets the surface again at R, is reflected to Q, where it leaves the drop in the direction QE. The ray is refracted or bent on entering the drop at P and again on emerging at Q—the amount of this refraction depending on the acuteness of the angle at which the ray meets the surface. Now it may be shown that there is a particular point P, such that any ray from S striking the surface below P emerges again above Q, and any ray above P also emerges above Q—the former owing to the more acute angle of the reflection, and the latter to the greater refraction on entering and leaving the drop. The course of two such rays is shown by the dotted lines in fig. 1. Q is thus a turning-point in the emerging rays, and near it a very large number of rays pass out, and an observer at E sees a bright image of S in the direction EQ. This statement applies to any one colour of sunlight; but, as the refrangibility increases from red to violet, the latter is bent more at P and Q, and the line EQ lies at a flatter angle. The observer, therefore, sees the violet rays reflected on drops at

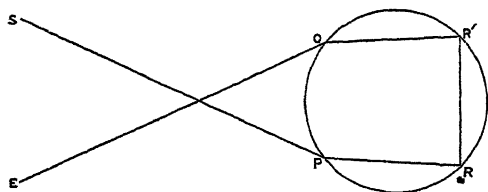


Fig. 2.

a less altitude than those that reflect the red, the other colours being intermediate. The raindrop being spherical, this reflection takes place in all directions, the fixed condition being the radius of the bow, that is the angle between the line from the observer to the bow and that passing from the sun to the observer, or, in other words, the observer's shadow. For red light this angle is $42^{\circ} 39'$, and for violet $40^{\circ} 13'$. If the sun were a luminous point each colour would be sharply defined, but as the disc of the sun subtends an angle of about $30'$ each colour is broadened to this amount, and they overlap.

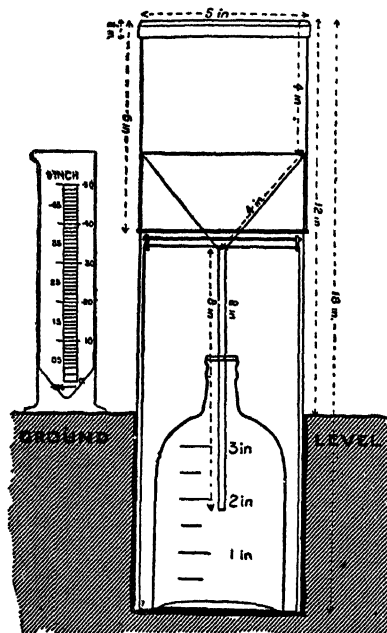
Exactly similar reasoning explains the secondary bow (fig. 2). The light that forms it has been twice reflected, at R and at R', the point Q lies above P, and rays entering either above or below P all emerge below Q. A glance at the diagram will show that the greater bending of the more refrangible rays makes the line EQ more nearly vertical, and therefore the violet rays form the outer edge and the red the inner of the secondary bow. The radius of the red is $50^{\circ} 5'$, and of the violet $54^{\circ} 0'$. The space between the bows gets no reflected light, but that inside the primary and outside the secondary is faintly illuminated by rays such as are indicated by the dotted lines in fig. 1 and their equivalents in fig. 2, which are not shown. These rays 'interfere' (see INTERFERENCE) with each other, and cause alternations of colour which appear as spurious bows inside the primary and outside the secondary. They can only be seen with strong sunlight and small drops of rain.

The radius of the primary bow being roughly 40° , it is evident that it cannot be seen when the sun is at a greater elevation than this, as the highest part of the bow would lie below the horizon. Hence in the latitude of Edinburgh rainbows cannot be seen for several hours about noon at the time of the summer solstice. If the drops of water be very small the interference of the rays causes such a complete overlapping of the colours that the bow appears white: this is the case generally with a fog-bow.

Intersecting rainbows have frequently been seen. When the sun is reflected from a surface of still water a bow is formed by the reflected image as well as by the sun itself. Lunar rainbows often occur, but the feebleness of the moon's light usually prevents any colours being observed. There are many popular weather prognostications connected with rainbows, all dependent on the fact that they imply local passing showers. 'A rainbow in the morning is the shepherd's warning: a rainbow at night is the shepherd's delight,' is easily understood when we remember that the rainbow is formed opposite the sun, and that weather-changes in the British Islands generally pass from west to east.

Rainey's Corpuscles. See GREGARINIDA.

Rain-gauge. The quantity of rain that falls is measured by a rain-gauge, of which there are many patterns in use. As experience has shown the great desirability of uniformity, either the Snowdon pattern, 5 inches in diameter, or the Meteorological Office pattern, 8 inches in diameter, should be employed. In no circumstances should rain-gauges of the Howard, Fleming, Symons, or British Association pattern be used, since experiments have shown that they are all open to grave



'Snowdon' Rain-gauge.

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defects. The Snowdon gauge (see fig.) consists of a copper or tin cylinder 5 inches in diameter, and about 18 inches long, sunk 6 inches in the earth, so that the receiving surface is as near as possible 1 foot above the ground. In order to

prevent out-splashing during very heavy falls of rain or hail, and also to facilitate the retention of snow in high winds, the funnel which communicates with the bottle or can in the interior of the cylinder is placed 4 inches below the rim of the rain-gauge, which is sharp-edged. To the left of the rain-gauge is shown the graduated glass measure; this holds half-an-inch of rain, and is graduated in tenths and hundredths of an inch. To facilitate the measurement of amounts of less than one hundredth of an inch, the rain-glass is made conical below.

A rain-gauge should be placed on a level piece of ground, at a distance from every object higher than itself, and not nearer to a wall or a house than a distance equal to the height of that object. The gauge should be planted in the earth, or placed in a hole which exactly fits it in a block of cement, so that it will keep level even in the strongest wind. Various forms of recording rain-gauges have been invented. Of these, perhaps the best known are the Beckley and the Hyetograph, but the more recent 'natural syphon' patterns possess important advantages over the older forms. In these automatic gauges a continuous trace of the rain that has fallen is given by means of a pen on a revolving drum actuated by clockwork. In this way is shown not only the amount, but the time over which the rainfall is spread. The drum carrying a specially prepared chart usually revolves once in 24 hours, but in some cases the drum completes a revolution in a week.

Rainier, MOUNT, or TACOMA, one of the highest peaks of the Cascade Range (q.v.), was in eruption during part of 1894.

Rainy, ROBERT, Scottish divine, was born at Glasgow on New Year's Day 1826, the son of the professor of Forensic Medicine there. After studying at Glasgow and New College, Edinburgh, he entered upon his first charge at Huntly Free Church in 1851, but was transferred to Edinburgh by a General Assembly resolution in 1854. Some eight years later he became professor of Church History in the Free Church College, attaining the principalship in 1874. He visited Australia in 1906, but died at Melbourne on 22d December. An outstanding figure in the ecclesiastical politics of Scotland in the later 19th century, Rainy is chiefly remembered for his part in the union of the Free and United Presbyterian Churches in 1900. He was thrice moderator of Assembly. His writings, not many in number, include *Three Lectures on the Church of Scotland* (1872), being a reply to the Dean of Westminster's lectures on the subject; *The Bible and Criticism* (1878); *The Ancient Catholic Church* (1902). See Life by P. C. Simpson (2 vols. 1909).

Rainy Lake, forming a portion of the boundary line between Ontario and the United States, lies 100 miles north-west of the nearest point of Lake Superior, and is about 50 miles long. It discharges by Rainy River into the Lake of the Woods. There were gold finds on the Canadian side in 1896-97.

Raipur, a town in the Central Provinces of India, standing on a plateau (950 feet), 180 miles E. of Nagpur, has numerous tanks and groves, an old fort (1640), and a trade in grain, lac, cotton, &c.; pop. 38,000.

Rais. See RETZ.

Raised Beaches. See BEACHES (RAISED), UPHEAVAL.

Raisins are dried grapes, used for cooking, for dessert, and in the manufacture of wines. They are produced in largest quantities in the south-eastern provinces of Spain (Málaga, Alicante, and Valencia), in Cos and Samos, and the adjacent districts on the mainland; smaller quantities are grown in Provence,

Southern Italy, the islands of the Greek Archipelago, and Crete. Currants (q.v.) are a small and peculiar variety produced in Greece, in the Morea, and the Ionian Islands. The grapes intended for raisins are dried either on the vines, after the stalks of the bunches have been partly cut through, or spread out on the ground; it is only in case of continued bad weather or persistent want of sunshine that they are dried by artificial heat. The better qualities are left on the stalks and dried in bunches; these are exported for use as dessert. All less estimable qualities are intended for cooking purposes, and, to a less extent, for the preparation of artificial wines or the improvement of wines of inferior quality. Raisins are rich in sugar, and it is this property that makes them serviceable to the manufacturers of wine. The bunches intended for table use are sometimes dipped in water upon the surface of which swims a layer of olive-oil, or in a strong potash lye. The object is to make the skin soft and give it a glossy lustre. The raisins grown in Spain are large and blue, and are known in the market as 'Malaga raisins', and as 'lexias,' the former for dessert, the latter for cooking. The raisins of Asia Minor are shipped principally at Smyrna (q.v.), and embrace the Elemé and similar varieties, which are long and light brown in colour, and sultanas, small light-brown grapes, with a thin and delicate skin and no seeds or kernels.

Rājā, or RAJAH (from the Sanskrit *rājan*, 'king,' cognate with the Lat. *reg-* of *rex*), originally a title which belonged to princes of Hindu race, who, either as independent sovereigns or as feudatories, governed a territory. Now, however, the title has a much wider extension: it is used of independent sovereigns, of subject or 'protected' princes, of petty chiefs, of great landowners, and of some persons of eminence. *Mahārājā* is 'great prince' (*mahā rājā*). *Rānī* is a *rājā*'s wife.

Rajamahendri (or *Rajahmundry*), a town of India, in the Presidency of Madras, stands on the left bank of the Godavari, 30 miles from its mouth. It has a museum, a provincial school, two gaols, and some Christian churches. From 1753 to 1758 it was held by the French. Pop. 54,000.

Rajmahal, a decayed town of India, stands on a steep eminence on the right bank of the Ganges, 170 miles NNW. of Calcutta. It was long the chief town of the Bengal and Bihar provinces, but is now deserted and ruinous, being only noteworthy for the remains of its palaces, formerly belonging to Shah Shuja and Kasim Ali, and as a station in an important transit trade. Its commercial value has been lessened in consequence of the Ganges often shifting its bed at this point. In the beginning of the 19th century it had 25,000 inhabitants, and now only about 3500.

Rajon, PAUL ADOLPHE, an etcher, was born at Dijon in 1842, and trained in Paris, partly at the School of Fine Arts. About 1865 he turned to etching, and gained immediate success with his first plate, 'Rembrandt at Work,' after Meissonier. Standing in the front rank of French etchers, he won several medals at the Salon exhibitions, and produced numerous beautiful etched portraits and plates for books. In 1872 he visited England, and published in London in 1873 a portrait of J. S. Mill after Watts, as well as in subsequent years many other plates. His greatest achievements were 'The Emperor Claudius,' a picture by Alma Tadema, the portrait of Darwin by Oulless, and those of Tennyson, Joachim, and Mrs Anderson Rose by Watts. He died at Auvers-sur-Oise on 8th June 1888. See *Twelve Etchings by P. A. Rajon*, with Memoir by F. G. Stephens (1889).

Rajputana, an administrative territory of India, embracing twenty-one Indian states and the

British districts (2711 sq. m.) of Ajmere-Merwara. It lies between Sind, the Punjab, Agra and Oudh, and the native states of Central India (on the S.). Area, 131,600 sq. m.; pop. (1901) 9,723,300—less by 2½ millions than in 1891, owing to famine; (1921) 10,339,655. The most important of the Indian states are Jaipur, Jodhpur (or Marwar), and Udaipur (or Mewar); next follow Alwar, Bhartpur, Kotah, and Bikaner. This region is crossed by the Aravalli Mountains, and consists in great part of sandy, barren plains, though there are of course numerous fertile valleys and other tracts. It gets its name from the ruling race or predominant Aryan tribes, called Rajputs. They are a proud aristocracy, own the soil, and have furnished ruling dynasties to very many of the states of India. Yet in 1921 they were but 626,000 in number. At the time of the Mohammedan invasions in the 11th century the Rajputs ruled over half-a-dozen strong states—Kanauij, Ajmere, Anhilwara, Udaipur, and Jaipur. From the end of the 16th to the middle of the 18th century these states acknowledged the supremacy of the Mogul emperor of Delhi. Then they were made to recognise the Mahrattas as their masters: since the Mahrattas were crushed by the British, the Rajput states are independent allies.

Rajshahi. See RAMPUR BAULEAH.

Rákóczi March, a famous Hungarian tune. Its authorship has been variously attributed, but it is generally assumed that it was made up of camp alarms and other military calls by some musician in the service of Prince Franz Rákóczi II. (1676–1735), whose unsuccessful rebellion against the Austrians ended in exile. About 1700 the song in its original form of three 12-barred periods appeared, but it was probably not put down on paper till the end of the century. Berlioz made an audacious setting of it as 'Marche Hongroise' in his *Damnation de Faust* (1846), and Liszt transcribed it in one of his Hungarian Rhapsodies.

Rakshas. See DEMONOLOGY.

Raleigh, the capital of North Carolina, is near the Neuse River, 186 miles SSW. of Richmond. The town is regularly built on an elevated site, with a central Union Square, from which four principal streets radiate, each 99 feet wide. In the square stands the capitol, a large domed building of granite. The city contains also various state institutions, colleges, iron-foundries and machine shops, and manufactures cottons, fertilisers, cars, &c. Pop. (1920) 24,418.

Raleigh, SIR WALTER, the typical gallant and hero of England's heroic age, was born of an ancient but decayed family at the manor-house of Hayes, near Budleigh in East Devonshire, probably in 1552. He was the second son of his father's third wife, who herself had been married before, and had borne her husband the famous Humphrey and Adrian Gilbert. He entered Oriel College, Oxford, about 1566, but left without a degree, most probably in 1569, to volunteer into the Huguenot cause in France. Here he served his apprenticeship to arms, but, beyond the fact that he was present at Montcontour, we know little of this period of his life. In 1578 he joined Humphrey Gilbert's luckless expedition, having most probably already crossed the Atlantic; and early in 1580 he landed in Cork at the head of a troop of one hundred foot to act against the Irish rebels. He quickly attracted notice by his dash and daring, took part in the assault of the fort at Smerwick and subsequent massacre of the six hundred Italian and Spanish prisoners, and seems to have approved thoroughly of all the drastic measures taken by the government to stamp out rebellion. He saw some months of

further hard and thankless service in Munster, but in December 1581 returned to England.

He now made his entry to the circle of the court as a protégé of the favourite Leicester, and in February 1582 accompanied him in his convoy of the Duc d'Alençon to the Netherlands. Almost immediately after his return he became prime favourite of the queen, whose heart was still susceptible despite the weight of almost fifty years. Fuller's well-known story of how he first caught her eye by flinging down on the ground his fine plush cloak to save her feet from the mire is most likely completely apocryphal, but well befits the romantic temper of the times and the manner of fantastic devotion with which the Virgin Queen loved to be wooed or worshipped by the fine gentlemen of her court. Raleigh was now in the prime of manly beauty; his tall and handsome figure, dark hair, high colour, lofty forehead, resolute and manly bearing, alert expression, and spirited wit combined to form an imposing personality, and all the advantage that nature had given him he heightened by a gorgeous splendour in dress and in jewels. But he was proud, haughty, and impatient, and everywhere, save in his native Devonshire, the broad accent of which he preserved all his life, he made himself a multitude of jealous and envious enemies. He was consulted confidentially on Irish affairs, but never to the last took a public place in the queen's counsels, perhaps because his royal mistress, with all her fondness, distrusted his ambition, and divined that he lacked that sagacity of the statesman which she recognised in the less splendid Burghley and Walsingham. The playful name of 'Water' by which she called him seems itself to imply a recognition of that instability of character which was his constant foible and, in the fullness of time, the occasion of his ruin. But meantime she heaped her favours lavishly upon him: in April 1583 he received two estates; next month the 'farm of wines,' a license duty of twenty shillings a year from every vintner in the kingdom, which at one time yielded £2000 a year; and in March 1584 a grant of license to export woollen broadcloths, which Burghley estimated had yielded him in the first year as much as £3950. About the close of 1584 he was knighted; in July 1585 he was appointed Lord Warden of the Stannaries, in September Lieutenant of Cornwall, in November Vice-admiral of Devonshire and Cornwall; and in the same year he was elected to parliament as one of the two county members for Devonshire. In 1587 he succeeded Sir Christopher Hatton as Captain of the Queen's Guard. During the summer of 1584 he leased of the queen the stately mansion of Durham House, spent much money on its repair, and kept it as his town-house from that time down to 1603. It was not till about the beginning of 1592 that he came into possession, on a ninety-nine years' lease, of the splendid park and castle of Sherborne alienated from the see of Salisbury.

In 1583 Raleigh risked £2000 in Sir Humphrey Gilbert's last ill-fated expedition, and on the news of his half-brother's loss took up a fresh charter of discovery and colonisation. In April 1584 he sent out a fleet under Amadas and Barlowe to explore the coast north of Florida. They made a prosperous voyage, and formally took possession of a district to which Elizabeth was pleased to give the name Virginia. Next year Raleigh fitted out a stronger expedition under Ralph Lane and Sir Richard Grenville, but the hundred men who lived a year under Lane's command on the island of Roanoke returned to England in Drake's fleet completely dispirited with their hardships. Soon after they set sail, Sir Richard Grenville arrived with three ships, and left on the island fifteen men well furnished with stores. One of the hundred

colonists—the first citizens of America—Thomas Hariot, in his account of the colony and the causes of its failure, speaks of the herb, 'called by the inhabitants *Yppowoc*,' which was destined to become one of the closest comforts of life to half the world. Raleigh himself took to the new luxury, and would enjoy it in pipes of silver, the queen sitting by him while he smoked. In May 1587 he sent out three ships, under Captain Charles White, with 150 colonists, seventeen of whom were women. They found the fifteen men had perished, and ere long misfortune after misfortune overtook themselves. White returned to England for supplies, and at length, after many delays and difficulties, reached Virginia in August 1590 to find the settlement ruined and the colonists dispersed, never afterwards to be seen. It was the last direct attempt of Raleigh himself at the colonisation of Virginia. The undertaking, says Hakluyt, 'required a prince's purse to have it thoroughly followed out'—it is supposed that Raleigh himself had spent forty thousand pounds upon it.

Already in May 1587 the appearance of the handsome young Earl of Essex at court had endangered Raleigh's paramount place in the favour of the queen. Hatton and Leicester long ere now had shown their jealousy of him, but this impetuous and petulant boy openly flouted him, and at length drove him from the court to Ireland. He had already received in the spring of 1587 a grant of 42,000 acres in Munster, and with characteristic vigour he at once set about repopulating this tract with English settlers. He was in Ireland when the Invincible Armada appeared in English waters, but he hastened to the south of England to superintend the coast defence, and he was present with the fleet a trusted counsellor throughout that glorious week of toil and triumph. His vessels scoured the seas in privateering enterprises, which gratified at once his inborn hate of Spain and helped to provide the means for his vast expense and his Virginian ventures. His over-zealous seamen sometimes transgressed the forbidden limit of piracy, but the Treasury winked at such accidents or made itself a receiver by claiming a share of the plunder. Raleigh sailed with Drake on his Portugal expedition of 1589, but by the autumn of that year was again in Ireland, where he quickly became a warm friend of Spenser, with the endless fame of whose great poem his name is imperishably linked. The poet had settled on his estate at Kilkenny three years before, and here the 'Shepherd of the Ocean' [Raleigh] visited him, and read him his poem of *The Ocean's Love to Cynthia* [Elizabeth], which Sir Edmund Gosse thinks must have contained at least 10,000 lines, the extant 130 stanzas being a fragment. In *Colin Clout's Come Home Again* we read how Raleigh carried the poet into the presence of the queen, who took delight to hear his poem, and commanded it to be published. In his Youghal garden during this breathing-space Raleigh planted tobacco, as well as the first potatoes that grew on Irish soil. He quickly recovered all his influence at court, and busied himself with further schemes for reprisals on the Spaniards down to the moment of his fall. His famous tract, *A Report of the Truth of the Fight about the Isles of the Azores this last Sommer*, appeared anonymously in 1591. It is a splendid piece of heart-stirring prose, and three hundred years later it gave the inspiration to Tennyson's noblest ballad. Early in 1592 Raleigh prepared a new expedition to seize the Spanish treasure-ships, but again his dotting mistress forbade him to sail with the fleet, which he had reluctantly to entrust to Frobisher and Sir John Borough. Hardly had he returned before she seems to have discovered his intrigue with

Bessy Throckmorton, one of her own maids-of-honour—an infidelity to her own supremacy which her jealous temper could not brook. In July 1592 Raleigh was committed to the Tower, and it was more than four years before he was again admitted to his mistress' presence. He bore his imprisonment with characteristic impatience, and vexed the air with exaggerated complaints of his loss expressed in the fantastic fashion of the time. Meantime Borough had captured the *Madre de Dios*, a huge carrack, which he brought into Dartmouth in September. So great was the excitement and such the rapacity of the vultures that gathered to the spoil that none but Raleigh could control the tumult. He was sent down to Dartmouth with a keeper, and Sir Robert Cecil describes with astonishment his popularity and influence among his sailors and his countrymen. 'But his heart is broken,' he writes his father, 'for he is extremely pensive longer than he is busied, in which he can toil terribly.' Raleigh now married Bessy Throckmorton, and for the next two years lived with her in quiet happiness, building and gardening at Sherborne. About 1593 his imagination seems first to have been fired by the descriptions of Guiana, with its vast city of Manoa and its El Dorado, and in 1594 he sent out Captain Whiddon to Trinidad to make inquiries for him. In February 1595 he himself sailed with five ships, explored the coasts of Trinidad, sailed up the Orinoco, and had his imagination set aglow for life by the tropical splendours of vegetation that he saw, and still more by the auriferous quartz and glittering stones he found, and marvellous stories of stores of gold beyond brought to him by the native Indians. Six months after his return he sent Captain Lawrence Keymis to make further explorations, and later Captain Berry, but he himself failed to rouse any great public interest in England in his splendid dream of a new world and untold wealth from the mines of Guiana. Early in 1596 he published *The Discovery of the large, rich, and beautiful Empire of Guiana* (Hakluyt Society, edited by Sir R. Schomburgk, 1848), a splendid piece of vigorous prose. In June 1596 he sailed in the expedition under Howard and Essex to Cadiz, and it was his advice that governed the whole plan of action in that splendid triumph which a second time shattered the naval strength of Spain. His faults ever fell from him in the hour of action, but never before or again in life did he show such tact and temper as in the skilful persuasions by which he forced the Lord Admiral and Essex to agree to his plans. Yet he was mortified to the heart, as he lay in his ship suffering from a wound in the leg, when their lack of energy allowed the Spaniards, two days later, to burn the whole fleet of treasure-laden carracks before his eyes. His spirited *Relation of Cadiz Action* remains the best history of the exploit. Despite his heroic conduct, it was almost the midsummer of 1597 before Raleigh was again admitted to court and allowed to take up his place as Captain of the Guard. Cecil showed himself friendly to him, and Essex was glad of his support in his desire for a more active opposition to Spain. Raleigh at once set himself to prepare and virtual ships for the projected expedition, which at length, in July 1597, was permitted by the queen to set sail from Plymouth. A desperate storm compelled many of the ships to put back for shelter, but at length Raleigh met Essex off the island of Flores. They agreed to attack together the Isle of Fayal, and Essex sailed off first, but Raleigh reached the harbour before him, and, after waiting three days, on the fourth landed his men and carried the town by storm. Next morning the squadron of Essex made the harbour, to find all the laurels of the 'Island Voyage' already reaped. Essex's mortification was

great, and was made greater by his cold reception at home. His surly temper grew upon him, and soon his helpless failure in dealing with Tyrone's rebellion in Ireland and his insane attempt at an insurrection in the streets of London brought him to the block. His hatred of Raleigh had become so desperate that he charged him, together with Cecil and Cobham, with a plot to murder him in his house—an absurd accusation, which Sir Christopher Blount on the scaffold confessed was 'a word cast out to colour other matters.' In 1600 Raleigh succeeded Sir Anthony Paulet as governor of Jersey, and in his three years' rule did much to foster its trade and relieve its fiscal burdens. About this time also he was active in parliament, advocating freedom of tillage, and of church-going, and the repeal of the more vexatious monopolies. His Irish estates he sold in 1602 to Richard Boyle.

In the dark intrigues about the succession that filled the closing years of Elizabeth's reign Raleigh took little part, while the crafty Cecil and the faithless Lord Henry Howard got the ear of James, and for their own advantage poisoned his mind against Raleigh and Cobham. The king had long been an admirer of Essex, and no doubt knew from the beginning that Raleigh was indifferent to his cause. The cowardice, timid love of peace, and the whole personal habits of the royal pedant, as well as his overweening conceit of his own judgment in affairs of state, were all naturally repugnant to the bold, self-reliant hero who had so long been a trusted confidant of the great-hearted queen. He met James on his southward progress at Burghley in Lincolnshire, and was greeted with a wretched pun worthy of its source—'On my soul, man, I have heard but *rawly* of thee.' Ere long he was stripped of, or forced into resigning, all his offices, the captaincy of the Guard, the wardenship of the Stannaries, the wine-license monopoly, the governorship of Jersey. All this must have cut Raleigh to the heart, and as he was at no time guarded in his tongue it is possible enough he may have in his haste spoken, or at least listened to, words expressing a preference for Arabella Stuart to the rule of the Scottish king. But the only witness against him was the miserable Lord Cobham, and he made and unmade his eight several charges with such facility as to make them of no value at all. Neither in the 'Main' nor the 'Bye' Plot was there any really adequate evidence of Raleigh's complicity, and the refusal of the crown to allow him to be confronted with his accuser is of itself almost enough to justify belief in his innocence. 'But one thing,' says Kingsley, 'comes brightly out of the infinite confusion and mystery of this dark Cobham plot, and that is Raleigh's innocence.' Raleigh was arrested on the 17th July, and in his first despair tried to kill himself. The trial began at Winchester on November 17th, the prosecution conducted by the attorney-general, Sir Edward Coke, who disgraced his robe by a brutality almost beyond belief. Raleigh's defence was splendid, and for the first time in his life he made his way into the hearts of all Englishmen by the dauntlessness of his bearing and the burning eloquence of his words. Coke could call him 'a monster,' 'a viper,' 'the rankest traitor in all England,' 'damnable atheist,' and 'a spider of hell,' and Chief-justice Popham could jeer at him as an atheist as well as traitor; but it was too much for Englishmen to believe that the hero of Cadiz and of Fayal had 'a Spanish heart,' and all his unpopularity fell from him from that hour. Dudley Carleton, who heard the trial, wrote that when it began he would have gone a hundred miles to see Raleigh hanged, but ere it was closed he would have gone a thousand to save his life. Yet he was condemned to death, and only on the scaffold was his sentence commuted to perpetual im-

prisonment. Shierborne he had conveyed to trustees for his wife and eldest son, but an invalidity in the deed of conveyance was soon found, and the unhappy wife's application to the king was met with the words, 'I maun hae the lond, I maun hae it for Carr.' In January 1609 it was given to the favourite, a payment of £8000 being made as compensation. Within the Tower Raleigh employed himself with study and with chemical experiments, and was treated on the whole with fair indulgence. The young prince Henry came often to him, for he greatly admired the noble captive: 'No man but my father would keep such a bird in a cage,' said he. But he died in November 1612, and the promise he had wrung from his father to release Raleigh the next Christmas was only remembered to be forgotten. The chief fruit of Raleigh's imprisonment was his *History of the World*, the first and only volume of which, extending to over 1300 folio pages, although coming down but to the second Roman war with Macedon (170 B.C.), was published in 1614. It is written throughout in admirable English; but the preface is the most interesting portion, for the subject itself is dreary, though lightened by glimpses of autobiography and occasional flashes of fire—scorching satire wrapped in ambiguous phrase. Its sale was suppressed in January 1615 as 'too saucy in censuring the acts of kings.' Oliver Cromwell, writing to his son Richard, in 1650, says, 'Recreate yourself with Sir Walter Raleigh's *History*; it is a body of history, and will add much more to your understanding than fragments of story.' The book was written for the young prince, and his death took from the author all heart to complete his work. Other writings of Raleigh's captivity were *The Prerogative of Parliament* (written 1615, published in 1628), which must have goaded the king still further; *The Cabinet Council*, published by John Milton in 1658; *A Discourse of War*, one of his most perfect pieces of writing; and *Observations on Trade and Commerce*, an appeal for free trade, suppressed like the rest.

On January 30, 1616, Raleigh was released from the Tower through the influence of Sir Ralph Winwood and Villiers, expressly to make preparations for an expedition to the Orinoco in search of a gold-mine which he maintained existed there. He engaged not to molest the dominions of the king of Spain, but he had been brought up on the old Elizabethan theory of no peace beyond the line, and doubtless he thought he had everything to gain and nothing to lose by a desperate venture, and that the gold he would bring home would gild over any formal breach of his promise. It seems difficult to understand how James can have expected that such an expedition could be made without a collision with Spain, and we find that he was careful to give himself the cowardly safeguard of allowing Raleigh to go with his old sentence still hanging over his head, as well as communicating his route to Gondomar, the Spanish ambassador. And so in April 1617 the hero sailed to the doom which fate was weaving for him, while James even then was drawing into ever closer relations with Spain, and beginning his negotiations for the Spanish marriage. Before sailing Raleigh asked leave, but in vain, to make an attack on Genoa, an ally of Spain. His small fleet was manned, some forty gentlemen excepted, by 'the very scum of the world, drunkards, blasphemers.' Storms, desertion, disease, and death followed them from the first, and ere they reached the mouth of the river Raleigh was himself stricken down by sickness and compelled to stay behind with the ships, and entrust the command of the party who went to seek the mine to Keymis. He did not give his men distinct orders to avoid fighting with the Spaniards, and when they found in their way a new Spanish town,

San Thomé, they attacked it and burned it down, but never reached the mine. In the fight young Walter Raleigh was struck down, as he shouted the words, 'Come on, my men! This is the only mine you will ever find.' Keymis lost control of his men, and came sadly back to his admiral, whose bitter reproaches made him drive a knife into his heart. The men now refused to return with Raleigh to the mine, whereupon he asked them if they would follow him in an attack on the Mexican fleet, telling them in his desperation that he had in his possession a commission from France. At length, on the 21st of June 1618, he arrived at Plymouth with his ship, the *Destiny*, alone and utterly cast down. His kinsman Sir Lewis [Judas] Stukely was sent to bring him up to London; at Salisbury on the way he feigned illness to gain four days' time to write his touching *Apology for the Voyage to Guiana*. Surrounded by a ring of spies, chiefest among whom was Stukely, he again intrigued for an escape to France, but was betrayed at every step. James dared not allow him to appear before the council of state, but had him formally examined before a commission of six, among them Coke, Archbishop Abbot, and Bacon, besides resorting to the infamy of sending a spy to gain his confidence and discover his secrets. In his perplexity Raleigh damaged his cause by contradictory statements and confessions, and his judges seem to have convinced themselves that he had never had any intention to find the mine at all, as appears from the *Declaration of the Demeanour and Carriage of Sir Walter Raleigh*, a feeble statement, though drawn up by the master-hand of Bacon. He was condemned to die the next morning (29th October 1618) on the old sentence, and neither the entreaties of the queen nor his own moving eloquence could save his life. 'You will come to-morrow morning,' he said to an old friend he met on his way back to prison; 'I do not know what you will do for a place. For my own part, I am sure of one.' One of his kinsmen warning him that his enemies would take exception at his high spirits, 'It is my last mirth in this world,' said he; 'do not grudge it to me. When I come to the sad parting, you shall see me grave enough.' His high courage never left him to the last. He wrote some verses the night before, and, says Dean Tounson, 'he ate his breakfast heartily, and took tobacco, and made no more of his death than if it had been to take a journey.' Of the cup of sack brought him he said, 'It is good drink, if a man might stay by it. The speech he made on the scaffold was masterly in its persuasive eloquence—'as he stood there in the cold morning air,' says Gosse, 'he foiled James and Philip at one thrust, and conquered the esteem of all posterity.' He asked to see the axe, and touched the edge with the words, 'This gives me no fear. It is a sharp and fair medicine to cure me of all my diseases.' To some one who objected that he ought to lay his head toward the east he answered, 'What matter how the head lie so the heart be right,' than which, as Gardiner well says, no better epitaph could be found for Raleigh's tomb.

The best edition of Raleigh's works is that in 8 vols. published at Oxford in 1829, with the 18th-century Lives by Oldys and Birch prefixed. Sir Egerton Brydges edited the Poems in 1814. See Dr T. N. Brushfield's Bibliography (1908). There are Lives by Cayley (1805), Tytler (1833), Mrs Thomson (1830), Edward Edwards (the fullest, vol. i., life; vol. ii., letters, 1868), J. A. St John (1868), Louise Creighton (1877), Sir Edmund Gosse (1886), William Stebbing (1892), Martin Hume (new ed. 1907), Sir Rennell Rodd (1904), H. de Salincourt (1908). Kingsley's glowing essay in *Miscellanies* is excellent; so also is the treatment in Sir Sidney Lee's *Great Englishmen of the 16th Century* (1904) and S. R. Gardiner's *History*.

Raleigh, SIR WALTER, critic, was born on 6th September 1861 at London, educated at University College there, and at King's College, Cambridge. After professorships at Liverpool (1890-1900) and Glasgow (1900-4), he was professor of English at Oxford from 1904. He died 13th May 1922. His works include numerous essays, also *The English Novel* (1894), *Style* (1897), *Wordsworth* (1903), *The English Voyagers* (1904), *Shakespeare* (1907), *Romance* (1917), *Some Authors* (1923). He combined great charm of manner with culture and scholarship. His boyish gusto for life and adventure drew him somewhat away from literature. Latterly his professorship grew irksome to him, and a more congenial activity was the writing of an unfinished official history of *The War in the Air* (vol. i. 1922).

Ralik. See MARSHALL ISLANDS.

Rallidæ. See RAIL.

Ralston, WILLIAM RALSTON SHEDDEN, Russian scholar and folklorist, was born in 1828 of Scottish ancestry—his surname originally Shedden. He studied at Trinity College, Cambridge (1846-50); was called to the bar at the Inner Temple in 1862, but never practised; and from 1853 to 1875 held a post in the library of the British Museum. He translated his friend Turgeniev's *Liza* (1869), and wrote on Russian folklore and history. He died in London, 6th August 1889.

Ram, a ship intended to run into and sink an enemy's vessel, and for this purpose provided with a heavily armoured stem projecting below the water-line in the form of a beak. Rams at first had a separate rating in the British navy. They were first employed during the American civil war in Norfolk roads in 1862, when the Federal frigate *Cumberland* was rammed and sunk by the Confederate armour-clad ram *Virginia*. Torpedoes have made the rushing of vessels at one another a much more dangerous policy than of yore; ramming is now an exceptional method, but during the Great War it was often resorted to for the destruction of submarines, especially by boats of the destroyer class. See TACTICS (NAVAL).

Rāma, in Hindu mythology, is usually the name of the hero of the Rāmāyana (q.v.), but is applied also to his older rival, also regarded as an incarnation of Vishnu (q.v.), Parāsurāma, and to Balarāma, brother of Krishna.

Ram'adan, the ninth month in the Mohammedan year. In it Mohammed received his first revelation, and every believer is therefore enjoined to keep a strict fast throughout its entire course, from the dawn—when a white thread can be distinguished from a black thread—to sunset. Eating, drinking, smoking, bathing, smelling perfumes, and other bodily enjoyments, even swallowing one's spittle, are strictly prohibited during that period. Even when obliged to take medicine the Moslem must make some kind of amends for it, such as spending a certain sum of money upon the poor. During the night, however, the most necessary wants may be satisfied—a permission which, practically, is interpreted by a profuse indulgence in all sorts of enjoyments. The fast of Ramadan, now much less observed than in former times, is sometimes a very severe affliction upon the orthodox, particularly when the month—the year being lunar—happens to fall in the long and hot days of midsummer. The sick, travellers, and soldiers in time of war are temporarily released from this duty, but they have to fast an equal number of days at a subsequent period when this impediment is removed. Nurses, pregnant women, and those to whom it might prove really injurious are expressly exempt from fasting. The principal passages treating of the fast of Ramadan are found in the second Surah of the Koran, called 'The Cow.'

Rāmāyana is the name of the second of the two great epics of India. Unlike the *Mahābhārata* (q.v.), it is, as regards books ii.-vi., essentially the work of a single poet, Vālmīki, and reveals marked unity of conception and style. The poet has combined two wholly different legends into a single theme; the first is a tale of court intrigue, showing how Daśaratha, king of Ayodhyā, is forced, in order to keep a rash promise to Kaikeyī, his second wife, to disinherit his eldest son Rāma in favour of Bharata, her child, and how Rāma goes into banishment in the forest, accompanied by his true wife, Sītā, and his youngest brother, Lakshmaṇa. The second tells of the rape of Sītā by a demon, Rāvaṇa, lord of Lankā—later identified with Ceylon, but originally quite distinct, and her rescue and the slaying of Rāvaṇa by Rāma, who is aided by a host of monkeys under Hanumat and Sugrīva; here we are in the region of myth brought down to earth; in the late Vedic literature Sītā is the goddess of the ploughed field, and Rāma's overthrow of Rāvaṇa, with Hanumat's aid, is a reflex of Indra's victory over Vritra, demon of drought, with the aid of the wind-gods, for Hanumat is son of the wind-god. In the later books, i. and vii, Rāma appears as identified with Vishnu as the supreme deity, but this is unknown to Vālmīki. The date of the poem is uncertain. H. Jacobi assigned it to the 6th century B.C., but more probably it falls in the 4th century. While it is not as old as the main story of the *Mahābhārata*, it is unquestionably long anterior to the definite redaction of that text. Its influence on later Indian poetry has been predominant; Vālmīki established the norm of the Śloka metre (verses of two lines each of sixteen syllables), of which tradition makes him the inventor, and displays many of the characteristics which are developed in later Sanskrit poetic style; his brilliance of description, command of pathos, love of nature, and dignity vindicate for Vālmīki a high rank as a poet, while his noble conception of Rāma has deeply influenced religious belief and worship, and has inspired the greatest epic of mediæval Hindustan, the *Rām Charit Mānas* of Tulsī Dās (1532-1624), which inculcates an ideal standard of purity and virtue.

Nominally composed, in its final form, of 24,000 Ślokas, arranged in seven books, the *Rāmāyana* has come down in several varying texts, representing the changes made during the process of tradition, often oral, in different parts of India; thus a Bengal, a Bombay, a West Indian, a Kashmirian, and a North-west Indian recension may be distinguished; all are probably of considerable antiquity, the West Indian and the Bombay versions having existed by 800 A.D. at least.

The *Rāmāyana* has been repeatedly edited in India; an Indian version of the Bengal recension by G. Gorresio, with text, appeared in 1843-58; an English version of the Bombay recension by R. T. H. Griffith appeared in 1870-75. See also A. Weber, *Ueber das Rāmāyana* (1870); H. Jacobi, *Das Rāmāyana* (1893); A. Ludwig, *Ueber das Rāmāyana* (1894).

Rambouillet. CATHERINE DE VIVONNE, MARQUISE DE, one of the most accomplished and illustrious women of the 17th century, was born at Rome in 1588. Her father was Jean de Vivonne, afterwards Marquis of Pisani; her mother, Julia Savelli, belonged to an old Italian family, and through her mother was connected with the Florentine banking house of Strozzi. At twelve Catherine was married to Charles d'Angennes, son of the Marquis de Rambouillet, who succeeded to the family estates and title on the death of his father in 1611. From the very beginning she disliked alike the morals and manners of the French court, and she early determined to gather round herself

a select circle of friends. At once virtuous, spirituelle, sympathetic, and appreciative, she gathered together in the famous Hôtel Rambouillet for a long series of years all the talent and wit of France, and in her salon met for the first time on an equal footing the aristocracies of rank and of *esprit*. For fifty years she received the wits, critics, scholars, and poets of Paris: Malherbe, Racan, Balzac, Voiture, Corneille, Ménage, Chapelain, Scarron, Saint-Evremond, Benserade, La Rochefoucauld. But half of the glory of the Hôtel belonged to the brilliant women who frequented it, among them Mademoiselle de Scudéry, the beautiful Duchesse de Chevreuse, the Marquise de Sablé, who inspired the *Maximes* of La Rochefoucauld, Mademoiselle de la Vergne, afterwards Madame de La Fayette, the inimitable Madame de Sévigné; but conspicuous beyond all by her splendid beauty and faultless grace, the idol of both sexes, shone the sister of the great Condé, and the heroine of the Fronde—the Duchesse de Longueville. As the centre of this group reigned the Marquise de Rambouillet—'la grande Marquise,' 'the divine Arthénice'—and her beautiful daughter Julie (the Parthénie of *Clélie*), after fourteen years of suing, wife of the Duke of Montausier, who presented her with the famous *Garden of Julia*, a collection of love-verses, illustrated with exquisite paintings on vellum.

The frequenters of the Hôtel were celebrated for the elegance of their manners and the refinement of their language; but the latter, on the lips of imitators, degenerated into extravagant affectation and palpable pedantry—a mark for the comic satire of Molière in *Les Précieuses Ridicules* and *Les Femmes Savantes*. It must be remembered that the title *Précieuse* originally meant 'distinguished' in its best sense, and that the ladies of the coterie a generation before had been proud to wear it. Madame de Rambouillet's good taste in everything was conspicuous, and she led the fashion also in the decoration of houses. Her famous 'Chambre bleue,' furnished with blue velvet relieved by gold and silver, with large windows from floor to ceiling, and her alcove with its *ruelle*—at first adopted merely to save her from the heat of the fire, which she could not bear—were imitated in many a great house in France. Her importance declined under Louis XIV., who distrusted clever women, but she survived till December 1665.

See the *Historiettes* of Tallemant des Réaux and the *Dictionnaire des Précieuses* of Somaize; Röderer's *Mémoire pour servir à l'Histoire de la Société polie en France pendant le Dix-septième Siècle* (1834); Victor Cousin's *Jeunesse de Mde. de Longueville, Mde. de Sablé, &c.*; Livet's *Précieuses et Précieuses* (1859); Brunetière's *Nouvelles Études Critiques* (2d ed. 1886); E. Magne's *Voiture et les Origines de l'Hôtel Rambouillet* (1912).

Rameau, JEAN PHILIPPE, a French musician, was born at Dijon, 25th September 1683. At eighteen he went to Milan, but soon returned to France, to Paris, Lille, and Clermont in Auvergne. Here he acted as organist to the cathedral, and wrote his *Traité de l'Harmonie* (1722). Removing to Paris, he published *Nouveau Système* (1726), *Génération Harmonique* (1737), and *Nouvelles Réflexions* (1752). In 1733, at the mature age of fifty, he produced his first opera, *Hippolyte et Aricie*, the libretto of which was written by the Abbé Pellegrin. It created a great sensation, and Rameau was forthwith elevated to the rank of a rival to Lully (see OPERA). Rameau's best opera was *Castor et Pollux*, produced at the Académie Royale de Musique in 1737. Between 1733 and 1760 he composed twenty-one operas and ballets, as well as numerous harpsichord pieces. Louis XV. created for him the office of composer of chamber music, granted him letters of nobility, and named

him a Chevalier de St Michel. Rameau died 12th September 1764. See A. Pougin's essay (Paris, 1876).—Rameau's nephew, well known as giving the title to a singular dialogue of Diderot's, which Goethe thought worthy of translation into German, had actual existence, being Louis Sébastien Mercier (1740–1814), author of the famous *Tableau de Paris*.

Ramée, DE LA. See RAMUS, and OUIDA.

Rameses, the name of several Egyptian monarchs, of whom two, the first and the second, were specially famous (see the article EGYPT). Some have identified the warrior king Rameses II. with the Pharaoh of the oppression, and Rameses III. with the Pharaoh of the Exodus, though there is some difficulty in the identification (see EXODUS, JEWS). The mummy of Rameses II. was found at Deir-el-Bahari in 1831, that of Rameses III. at Bulak in 1886. The story of Rhampsinitus (q.v.) seems to refer to Rameses III. For the treasury-city called Rameses, see PITHOM.

Ramie. See BEHMERIA.

Ramillies, a village of Brabant, Belgium, 14 miles by rail N. of Namur, is memorable as the place near which, on 23d May 1706, the French forces under Marshal Villeroy and the Elector of Bavaria were defeated by Marlborough, with the loss of almost all their cannon and baggage, and thirteen thousand killed and wounded. This victory compelled the French to give up the whole of the Spanish Netherlands.

Rammohun Roy. Rájá Rám Mohán Rái, founder of the Brahma Samáj (q.v.), was born at Radhanagar in Bengal in May 1772, his ancestors being Brahmans of high birth. He studied Persian, Arabic, and Sanskrit, and soon began to doubt the foundations of the ancestral faith. He spent some time studying Buddhism in Tibet, and gave offence there by his frank criticisms. He incurred the enmity of his family for his religious views, and lived at Benares till 1803. For some years he was revenue collector in Rangpur. In 1811 he succeeded to affluence on the death of his brother. He published various works in Persian, Arabic, and Sanskrit, the object of the whole being the uprooting of idolatry. His influence was powerful in securing the abolition of suttee. He also issued in English an abridgment of the *Vedanta*, giving a digest of the Vedas, the ancient sacred books of the Hindus. In 1820 he published *The Precepts of Jesus, the Guide to Peace and Happiness*, accepting the morality preached by Christ, but rejecting belief in his deity or in the miracles, and wrote other pamphlets hostile both to Hinduism and to Christian Trinitarianism. In 1828 he began the association which grew into the Brahma Samáj, and in 1831 visited England, where he was received with all but universal friendliness and respect. He took a lively interest in the Reform agitation, and gave valuable evidence before the Board of Control on the condition of India, but overtasked himself, and died at Bristol, 27th September 1833.

See Miss Carpenter's *Last Days of Rammohun Roy* (1866); the fuller Bengali memoir (1881); his English works, edited by Jogendra Chunder Ghose (1888); and Dinesh Chandra Sen's *History of Bengali Language and Literature* (1912).

Ramnagar, two towns of India: (1) a town of the United Provinces of Agra and Oudh, stands on the right bank of the Ganges, 2 miles above Benares. It contains a palace, the residence of the raja of Benares, which rises from the banks of the sacred stream by a number of fine gháts or flights of stairs. There is a fort, and whips and wicker-work chairs are manufactured. Pop. 10,000.—(2) A town of the Punjab, on the Chenab River, 28 miles NW. of Gujranwala. It was a place of great importance in the 18th century, being then known as Rasul-

nagar, but was stormed by the Sikhs under Ranjit Singh in 1795, and its name changed to Ramnagar. It is now a place of 4600 inhabitants. The opening of the Sind-Sagar Railway has practically ruined its trade.

Rampart forms the substratum of every permanent fortification; see FORTIFICATION.

Ramphastidæ. See TOUCAN.

Rampion (*Campanula Rapunculus*; see CAMPANULA), a perennial plant, a native of Europe, rare in England, with a stem about two feet high, and a panicle of very pretty pale-blue bell-shaped flowers. The radical leaves are ovato-lanceolate and waved. The root is white and spindle-shaped, and was formerly much used for the table, under the name of *Rampion* or *Ramps*. The plant is now little cultivated in Britain, but is still commonly grown in France for the sake of its roots, which are used either boiled or as a salad, and of its young leaves, which are also used as a salad.



Rampion
(*Campanula Rapunculus*).

Rampur, the capital of an Indian state in the United Provinces of Agra and Oudh, on the river Kosila, 110 miles E. by N. of Delhi, manufactures damask, pottery, sword-blades, and jewellery; pop. 73,000.—The *state*, entirely surrounded by British territory, has an area of 900 sq. m. and a pop. of 453,600.

Rampur Bauleah, chief town of the Rajshahi district (area, 2600 sq. m.) of Bengal, on the north bank of the Ganges, is a centre of silk and indigo trade, and has an English Presbyterian mission; pop. 24,600.

Ramsay, ALLAN, Scottish poet, was born in the parish of Crawford, Lanarkshire, 15th October 1686. His father had been manager of Lord Hopetoun's mines at Leadhills; his mother, Alice Bower, was the daughter of a Derbyshire miner. At fourteen he was put apprentice to a wigmaker in Edinburgh, and followed that calling till his thirtieth year, by which time he had become known as a poet, having issued several short humorous satires and realistic descriptions which were printed as broadsides, and sold in his shop or on the street for a penny each. He had also written (1716–18) two additional cantos to the old Scots poem of *Christ's Kirk on the Green*, felicitous pictures of rustic life and broad humour. Ramsay now abandoned wig-making, and commenced business as a bookseller in the High Street, with a sign of Mercury over his door. Later he removed to the Luckenbooths, and there flourished under the heads of Drummond and Ben Jonson, adding to his business a circulating library—the first established in Scotland. Down to 1755, when he retired to a villa of his own erection, 'honest Allan's' career, worldly and literary, was eminently prosperous. Neither Puritan nor profligate, social in his instincts, yet careful and industrious, Ramsay never allowed his pride and vanity as a poet to withdraw him from business. One brief cloud overcast the poet's successful career. He built a theatre in Edinburgh at his own expense, which was almost immediately shut up by the magistrates, in virtue of the act passed in 1737 prohibiting all dramatic exhibitions without special license. Besides his loss he suffered

much from the attacks of the churchmen of the day. His application to Lord Advocate Forbes for 'some canny post' was unsuccessful; yet his misfortunes had left him a decent competency, and he spent the last two or three years of his life in cheerful retirement in the quaint but picturesque octagonal house he had built on the north side of the Castle Hill, and here he died 7th January 1758. He had the gratification of seeing his only surviving son, Allan Ramsay (1713-84), fast rising into distinction as a portrait-painter; in 1767 he was appointed principal painter to the king. A complete edition of the elder Allan's poems with a biography was published by Chalmers (1800); a fine edition, with the music of the songs, and engravings by David Allan, in 1788. A good selection is that by J. Logie Robertson (1887). A monument to Ramsay by Steell was erected in Edinburgh in 1865.

The following are his principal works: *Tartana, or the Plaid* (1721); a collected edition of his *Poems*, published by subscription in 1721, by which it is said the poet realised 400 guineas; *Fables and Tales* (1722); *Fair Assembly* (1723); *Health, a Poem* (1724); *The Tea-table Miscellany*, a collection of the most choice songs, Scottish and English (1724), to which a second volume was published in 1725, a third in 1727, and a fourth in 1740; *The Evergreen*, 'being a collection of Scots Poems wrote by the Ingenious before 1600,' published in 1724; *The Gentle Shepherd, a Pastoral Comedy* (1725); a second collection of *Poems* (1728); *Thirty Fables* (1730). See the *Life* by Oliphant Smeaton ('Famous Scots' 1896); Mackail in *Essays and Studies*, vol. x. (Engl. Ass. 1924); and A. Gibson, *New Light on Allan Ramsay* (1927).

Ramsay, Sir Andrew Crombie (1814-91), born in Glasgow, joined the Geological Survey in 1841, became director-general in 1871, and in 1881 retired with a knighthood. See *Life* by Sir A. Geikie (1895).

Ramsay, Edward Bannerman Burnett (1793-1872), born in Aberdeen, was a son of the sheriff of Kincardine, a Burnett of Leys, who inherited an uncle's estates and took the name of Ramsay. He took a poll degree at St John's College, Cambridge; became a curate in Edinburgh in 1824, and in 1830 incumbent of St John's there; and in 1846 he was appointed dean of the diocese. Dean Ramsay was practically founder of the Representative Church Council of the Scottish Episcopal Church. He published several theological treatises and memoirs, but is best known for his *Reminiscences of Scottish Life and Character* (1857-61). See the *Memoir*, by Cosmo Innes, prefixed to the 22d ed. (1874).

Ramsay, William (1806-65), a son of the baronet of Bamff in Perthshire, was professor of Humanity at Glasgow, and wrote a manual of *Roman Antiquities*, long a standard work.—His nephew, **Sir James Henry Ramsay** (1832-1925), born at Versailles, wrote *Lancaster and York*, and other important works on English history.

Ramsay, Sir William, K.C.B., F.R.S., born at Glasgow in 1852, a nephew of the geologist Sir Andrew Ramsay, was professor of Chemistry, and later principal, at University College, Bristol, and in 1887-1912 professor at University College, London. With Lord Rayleigh he discovered Argon (q.v.), obtained helium, and discovered afterwards neon, krypton, and xenon. He wrote on the gases of the atmosphere, on radium, and on chemistry generally. He died 23d July 1916. See *Life* by Tilden (1918).

Ramsay, Sir William Mitchell, born at Glasgow in 1851, studied at Aberdeen, Oxford, and Göttingen, was professor of Humanity at Aberdeen in 1886-1911. He travelled much in Asia Minor, wrote on the geography and antiquities of the region, on early Christian history there, and especially on St Paul and his labours in that region.

He and his wife have also written on Turkish life and Turkish policy.

Ramsbottom, a manufacturing town of Lancashire, on the Irwell, 4 miles N. of Bury. The first Sir Robert Peel established calico-printing here, and it now has iron and brass foundries and manufactures of cottons, calicoes, ropes, machines, &c. Pop. (1861) 4134; (1881) 16,142; (1921) 15,381.

Ramsden, Jesse, a mathematical instrument-maker, was born at Salterhebble, near Halifax, in 1735, and began life as a cloth-worker. About 1755 he moved to London, where his skill as an engraver recommended him to the instrument-makers. Being of an inventive turn, he spent his best efforts in improving the sextant, theodolite, equatorial, barometer, micrometer, mural quadrant, and the like, reducing the range of error of the sextant from 5 minutes to 30 seconds. He made the theodolite for the ordnance survey of England. He devised the mural circle, and made the first for Palermo and Dublin. He spent several years over an instrument for graduating mathematical instruments (see GRADUATION), and published an account of it (1777). For this the Commissioners of Longitude awarded him £615. He was elected a Fellow of the Royal Society in 1786, and was voted the Copley medal in 1795. He died at Brighton on 5th November 1800. Descriptions of some of his improved instruments will be found in *Phil. Trans.* (1779 and 1783).

Ramsey, (1) a seaport and watering-place in the north of the Isle of Man, 14 miles NNE. of Douglas. It stands on a spacious bay, with a good sandy beach and a background of wooded hills (1842 feet), and from the beauty of its surroundings and the salubrity of its climate has risen into a favourite resort of pleasure-seekers. It has two promenades, a park, salt-water lake, a pier 720 yards long, and steamboat communication with Liverpool, Belfast, Glasgow, Ardrossan, and Douglas. Pop. 5000.—(2) An urban district of Huntingdonshire, 12 miles NNE. of Huntingdon. It has remains of a mitred Benedictine abbey (969). Pop. 5000.

Ramsgate, a watering-place and seaport of Kent, in the south-east of the Isle of Thanet, 72 miles E. by S. of London, 4 SSE. of Margate, and 15 ENE. of Canterbury. From a small fishing-village it began to increase in importance during the 18th century through successful trade with 'Russia and the East country,' and through the formation (1750-95) of a harbour of refuge for the Downs. That harbour, 51 acres in extent, with a sea-entrance 250 feet wide, is enclosed on the east and west by two piers 670 and 520 yards long. The aspect of the place, which George Eliot calls 'a strip of London come out for an airing,' is familiar through Frith's 'Ramsgate Sands' (1854); among its special features are a municipal concert-hall (1914), an obelisk marking the spot where George IV. in 1821 embarked for Hanover, an iron promenade pier (1881), the fine Granville Hotel, a beautiful Roman Catholic church by the Pugins, a Benedictine monastery, college, and convent, and a Jewish synagogue and college, erected by Sir Moses Montefiore, who, like the elder Pugin, was a resident. To the north is Broadstairs (q.v.), beloved of Dickens; and to the west Pegwell Bay, with Ebbsfleet, the landing-place of St Augustine, and also, traditionally, of Hengist and Horsa. Here, too, is Osengall Hill, with an early Saxon cemetery. Ramsgate was incorporated in 1884. Pop. (1851) 11,838; (1881) 22,683; (1911) 29,603; (1921) 36,560.

Ramsons. See ALLIUM.

Ramus, Petrus. Pierre de la Ramée, an illustrious French humanist, was the son of a

poor labourer, and was born at the village of Cuth, in Vermandois, in 1515. In his twelfth year he got a situation as servant to a rich scholar at the Collège de Navarre, and, by devoting the day to his master, obtained the night for study, and made rapid progress. The method of teaching philosophy then prevalent dissatisfied him, and he was led to place a higher value on 'reason' than on 'authority'; when taking his degree in his twenty-first year he even maintained the extravagant thesis that 'all that Aristotle had said was false.' Immediately after he began lectures on the Greek and Latin authors, designed to combine the study of eloquence with that of philosophy. His audience was large, and his success as a teacher remarkable. He now turned his attention more particularly to the science of logic, which, in his usual adventurous spirit, he undertook to reform. His attempts excited much hostility among the Aristotelians, and when his treatise on the subject (*Dialecticae Partitiones*) appeared in 1543 it was fiercely assailed by the doctors of the Sorbonne, who managed to get it suppressed by a royal edict, and his lectures for a time suspended. But Ramus had at this time two powerful friends, Cardinals Charles de Bourbon and Charles de Lorraine, through whose influence he was, in 1545, appointed principal of the Collège de Presles. In 1551 Cardinal Lorraine succeeded in instituting for him a chair of Eloquence and Philosophy at the Collège Royal. He mingled largely in the literary and scholastic disputes of the time, and ultimately embraced Protestantism. He had to flee from Paris; after 1568 he travelled in Germany and Switzerland; but on returning to France in 1571 he perished in the fatal massacre of St Bartholomew, 24th August 1572. It was believed that he was assassinated by the direct instigation of one of his most persistent enemies.

Ramus holds an honourable place in the list of intellectual reformers. His assault on scholasticism as a *method of thinking* is vigorous, and his exposure of its puerile and useless subtleties is thorough. His system of logic, by which his name is best known, is marked by its lucid definitions, its natural divisions, and its simplification of the rules of the syllogism; but it really adds little to logical science. What strikes one most, however, in Ramus is his universal intellectual activity. He wrote treatises on arithmetic, geometry, and algebra which were text-books for a hundred years; he was among the earliest adherents of the Copernican system of astronomy; Latin, Greek, and French grammar, rhetoric, morals, and theology all engaged his pen, and he seldom handled a subject which he did not to some degree elucidate. His followers were a widespread, and for long a powerful, body of thinkers and teachers; France, England, the Low Countries, Germany, Switzerland, Denmark, and even Spain had their *Ramists*.

See monographs by Waddington (Paris, 1855), Desmazière (1864), and Lobstein (Strasb. 1878).

Rana. See FROG.

Rancé, ARMAND DE (1626-1700), the founder of the Trappists (q.v.).

Ranching, the business of cattle-breeding as formerly pursued in the unsettled districts of the United States from the Mississippi to the Pacific coasts, and from the Bad Lands of the Upper Missouri to the Gulf of Mexico. The name is derived from the Spanish *rancho*, properly 'mess' or 'mess-room,' but used in Mexico also for a herdsman's hut, and finally for a grazing-farm, as distinguished from an *hacienda*, a plantation or cultivated farm. The cattle were raised and kept in a half-wild condition, with little or no house shelter and no artificial feeding. The life of the

'cowboys' and ranchmen was free, open, and exciting enough to have great charms for enterprising youths.

Large fortunes were made in the wild old days, but the gradual settlement of the ranching country seriously embarrassed the business of the ranchman. The old cattle-kings of the south often had ranges, under Spanish land-grants, extending over several hundred square miles, and would brand many thousand calves each year. Herds would be 'on the trail' for from two to four months, the cattle from Texas crossing Red River, and passing through Indian Territory and southern Kansas to the railway; but the gradual settlement of the country and the extension of railways rendered these long trails impracticable and needless. The great events of the ranchman's year were the 'round-up,' when stock was taken, the cattle branded, and such full-grown cattle gathered into a herd as were suitable for market; and the departure of the herds for market or port—times of hard work and severe strain for all concerned. In the south there was but one annual round-up; on the more civilised ranges there were two round-ups in the year—one early in spring, to brand the calves and ascertain the losses during winter, another in autumn, when the steers over three years old were separated from the main herd and sent for sale. Similar methods have existed in Argentina, Uruguay, and Australia. The word ranching is loosely used in commerce for stock-farming and even fruit-farming; and 'fox-ranching' is the breeding of the silver fox for its valuable fur, now an important enterprise.

Rand or RANDT, THE. See JOHANNESBURG.

Randall, JAMES RYDER, the author of 'Maryland, my Maryland,' was born in Baltimore, 1st January 1839, taught for a while in a Louisiana college, and then turned to journalism. Shut out from the army by a delicate constitution, he still gave powerful aid to the southern cause by his lyrics. These include, besides 'Maryland' (1861; called forth by news of the passage of the first Massachusetts troops through the streets of Baltimore, and the consequent bloodshed), 'Stonewall Jackson,' 'There's Life in the Old Land Yet,' and others. From 1866 he edited a paper in Augusta, Georgia. He died in 1908.

Randazzo, a town of Sicily, at the northern foot of Mount Etna, with some old Norman churches, 43 miles N. of Catania by rail and 26 miles direct; pop. 17,161.

Randers, a town in Jutland, on the Randers-Fiord, 20 miles from its mouth in the Kattegat; pop. (1921) 26,495. It manufactures railway carriages and spirits, and exports butter and eggs.

Randolph, EDMUND JENNINGS, an American statesman, was born at Williamsburg, Virginia, 10th August 1753, studied at William and Mary College, and was admitted to the bar. In 1776 he helped to frame the constitution of Virginia, and became the state's first attorney-general. In 1786-88 he was governor of Virginia, and in 1787 he was a member of the convention which framed the constitution of the United States. He was working hard at a codification of the state-laws of Virginia when, in 1789, he was appointed by Washington attorney-general of the United States. In 1794 he was made secretary of state, but after the president's signing of the Jay Treaty (1795) with England he resigned in order to be free to vindicate his own conduct. Meanwhile he was practically ruined by the responsibility which he had incurred, as part of the duties of his office, for certain funds provided for foreign service; and, though he returned to the bar, he had to assign his lands and slaves. He died 13th September 1813. See Moncreu D. Conway, *Omitted Chapters of History*,

disclosed in the Life and Papers of Edmund Randolph (1888).

Randolph, JOHN, 'of Roanoke,' was born at Cawsons, in Virginia, June 2, 1773. He was a second cousin of Edmund Randolph, and boasted the Indian princess Pocahontas among his ancestors. In 1799 he was elected to congress, where he became distinguished for his eloquence, wit, sarcasm, invective, and eccentricity, and for thirty years was more talked and written about than any American politician. Tall and meagre, peculiar in dress and manners, he was described as a strange mixture of the aristocrat and the Jacobin. He was the Democratic leader of the House of Representatives, but quarrelled with Jefferson, and opposed the war of 1812; he opposed also the Missouri Compromise, and stigmatised its northern supporters as 'Doughfaces;' and he sided against Jackson on the nullification question. From 1825 to 1827 he sat in the senate, and in 1830 he was appointed minister to Russia. By his will he manumitted his numerous slaves, and provided for their settlement in a free colony. He died in Philadelphia, June 24, 1833. See *Lives by Garland* (2 vols. 1850), *Henry Adams* (1882), *W. C. Bruce* (1923).

Randolph, SIR THOMAS. See *MORAY (EARL OF)*.

Randolph, SIR THOMAS, a trusted agent of Queen Elizabeth, was born in 1523, lived abroad for safety's sake during Mary's reign, and after Elizabeth's accession was frequently employed in diplomatic missions to France, to Russia, and especially to Scotland. He was first sent thither in 1559, and at many a critical juncture for more than twenty years thereafter he played his mistress's cards in the perplexed and corrupt game of Scottish politics. He was twice shot at, in 1566 was ordered by Mary to leave the court, and in 1581 had to flee from Scotland for his life. He died in 1590.

Randolph, THOMAS, poet and dramatist, belonged to a good Sussex family, but was born at his maternal grandfather's house in Northamptonshire in 1605. He was educated at Westminster and Trinity College, Cambridge, and died in March 1635. He left a number of poems and several plays: *Aristippus, or the Sivial Philosopher*; *The Conceited Peddler*; *The Jealous Lovers*; *The Muses' Looking-glass*; *Anyntas*. See *W. C. Hazlitt's* edition of his works (1875).

Ranelagh, a building erected in 1742 on the gardens of the last Earl of Ranelagh at Chelsea, had a rotunda 150 feet in diameter, with an orchestra in the centre and tiers of boxes all round. The chief amusement, promenading round and round the area below and taking refreshments in the boxes, the orchestra performing meanwhile, is often alluded to by Smollett, Johnson, and Walpole. Its older rival, Vauxhall (q.v.), survived it, for it was closed in 1803, and built upon the next year. Its site is now part of the Chelsea Hospital garden.—The name of RANELAGH, North and South, is given to two southern suburbs of Dublin.

Range-finders are used for finding the range or distance of an enemy in the field. If a measured base-line be used at right angles to the direction of an object, the distance of the object can be expressed as a function of that base-line and an angle. It is sufficient, therefore, to have an instrument capable of measuring an angle, with a scale from which the observer reads off not the actual value of the angle, but the corresponding value of the function in question, that is, the distance of the object. For harbour-defence purposes it is convenient to use an instrument for observing the

angle of depression of the object, which is equal to the angle subtended at the object by the height of the instrument above sea-level. The instrument is adjusted to that height. Instruments used at sea have a long tube, with a side-window near each end. By means of mirrors, lenses, and prisms two half-images are transmitted to the right eye of the observer looking into the middle of the tube. The rays from one end are deflected by a movable prism until coincidence is obtained, and the corresponding distance read off on a scale read by the left eye. A range-finder of the same general character, capable of solving triangles not only in the horizontal, but in vertical and other planes, is used by the British army. Others apply the principle of the sextant in quite a simple manner, but, requiring two observers working some distance apart, they are less useful in warfare than one-man instruments. See *CANNON*.

Rangoon, the capital of Burma and residence of the governor, stands on the Hlaing or Rangoon River, about 20 miles from its entrance into the Gulf of Martaban. The existing city is almost entirely of modern construction, built since the British took possession of the place in 1852. The town extends along the left bank of the Hlaing, the docks being on the other side of the river. Behind the town is the large military cantonment, grouped round the fortified hill (166 feet) on which stands the Shway-Dagon pagoda, 'the most venerated object of worship in all the Indo-Chinese countries.' It is built of brick, is lavishly gilded, and tapers up to a cone 321 feet above the ground (see illustration under *BURMA*). There is an excellent water-supply, and there has been an elective municipality since 1883. The principal buildings are the public and governmental offices, the High Court, the Anglican cathedral (begun 1886) and other European churches, the pagodas, a lunatic asylum, the chief gaol of Lower Burma, the Phayre Museum in the horticultural gardens, St John's College, the high school, a hospital, &c. The university was founded in 1920, and a site on the outskirts by the Victoria Lakes has been chosen for its colleges, halls of residence, &c. Along the river-side are numerous rice-husking-mills and sawmills. Pop. (1852) 25,000; (1872) 89,897; (1881) 134,176; (1891) 181,210; (1901) 234,885; (1921) 341,962—natives of India being nearly as numerous as the Burmese. Rangoon is the principal port in all Burma, by far the greater part of the total trade passing in and out at this port. Its trade has grown at a wonderfully rapid rate since the British took possession of Lower Burma. (See *BURMA*.) Rangoon ranks as fourth of the commercial cities of the Indian Empire. A town has existed on the site of Rangoon since the 6th century B.C. It was always called Dagon down to the capture of the place by the Burmese sovereign Alompra towards the end of the 18th century. That prince rebuilt the place and called it Rangoon. It was taken by the British in 1825, and held until 1827; they captured it again in 1852, and have kept possession of it ever since.

Rangpur, a town of Bengal, on the Ghaghat, an arm of the Brahmaputra, 110 miles S.E. of Darjiling. It is the capital of a district in a great well-watered, fertile, well-tilled plain of sandy loam. Pop. 19,000.

Ranjit Singh, the founder of the Sikh kingdom in the Punjab of India, was born at Gujranwala on 2d November 1780, the son of a Sikh chief. His father died when he was twelve and his mother when he was seventeen years old. He at once began to show his ambition and capability for rule, and after the shah of Afghanistan had given him the

province of Lahore he directed all his energies to the founding of a kingdom which should unite all the Sikh provinces under his own personal rule (see SIKHS). He died on 27th June 1839. He procured from an Afghan prince, as the price of his assistance in war, the famous Koh-i-nur diamond (see DIAMOND). (See Giffin, *Ranjit Singh* (1892), Cunningham, *History of the Sikhs* (rev. ed. 1919).

Rank in the military forces of the British empire is not confined to the commissioned classes; the various grades of non-commissioned officers, and even the titles gunner, driver, sapper, or private are officially styled ranks. *Lance* or *acting rank* is a temporary advancement. Thus, a private or sapper is first made a lance-corporal, and a gunner or driver an acting-bombardier, before being permanently promoted. Until so promoted they rank only as private soldiers. Similarly a lance-sergeant is a corporal acting as sergeant, and holds only the lower rank.

Officers of the army and royal marines may hold either regimental or army rank or both. Up to captain inclusive, rank is purely regimental. Afterwards a captain may be promoted in his regiment to the successive ranks of major and lieutenant-colonel, or while still remaining a captain in his regiment he may become a major or lieutenant-colonel in the army by Brevet (q.v.). The rank of colonel is purely an army rank, obtainable only by brevet or on receiving an appointment, such as assistant-adjutant-general, which carries that rank. The several grades of General (q.v.) are also army ranks only. *Local rank* is sometimes conferred on an officer to enable him to exercise command over others senior to him in a certain locality. *Temporary rank* is often similarly granted, and some appointments carry such rank; for instance, a colonel appointed quartermaster-general in India becomes a temporary major-general while so employed, and reverts to the lower rank at the end of his five years' term of office unless promoted in the meantime. *Honorary rank* is held by some quartermasters and riding-masters, and in the field by certain civilians, such as war correspondents. *Substantive rank* is an officer's or man's rank in his own unit. *Rank* and appointment must be kept distinct. Thus lance-sergeant is an appointment, the holder being corporal in rank. *Relative rank* is held by new officers of the ordnance corps and army pay department, and by chaplains. It carries with it all precedence and advantages attaching to the military rank with which it corresponds, and regulates rates of lodging-money, number of servants and horses, rations of fuel and light (or allowances in their stead), detention and prize-money. It does not entitle the holder to salutes from ships or fortresses, nor to the turning-out of guards, and, of course, it does not confer any right to command, but it allows the holder to sit on courts-martial. The corresponding ranks in the army, navy, and air force are shown in the following table. Officers rank one with another according to date of commission.

Navy.	Army.	Royal Air Force.
Admiral of the Fleet.	Field-marshal.	Marshal of the Royal Air Force.
Admiral.	General.	Air Chief Marshal.
Vice-admiral.	Lieut.-general.	Air-Marshal.
Rear-admiral.	Major-general.	Air Vice-Marshal.
Commodore, 1st and 2d class.	Colonel Commandant and Colonel on the Staff.	Air Commodore.
Captain.	Colonel.	Group Captain.
Commander.	Lieut.-colonel.	Wing Commander.
Lieut.-commander.	Major.	Squadron Leader.
Lieutenant.	Captain.	Flight Lieutenant.
Sub-lieutenant.	Lieutenant.	Flying Officer (or Observer).
Chief Gunner, Boat-swain, or Carpenter.	2d Lieutenant.	Pilot Officer.

Ranke, LEOPOLD VON, the greatest of German historians, was born on 21st December 1795, at Wiehe, about half-way between Gotha and Halle. Although he studied theology and philology at Halle and Berlin, and in 1818 began to teach at the gymnasium of Frankfort-on-Oder, his chiefest thoughts were given to the study of history, to which they were directed principally by his Luther studies and the reading of Scott's romances. The two works, *Geschichte der romanischen und germanischen Völker von 1404 bis 1535* (1824) and *Zur Kritik neuerer Geschichtschreiber* (1824), procured him a call to Berlin as professor of History in 1825. The latter of these works, and *Analecta* to his subsequent books, expound his views of the functions of history, and the methods of the ideal historian. History is the record of facts. It should know nothing of the political party, or church politics, or subjective views of the writer. It should be based upon sound documentary evidence, critically examined and sifted. In 1827 he was sent by the Prussian government to consult the archives of Vienna, Venice, Rome, and Florence; four years he spent in this work, and returned with a mass of the most valuable historical materials, which he utilised in *Fürsten und Völker von Süd-Europa im 16. und 17. Jahrhundert* (1827) and in books on Serbia, Turkey, and Venice; and *Die römischen Päpste ihre Kirche und ihr Staat im 16. und 17. Jahrhundert* (1834-37; 9th ed. 1889), perhaps the most finished of his books, certainly one of his great masterpieces of historical writing. Then he turned his attention to central and northern Europe, and wrote in quick succession *Deutsche Geschichte im Zeitalter der Reformation* (1839-47); *Zwölf Bücher preussischer Geschichte* (1847-48; new ed. 1871-74); *Französische Geschichte* (1852-61); *Englische Geschichte* (1859-67; 4th ed. 9 vols. 1877-79), the last two treating chiefly of the same two centuries as the books on south Europe; and *Zur deutschen Geschichte, vom Religionsfrieden bis zum Dreissigjährigen Krieg* (1869). Later periods and special periods of German history are treated of in books on the Origin of the Seven Years' War (2d ed. 1874), the German Powers and the Confederation (1871), *Zur Geschichte von Oesterreich und Preussen zwischen den Friedensschlüssen zu Aachen und Hubertsburg* (1876); the history of Germany and France in the 19th century (1887), and monographs on Wallenstein (1869), Hardenberg (5 vols. 1877-78), and Frederick the Great and Frederick William IV. (1878). To the above must be added a book on the revolutionary wars of 1791 and 1792 (1873), another on Venetian History (1878), and *Die Weltgeschichte*, of whose nine volumes (1881-88) he lived to see only seven published. This last work, which is the copestone of Ranke's historical labours, was begun when he was an old man of eighty-two; yet at that great age he kept two schooled historical assistants busy, studied critically the Greek and other sources, dictated and worked eight to ten hours a day, and published one volume a year regularly, until he died, on 23d May 1886, having rested from his beloved work only a few short days. Even his long life—he was over ninety when he died—would hardly have sufficed for the thorough works he accomplished had he not been a man of unwearied industry, with a marvellous memory, and a swift and intuitive judgment as to the value of historical material. His style is not brilliant, yet sufficiently clear and interesting. He always wrote from the standpoint of one who had the whole history of the world before his mind's eye. This and his skill in the portraiture of historical personages often lend the deepest interest to his narratives. His point of view was, however, that of the statesman; and he fails to give due prominence to the

social and popular sides of national development. Ranke married an Irish lady in 1843, and was ennobled in 1865. He continued to lecture until 1872. His lectures exercised a great influence upon those who sat at his feet to learn, as is seen in the works of the great school of historical writers, Waitz, Von Sybel, Giesebrecht, and others. The 54-volume edition of his works (1881-90) does not comprise the *Weltgeschichte*, but includes the autobiographical *Zur Eigenen Lebensgeschichte*. Several of the works have been translated into English.

See monographs by Giesebrecht (1887), Guglia (1893), and Helmolt (1907); H. Oncken, *Aus Rankes Frühzeit* (1922); and Guiland, *L'Allemagne Nouvelle* (1899).

Rankine, WILLIAM JOHN MACQUORN, was born of good Ayrshire family at Edinburgh in 1820, and had his education at the university there. He learned engineering under Sir J. Macneill, and was appointed in 1855 to the chair at Glasgow. He died 24th December 1872. Rankine was an incessant worker, and his books were quickly accepted everywhere as standard text-books of engineering; and of especial value in the region of mathematical physics were his contributions to the science of Thermodynamics, and to the theories of Elasticity and of Waves. His more important papers were collected, with a Life by Tait (1881). Another side of his nature was seen in his humorous and patriotic songs, collected as *Songs and Fables* (1874).

Rannoch, a bleak, desolate moorland of north-west Perthshire, with a mean elevation of 1000 feet above sea-level, measuring 28 miles by 15. Its surface is mostly a broad, silent, featureless tract of bog, heath, and moss, girdled by dark, distant mountains. In its western part is Loch Lydoch (5½ miles by ½ mile; 924 feet above sea-level), which winds amid flat and dismal scenery. Stretching eastward from the moor is Loch Rannoch (9½ miles by 1½ mile; 668 feet), which is overhung by Schiehallion, contains a crannog with a later fortress, and sends off the Tummel 29 miles eastward and south-south-eastward to the Tay. Loch Tummel (2½ miles by ½ mile; 130 feet) is an expansion of this river, on which are also the Falls of Tummel, 20 feet high.

Ransom—from Latin *redemptio*—was the price paid by a prisoner-of-war, or paid on his behalf, in consideration of his being granted liberty to return to his own country. In early times, when armies received little or no regular pay, the soldier looked for his reward in the booty he might capture, and this booty included the bodies as well as the chattels of the vanquished. The conqueror had the option of slaying his prisoner; but for his profit, he would make him his slave, or sell him into slavery. The transition would be natural to accepting compensation from the prisoner himself, and setting him at liberty. In feudal warfare the ransoms formed a large portion of a soldier's gains; those for persons of low degree belonging to the individual captors, but those for princes or great nobles to the king. Ransoms were sometimes of large amount, more than the immediate family of the captive could pay. His retainers were then required by feudal usage to contribute; as in the case of redeeming King Richard I. for £100,000, when twenty shillings was assessed on every knight's fee, and the clergy subscribed liberally. David Bruce of Scotland was ransomed for 100,000 marks, and King John of France for £500,000, payable in instalments. In the war between France and Philip II. of Spain, the Duc de Longueville paid Count Horn 80,000 crowns as his ransom. Ransoms were superseded by exchange of prisoners.

Ranters, a fanatical antinomian sect, charged

with pantheism and unholy practices, which arose in England about 1645, and died out with the century. Quakeism helped to supersede rantism. The name was also given to the Primitive Methodists.

Ranunculaceæ, a family of dicotyledons, mostly herbaceous, rarely shrubs, and generally natives of cold, damp climates. Some are found within the tropics, but almost exclusively in very elevated situations. The number of known species exceeds 1000. They occur in all quarters of the globe, but most abundantly in Europe. The leaves are generally much divided, and have dilated sheathing stalks. The calyx is of 3-6 deciduous hypogynous sepals; the corolla of 3-15 hypogynous petals, in one or more rows, sometimes assuming very remarkable forms, as in larkspur, aconite, and columbine; rarely absent, in which case the sepals are gaily coloured. The stamens are usually numerous; the carpels are numerous, one-celled, sometimes united into a single many-celled pistil; the ovary with one or more ovules. The fruit either consists of dry achenia, or is berry-like or follicular. Acidity is the prevailing character of the order, and the leaves of some species readily produce blisters; but this property disappears when they are dried or heated. Many are narcotic and poisonous; some are used in medicine, as aconite and hellebore. The seeds of *Nigella sativa* were formerly used instead of pepper. The May Apple or Wild Lemon (*Podophyllum peltatum*) of North America is usually placed in Berberidaceæ (see *PODOPHYLLUM*). Many of the order produce flowers of great beauty, as some species of *Ranunculus* (q.v.), *Anemone* (q.v.), *Larkspur* (q.v.), *Peony* (q.v.), *Columbine* (q.v.), *Clematis* (q.v.), &c.

Ranunculus, a genus of plants of the family Ranunculaceæ; having five sepals; five petals, with a nectariferous pore at the base of each petal, often covered with a scale; many stamens situated on a receptacle, and ovaries accumulated into a head. The species are numerous, herbaceous plants, mostly perennial. Some of them adorn meadows with their yellow flowers, familiarly known as *Buttercups*; others, known by the name



Ranunculus asiaticus, garden varieties.

of *Crowfoot*, are troublesome weeds in gardens and pastures. Many, as the *Spearworts*, are found chiefly in moist places, and some are altogether aquatic, covering the surface of ditches, ponds, and rivers, where the water is shallow, with a carpet of verdure exquisitely studded with beautiful white flowers. One species, the Asiatic *Ranunculus*, or *Garden Ranunculus*, exclusively the *ranunculus* of florists, a native of the Levant, has

been grown in Europe for 300 years. The cultivated varieties are extremely numerous, brilliantly coloured, and very symmetrical in form. The ranunculus is propagated by seed, by offset tubers, or by dividing the clusters of tubers. The roots are often taken up in summer, after the leaves die, and kept in a dry place till the beginning of the ensuing winter or spring. The ranunculus loves a tree and rich soil. Double flowered varieties of some other species, with taller stems and smaller white or yellow flowers, are cultivated in flower-gardens, sometimes under the name of *Bachelors' Buttons*. The acidity of many species of ranunculus is such that the leaves, bruised and applied to the skin, produce blisters; and those of *R. sceleratus*, a pretty common British species, are said to be used by beggars to cause sores in order to move compassion. *R. Thora*, an Alpine species, is of extreme acidity, and hunters were accustomed in former times to poison darts and arrows with its juice. Water distilled from the leaves of *R. Flammula*, a British species, with rather tall stem and ovato-lanceolate leaves, common by the sides of ditches, &c., is an active and powerful emetic, producing almost immediate vomiting, and capable of being used with great advantage in cases of poisoning. Yet the leaves of *R. Ficaria*—sometimes called *Pilewort* and *Lesser Celandine*, a very common British species, adorning hedge-banks with bright yellow flowers in spring—are capable of being used as a pot-herb. Pasture in which *R. acris*, *R. repens*, &c., are very abundant are injured by them; these plants are particularly supposed to give an unpleasant taste to milk and butter; but it is thought not improbable that a moderate mixture of these plants with the other herbage is even advantageous, and that they may act as a condiment. Their acidity is lost in drying, and they are not injurious to hay. The small tubers of *Pilewort* were once used for the cure of hæmorrhoids (see *SIGNATURES*). *R. aquatilis*, by many divided into a multitude of species distinguishable only by an expert, is very abundant in streams in many parts of Britain. Its submerged leaves are often finely divided, its floating leaves lobed. It is eaten with avidity by cattle, the acidity so general in the other species being wanting in it.

Ranz des Vaches (in German, *Kühreigen*), a name applied to certain simple native melodies of the Swiss Alps, which are usually sung by the herdsmen, and played by them when driving their herds to and from the pasture on the Alphorn or Kuh-horn (q.v.). The associations of pastoral life recalled by these airs to the Swiss in foreign countries have been said to produce an almost irresistible longing for home.

Rap (contracted from *rapparee*, 'an Irish plunderer'), familiar in the phrase 'not a rap,' was a counterfeit Irish coin of the time of George I., which passed for a halfpenny, though not really worth a fourth of that value. The Swiss centime is called a *rappen*.

Rapallo, a winter health resort of Northern Italy, 17 miles by rail ESE. of Genoa, with a castle and the pilgrimage church of the Madonna (1557) on the Monte Allegro. Off here the Venetian Fleet defeated the Genoese in 1431. Pop. 14,000.—By the treaty of Rapallo (1920) Yugoslavia agreed that Italy should have Cherso, Lussin, Unie, and Lagosta, and the town of Zara; Fiume to be independent.

Rapateaceæ, a family of monocotyledons with some affinity to Bromeliaceæ and Eriocaulaceæ, amphibious marsh plants inhabiting the country between the Orinoco and the Rio Negro. *Rapatea paludosa*, with leaves nearly two yards long, may be considered the type.

Rape, or COLESEED (*Brassica Napus*; see BRASSICA), an annual plant much cultivated on account both of its herbage and of its oil-producing seeds. It is a native of Europe and perhaps of England; but it is hard to say where it is truly indigenous and where naturalised. It is so nearly allied to *Brassica Rapa* (Turnip), *B. campestris* (Swedish Turnip, Colza, &c.), and *B. oleracea* (Kale, Cabbage, &c.), that botanical distinction is difficult, particularly for some of the cultivated varieties. The root of rape is slender, or in cultivation sometimes becomes carrot-shaped (see *NAVEW*), but it never becomes turnip-shaped. The cultivation of rape is very general in many parts of the continent of Europe, from which it seems to have been introduced into England at least as early as the 16th century; and in the 17th century, if not sooner, large quantities of oil were made from its seeds, chiefly in the fenny and other alluvial districts of the east of England, where also it has long been most extensively employed for feeding sheep. On the Continent it is not unusual to sow rape for *green-manuring*—i.e. its herbage is ploughed into the soil, a mode of enriching land much more common in some parts of Europe than it is in Britain. *Rape-oil* is used for machinery, for lamps, and, especially in the East Indies, for human consumption; but the oil and cake so called are not exclusively obtained from this plant, nor are the names *Colza-oil* and *Rape-oil* used to discriminate the produce of different plants, although in some parts of Europe the name Colza is given to varieties of *Brassica campestris* and *B. oleracea*, which are cultivated in the same way as rape. *B. præcox* is also cultivated in some places, being sown in spring and reaped in autumn. The seeds of other cruciferous plants are also crushed indiscriminately with these, and the oil and cake sold by the same names (see *OILS*, *OIL-CAKE*).—The name *Rape* is from Lat. *rapa*, 'a turnip'; *Colza* is through the French from the Dutch *koolzaad*, 'cole-seed.'

Rape is having carnal knowledge of a woman without her conscious consent, and such consent must not be extorted by violence or threats of violence. The Criminal Law Amendment Act, 1885, provides that a man is guilty of rape if by personating a woman's husband he succeeds in having connection with her. Previously the point was doubtful. A husband cannot under any circumstances commit rape on his own wife, her consent at marriage being irrevocable; but Mr Justice Stephen was of opinion that under certain circumstances he may be convicted at least of an indecent assault. Nor, in England, can a boy under fourteen be guilty of this crime, for in law (whatever be the physical fact) he is absolutely presumed incapable; but both husband and boy may be charged with assisting others in committing it. Rape is a felony punishable with penal servitude for life. To this every one who unlawfully and carnally knows any girl under the age of thirteen years is also liable. The attempt to have unlawful carnal knowledge of any girl under



Rape (*Brassica Napus*):
a, silique.

thirteen years of age is a misdemeanour punishable by two years' imprisonment with hard labour. The act or attempt to have unlawful carnal knowledge in the case of a girl between thirteen and sixteen, or in the case of any female idiot under circumstances which do not amount to rape, are also misdemeanours, punishable in the same way. The Criminal Law Amendment Act, 1922, no longer makes a reasonable belief on the part of the accused that the girl was over sixteen a defence to the charge, except where the accused is under twenty-three on the first occasion of the charge. The merest penetration suffices to constitute the crime. As regards evidence in cases of this sort, the most important question will usually be, How far is the supposed injured person to be believed? That depends on many things, of which the chief are (1) her character—for though as a matter of law rape may be committed on a prostitute, since even she cannot be compelled to submit to outrage, yet in fact if the chief witness is shown to be unchaste the charge almost invariably breaks down; (2) the time within which and the person to whom she made the first complaint; (3) any marks of violence on her dress or person, and her agitated or calm demeanour; (4) the scene of the alleged crime, and the probability of strenuous resistance attracting public notice; (5) whether the prisoner fled or not; (6) any marks of violence on his dress or person. (7) If apprehended soon after the alleged act the accused is usually asked to submit to medical examination. Refusal to do so is a strong presumption of at least intercourse. The thing to be guarded against is either a false charge made by a woman to extort money or, on failure of this attempt, persisted in from spiteful motives, or an accusation made by one who after consenting resists too late, or who tries when by any accident the fact of connection becomes known to whitewash her character.

The law which protects women against the class of crime of which rape is the chief has been made much wider of late years, chiefly by the Criminal Law Amendment Act of 1885, which contains provision against various kinds of procuration. As regards the abduction (1) of a woman on account of her fortune; (2) by force with intent to marry; (3) of an unmarried girl under the age of eighteen with intent to have carnal knowledge of her, it need only be remarked that the first two are felonies punishable by fourteen years' penal servitude, and the third a misdemeanour punishable by two years' imprisonment with hard labour.

In the United States the crime is everywhere treated as a felony, and punished with imprisonment for life or for a number of years; but the punishment is somewhat different in the different states of the Union. See also ABDUCTION.

Rape, a territorial division peculiar to the county of Sussex. There are six of them—viz. Hastings, Pevensey, Lewes, Bramber, Arundel, and Chichester.

Raphael Santi, born at Urbino in 1483, died at Rome 1520, was the son and pupil of Giovanni Santi, a painter, whose death took place in 1494. Apprenticed about 1499 at Perugia, Raphael learned his profession from Perugino, and became such a clever imitator of his style that to this day the early pictures of the disciple are confounded with those of his teacher. Raphael, in fact, copied Perugino's drawings (Academy of Venice), helped to work at Perugino's pictures, and finished altarpieces from Perugino's designs. Examples are the Resurrection of the Vatican and the Virgin and Child, with and without attendant saints, at Berlin. The presence of Raphael during these years at Perugia, Urbino, and Città di Castello may be traced by his sketches at each of these

places. His first patrons were the Duke and princesses of Urbino, ecclesiastical corporations at Città di Castello, and ladies of the high families of Baglione and Oddi at Perugia. His earliest commissions were those of Città di Castello, where (1502-3) the most important of his early works, the Crucifixion in the National Gallery, was painted. An Assumption of the Virgin, now at the Vatican, was executed shortly after for Maddalena degli Oddi. Distinct features in these pieces are dependence as to form on Perugino and Pinturicchio, combined with a feeling for grace and pure colour essentially original. In a Marriage of the Virgin of 1504 (Milan gallery), these qualities are found in conjunction with exact repetitions of Perugino's figures. It is probable that about 1504 Raphael began to discern the advantage of greater independence. His predellas of the Vatican Coronation, and especially the Epiphany of that series, already display some acquaintance with the more advanced methods of the Florentines. Yet for some time longer the paramount influence of Perugino remained manifest, and Raphael showed Peruginian influence in such pictures as the Conestabile Madonna, now at St Petersburg, the Vision of the Knight in the National Gallery, the little St Michael and St George, or the Marsyas of the Louvre, and the Graces at Chantilly. The painting of the Graces is obviously connected with a journey which Raphael made to Siena in 1505, when he gave assistance to Pinturicchio in drafting the preliminary design for frescoes in the Piccolomini library. It was there that he copied the Graces, of which the sketch, sometimes, however, attributed to Pinturicchio, is preserved at the Venice Academy. At Siena Raphael probably heard that Leonardo and Michelangelo were rivals for the decoration of the town-hall of Florence, and there is good cause for thinking that he accompanied Perugino to that capital to be near the lists of this artistic tournament. But before starting he probably took commissions, which gave as a final result the Virgin, Child, and Saints, in full length, called the Madonna Ansidei, now at the National Gallery, and the Virgin and Child with four saints, called the Madonna of Sant' Antonio, in the Morgan collection, both of which were delivered at Perugia. The Madonna of Terranuova, a group of half-lengths at the Berlin Museum, was completed at Florence. Raphael was now on the path which Perugino had trod before him, had a painting room at Florence and a painting-room at Perugia, but was not satisfied as his master had been with that finality which caused Perugino to remain stationary in the rut of an old style. He determined to acquire and assimilate some of the boldness of Michelangelo, and the principles which Leonardo had been teaching to the students of his academy at Milan. When, after a short absence at Florence, he resumed work on the Ansidei and Sant' Antonio Madonnas at Perugia, Raphael gave as much as he could of the new spirit which was in him to those compositions, without being able to alter their archaic character. In the second of these pictures some heads, recast in a new mould, reveal the influence of Da Vinci; for it is characteristic of Raphael that, after witnessing the struggle of that master with Michelangelo, he came for a time to the conclusion that Leonardo was the better man so far as grace and expression were in question, though for action the spirit of Michelangelo might be preferable. The Terranuova Madonna shows the struggle in which Raphael was engaged. It has the brightness and sweetness of the Umbrian with the breadth of execution of the Florentine. But similar characteristics distinguish the five small predellas which once formed part of the

Madonna of Sant' Antonio, whilst the 'Sermon on the Mount,' in Lord Lansdowne's collection at Bowood, and part of the predella of the Ansidei Madonna, display the influence of the works of Masaccio, Filippino, and Ghirlandajo.

It is not historically proved that Raphael and Da Vinci were intimate, but all the pictures which left Raphael's easel at Florence in 1505-6 recall Leonardo in expression, concentration of lines and light, tempered atmosphere, and subtle combinations of movement and tints. Examples are Madonnas and Holy Families, of which the most conspicuous are that of the Gran Duca at Florence, the small Cowper, the Cardellino, and Casa Tempi, and the Virgin in Green at Vienna. But in portrait more than elsewhere the lessons of Da Vinci are visible, and the likeness of Maddelena Doni at Florence is inspired by the Mona Lisa of the Louvre. Of special interest to Englishmen as a creation of this time is the St George, which was sent by the Duke of Urbino to Henry VII. of England in return for the garter given by that prince to Guidobaldo of Montefeltro. Attractions in other ways are the painter's own likeness at the Uffizi, in which we discern that the grace of his art was also displayed in Raphael's person, the Madonnas of Orleans, of the Palm, of St Petersburg, and Canigiani, in which Raphael finally appears as a pure Tuscan familiar with the arts of all his Florentine contemporaries.

The Entombment to which Raphael now turned his attention was finished for Atalanta Baglioni, and recalls in many ways the misfortunes which attended the worthless family of that name, which had so long governed Perugia. The sketches for the picture contain incidents that remind us of a massacre in which Atalanta lost her son. The picture in the Borghese palace is an embodiment of all the new principles which Raphael acquired at Florence, realising the perfect drawing of Da Vinci and the sculptural shape of Michelangelo, allied to Peruginesque softness, and colour such as only Raphael could give. The result is perhaps a little stiffness, which is happily avoided in a graceful predella representing Hope, Faith, and Charity. As this fine work advanced to completion Raphael became very evidently attracted by the style of Fra Bartolommeo; and, under the influence of that master of monumental painting, he brought in part to perfection the Apostles attendant on the Eternal, in a fresco at San Severo of Perugia, whilst he composed and finished the Madonna del Baldacchino at Florence. During the progress of these works Raphael got into a large practice at Florence, where he reigned supreme in the absence of Perugino, Leonardo, and Michelangelo. Some of the best work of his Florentine period was now produced—the small Holy Family with the Lamb at Madrid, much in the spirit of Da Vinci; the St Catharine of the Louvre; the Bridgewater and Colonna Madonnas; the Virgin and Sleeping Infant of Milan; the large Cowper Madonna; the Bella Giardiniera, and the Esterhazy Madonna.

From the days of Giotto and Masaccio to those of Raphael Rome had always attracted to its centre painters and sculptors of acknowledged skill in other cities of Italy. Michaelangelo had left Florence for the Vatican, and Raphael in 1508 did the same at the instigation of his friend Bramante, who was in great favour with Julius II., and not without support from Michelangelo. The plans of this pope were gigantic. He laid the foundation of the new cathedral of St Peter because old St Peter's was tottering to its fall, and he caused the papal chambers to be decorated afresh because he disliked the frescoes of the old masters at that time covering their walls. He employed

Raphael because Perugino, Sodoma, and others had failed to satisfy his taste. The date of Raphael's engagement to paint the 'Camera' of the Vatican is now fixed with certainty as 1509. In the ceiling of the chamber 'of the Signature' the space is divided into fields, in which the Temptation, the Judgment of Solomon, the Creation of the Planets, and Marsyas and Apollo were inserted side by side with medallions enclosing allegories of Theology, Philosophy, Justice, and Poetry. All these pictures exhibit an expanded style, in which the spirit of Perugino, quickened by the subtler spirit of Leonardo and Fra Bartolommeo, becomes associated with the antique. Never before had the artist had such an opportunity of study as now. When at Rome he was enabled to visit the treasures of old sculpture and gems at the Vatican, and the collections of the cardinals Rovere and Medici. On the walls of the camera Raphael began the Disputa, in which he represented the Eternal, Christ, Mary, and the apostles and angels presiding in heaven over the sages of the Trinitarian controversy. Here Raphael practically entered on a method of painting with which he had not been very familiar; but he gained confidence as he proceeded, and, gradually descending from the higher parts to the lower, he equally applied the models and precepts of Leonardo and Fra Bartolommeo, became bolder and more energetic in the conception and rendering of form, and nearly succeeded in equalling the power of Michelangelo himself. It was a happy time during which the youthful master laboured at this composition, the time when he longed to add to the art which he knew so well that of poetry, in which Michelangelo excelled. His sketches for the Disputa are filled with snatches of sonnets, which, as he soon saw, were entirely beneath the mark. But if his friends should reject his verses, they could praise his picture, which is indeed the noblest work that had then been completed at Rome. The School of Athens immediately followed the Disputa, taking Raphael into the pre-Christian period of Plato and Aristotle. The picture embodied old philosophy and sciences. It was laid out in a temple planned for Raphael by Bramante, in which the philosophers met, appropriately clad in the dress of the ancient Greeks, surrounded by statues and bas-reliefs, which all gave occasion to the painter to transport his spectators into an almost forgotten realm. The manner in which he reproduced antique character and costume, in action, movement, and expression, is acknowledged to have been worthy of the man who succeeded in displaying with a single effort the progress made by Italian painters from the days of Giotto to those of Ghirlandajo. The Parnassus which came after the School of Athens takes us back to the age of Greek verse, showing us Apollo and the Muses attended by the poets from Homer to Ovid, and escorted by Dante. Raphael admirably transformed the antique into something living and present to the moderns, infusing into groups and figures the life of a scenic actuality. The allegory of Prudence, which came next, is less natural than the Parnassus, but rescued from affectedness by grace of lines and skill in pictorial treatment. The subordinate pictures of the Pope accepting the Decretals, Justinian receiving the Pandects, and Augustus saving the manuscripts of Virgil are worthy adjuncts to the principal themes. Julius II. asked Raphael to introduce his portrait into the Decretals, and the likeness of the pontiff with a beard enables us to fix the date of the completion of the Chamber of the Signature in the middle of August 1511. On the same day that Julius II. was privileged to witness the completion of Raphael's first cycle of wall-paintings he officiated

at mass in the Sistine Chapel, where the first half of Michelangelo's ceiling was uncovered.

During the progress of the works in which he employed and formed the talents of his disciples—Giovanni da Udine, Penni, and Giulio Romano—Raphael divided his time between the labours of the Vatican and easel-pictures. The portraits of Julius II. and the Virgin of the Popolo, of which copies have come down to us, were executed; drawings were furnished to the copper-plate engraver Marcantonio for the Massacre of the Innocents; and Madonnas and Holy Families were composed, of which it is only possible here to give the names—Madonnas of Alba at St Petersburg, of Garvagh at the National Gallery, of the Diadem at the Louvre. Nothing could exceed the impatience of Julius to get the chambers of the Vatican properly decorated. He urged Raphael not in vain to begin the chamber of Heliodorus, and in a comparatively short time the master produced, with clever help from his disciples, the ceiling, in which the Eternal appears to Noah, Abraham's Sacrifice, Jacob's Dream, and the Burning Bush. In all these compositions Raphael's mastery is great, and his figures of the Eternal are majestic. The Expulsion of Heliodorus and the Mass of Bolsena are planned so that by a pictorial license the pontiff is present as the scenes are enacted. The death of Julius early in 1513 but slightly interrupted the labours of the painter, who gave a noble rendering of Leo X. and his suite in the picture of the Defeat of Attila. The Deliverance of Peter, which closed the decorations, was an effective piece of composition, in which Raphael for once indulged in contrasts of torch and moonlight and glare balanced by powerful gloom. The constant employment of disciples enabled Raphael, in the three years which elapsed between the completion of the two chambers—i.e. between 1511 and 1514—to finish the Madonna di Foligno at Rome, the Isaiah of St Agostino at Rome, the Galatea of the Farnesina, and the Sibyls of the Pace, not to speak of the mosaics of the Popolo ordered by Agostino Chigi. In many of these works Raphael's style is equal to that of Michelangelo at the Sistine, with the additional charm of a grace which was his own. He also laid the antique under contribution with great skill and success, and his art was that of a master who works without hesitation because ready for every form of effort that can be required of him. In a graver mood he also painted at this time the severe Madonna of the Fish at Madrid, in a playfully sweet mood the Madonna della Sedia at Florence; whilst in portraits such as Altoviti at Munich, and Inghirami at Florence, he rises to the perfect rendering of features and expression which finds its greatest triumph in the Leo X. of Florence.

Raphael, who had been greatly favoured by Julius, became a personal favourite of Leo, who selected him to succeed Bramante as architect of St Peter's in 1514, and afterwards made him inspector of Roman ruins. But he was as impatient as his predecessor to get the Vatican chambers finished, and he successfully obtained from the masters the frescoes of the Camera dell' Incendio, which all illustrate scenes from the lives of Leonine popes: the Fire of Borgo, in which all the remnants of Roman buildings known to Raphael are introduced, the Battle of Ostia against the Saracens, the Coronation of Charlemagne, and the Oath of Leo III. But Raphael was now too busy to attend personally to wall-painting, and much of his attention was taken up with the composition of the cartoons which he executed, with help from assistants, for the tapestries of the Sistine Chapel. It would be impossible to describe these masterpieces or the tapestries made from them in the space here at

our command. The cartoons may be seen at the Kensington Museum, the tapestries at the Vatican. They are masterpieces worthy of a pilgrimage; the first completed in December 1516, the second woven at Brussels in 1519. At this period of his career Raphael was a welcome guest in the best circles of Rome, painted the likenesses of the pope's relatives, Giuliano and Lorenzo de' Medici, and was asked in vain for pictures by the Duke of Ferrara. His portraits of the Duke of Urbino, Castiglione, Bembo, Navagero, and his decoration of Cardinal Bibiena's rooms at the Vatican tell of the company which he frequented. When Leo X. succumbed to Francis I. after Marignano Raphael followed the pontiff to Florence and Bologna, and found there the new patrons for whom he executed the Sistine Madonna, the St Cecilia of Bologna, and the Ezekiel of the Pitti. The labours subsequently completed were immense, including the Spasimo at Madrid, the Holy Family and St Michael, which the pope sent to the king of France in 1518, and the likeness of the vice-queen of Aragon, followed by the celebrated portrait of the Violin-player of the Sciarra collection at Rome. Wall-painting, with help from the assistants, was diligently carried on, and produced the cycle of the Psyche legend at the Farnesina, the gospel-scenes of the Loggia of the Vatican, and the frescoes of the Hall of Constantine. The last work done in the master's painting-room was the Transfiguration, which was nearly finished when Raphael died of a pernicious fever caught in the excavations of Rome. He expired on the 6th of April 1520, after a week's illness.

See, besides Vasari's, books by Castiglione (1766), Pungileoni (1822), Rumohr (1827), Passavant (1860), Campori (1870), Müntz (1881), Crowe and Cavalcaselle (1882), Springer (1883), Grimm (1886; trans. 1889), Lützow (1890), Knaackfuss (1895), Strachey (1900), Staley (1904), Cartwright (1914), McCurdy (1917), Lavery (1920); and works on Italian painters by Morelli (1893), Berenson (1897).

Raphania, or **ERGOTISM**, is a disease which was much more prevalent some centuries ago than it is at present. The name *raphania* was first given to it by Linnæus, who thought the morbid symptoms were dependent upon the mixture of *Raphanus Raphanistrum*, or jointed charlock, with the wheat used as food. It was suspected, as early as the end of the 16th century, that the disease was due to the development of a fungus (*Claviceps purpurea*) in the grain, and this fact is now established, although some writers held (as Linnæus did) that this morbid state was also produced by the presence of poisonous plants, especially *Lolium temulentum*, or darnel, among the grain. Deficiency of proper food probably contributed to cause the disease, but it can be experimentally produced in animals by excessive doses of ergot alone. Although rye is the ordinary seat of the poisonous fungus, other grains are liable to be similarly affected, and to produce similar results. See **ERGOT**.

There are two forms of the disease—the spasmodic and the gangrenous. In both, symptoms of irritation of the digestive organs are the first to appear. In the spasmodic form tingling or itching of various parts of the body, with loss of sensation in the feet and hands, are the most constant symptoms. Violent contractions of the muscles may occur, giving rise to intense pain, and sometimes convulsions supervene. In the gangrenous form the extremities are painful, red but cold, and not easily moved; and after a varying time gangrene, due to spasm of the arteries, supervenes. With regard to treatment, the main thing is to replace the poisonous flour by easily digested,

wholesome food. Whatever be the form of treatment adopted, the mortality in the gangrenous form is usually very high.

Raphia, a genus of Palms (q.v.), the leaves, bark, and pith of which are used for various purposes. The bast of one South American species, *R. tediigera* or Jupati-palm, is largely used by gardeners everywhere for tying up plants, in fastening grafts, &c. And the midribs of the leaves of another species, found in Madagascar, &c., are supposed to have been taken for the feathers of the fabled Roc (q.v.). *R. vinifera* is the wine-palm of the Amazon.

Raphoe, a market-town of Donegal, 15 miles SSW. of Londonderry. Its former see was united to Derry in 1835. Pop. 700.

Rapidan, a river of Virginia, and tributary of the Rappahannock (q.v.).

Rapids. See WATERFALL, RIVER, NIAGARA, NILE, PARANÁ, &c.

Rapier, a light, highly-tempered, edgeless, thrusting weapon, finely pointed, and about 3 feet in length. It was for long the favourite weapon in duelling, and was worn by every gentleman. At present it is worn only on occasions of court ceremonial. See FENCING, SWORD.

Rapin de Thoyras, PAUL DE, a French historian of England, was descended from a Protestant Savoyard family, which settled in France in the 16th century, and was born at Castres, in Languedoc, 25th March 1661. He studied at the Protestant college at Saumur, and passed as advocate in 1679, but had no liking for the profession; and when the revocation of the Edict of Nantes (1685) forced him to leave France he sought employment without success in England, and afterwards in Holland, where he enlisted in a corps of volunteers at Utrecht, formed by his consin-german, Daniel de Rapin. With his company he followed the Prince of Orange to England in 1688, was made ensign in the following year, and distinguished himself by his bravery at the siege of Carrickfergus, the battle of the Boyne, and the siege of Limerick, where he was shot through the shoulder by a musket-ball. From 1693, tutor to the Earl of Portland's son, he travelled in Holland, Germany, and Italy, after which he settled first at The Hague, then in 1707 at Wesel, where he devoted the remaining seventeen years of his life to the composition of his great work. The severity of his labours is believed to have shortened his days. He died May 16, 1725. Rapin's *Histoire d'Angleterre* was published at the Hague in 8 vols. the year before his death. It was undoubtedly, as Voltaire has said, the best work on English history that had until then appeared; full, minute, careful in the citation of authorities, clear, rapid, and accurate in narration, methodical in the arrangement of its materials, comparatively impartial in spirit, and yet betraying on the part of the author an honourable reverence for law and liberty.

Rapin begins with the invasion of Britain by the Romans, and ends with the accession of William III. The work was continued to the death of William III. by David Durant (Hague, 2 vols. 1734). The best edition of the *Histoire* in its augmented form is by Lefebvre de Saint-Marc (Hague, 16 vols. 1749 et seq.). The original was translated into English by the Rev. Nicholas Tindal (Lond. 15 vols. 1725-31), and subsequently by John Kelly (in 2 vols. fol.).

Rapp, GEORGE, founder of the sect of Harmonists, was born in Württemberg in 1770, and, after an attempt to restore the church of New Testament days in Germany, emigrated with his followers to Western Pennsylvania in 1803. There he established a settlement which he named

Harmony (whence the early title of the sect, Harmonists or Harmonites). In 1815 the community removed to Indiana, and founded New Harmony (q.v.); but this was sold in 1824 to Robert Owen, and Rapp and his followers returned to Pennsylvania, where they built Economy, a village on the right bank of the Ohio, 15 miles NW. of Pittsburg, and engaged in farming. There Rapp died, 7th August 1847. Impressed with the certainty of the speedy second coming of Christ, his absorbing aim was to amass great wealth, to be placed then at the Lord's disposal. To this end he and his followers practised a rigid economy, and lived a life of toil and self-denial, in which celibacy formed a part; and, with the same object, all things were held in common. As the years passed, the community became very wealthy, owning great farms, dairies, and vineyards. Its numbers, however, diminished, and it was all but extinct by the first decade of the 20th century.

Rapp, JEAN, COUNT, a French general, was born at Colmar, 27th April 1772. He was intended for the church, but his taste for a military life led him to enrol himself (1788) in the mounted 'chasseurs' of the French army. Distinguishing himself in Germany and Egypt, on the death of Desaix at Marengo Rapp became aide-de-camp to Napoleon. His brilliant charge at Ansterlitz upon the Russian Imperial Guard was rewarded with the grade of general of division (1805). For his services at Lobau he was named a Count of the Empire (1809). He opposed the Russian expedition, but accompanied the Emperor throughout the whole of it, and defended Danzig for nearly a year against a powerful Russian army. The Russians, contrary to the articles of capitulation, sent Rapp and his garrison prisoners to Russia, and he did not return to France till July 1814. On reaching Paris he was well received by Louis XVIII.; but in 1815 he went over to his old master, and was appointed commander-in-chief of the army of the Rhine, and peer of France. After Waterloo Rapp again submitted to Louis. Re-created a peer of France (1819), he held various offices about the court, and died at Paris, 8th November 1821. See his *Memoirs* (1823), and Spach's *Biographies Alsaciennes* (1871).

Rappahannock, a river of Virginia, rises in the Blue Ridge of the Alleghany Mountains, receives the Rapidan (above this point it is sometimes called the North Fork), and flows about 125 miles south-east to Chesapeake Bay. It is tidal and navigable to Fredericksburg. The Rappahannock and the Rapidan were the scenes of some of the bloodiest battles of the Civil War, at Fredericksburg, Chancellorsville, and the Wilderness.

Rappee' (Fr. *rapé*), a coarse kind of snuff. See TOBACCO.

Rapperswyl, on the north shore of the Lake of Zürich, has an old castle fitted up in 1869 by a Polish nobleman as a Polish National Museum.

Rarey. See HORSE.

Rarotonga. See COOK ISLANDS.

Ras (= Heb. *rosh*), an Arabic word, signifying 'head,' 'promontory,' occurs in the names of many capes on the Arabian and North African coasts, and also in Sicily and Malta.

Rashes, affections of the skin, characterised by a red superficial efflorescence, diffused or in patches, disappearing under pressure, and usually ending in desquamation. To this division of cutaneous disorders belong Measles, Scarlatina (or Scarlet Fever), Erysipelas, Erythema, Roseola (or Scarlet Rash), and Nettlerash. Of these rashes Measles, Scarlatina, and Erysipelas are rather to be regarded as fevers or infectious diseases

than as cutaneous diseases in the true sense of the phrase.

Rashi (i.e. Rabbi Solomon bar Isaac, from the initials of Rabbi Shelomo Yizhaki, often erroneously called Yarhi through confusion with Solomon of Lunel. *Yarhi* means 'lunar,' hence it became an equivalent of Lunel), the greatest Jewish commentator and exegete, was born about 1040 at Troyes, in France. The story of his extensive travels is legendary, but interesting; his tours, undertaken for purposes of study, were probably confined to Lorraine. At Worms, the 'Rashi Chapel' where he worked (c. 1035) still exists. He returned to Troyes (c. 1065) and remained there, acting as unpaid rabbi and judge, and acquiring great renown. He had no sons, but his three daughters, who were possessed of considerable scholarship, carried on his tradition. Their husbands were distinguished among Rashi's pupils, and they continued the school which he created. Rashi died at Troyes on 13th July 1105, saddened by the events of the first crusade. His fame rests mainly on his commentaries on the Bible and Talmud. That on the Pentateuch was the first dated Hebrew book to be printed (Reggio, 1475, without biblical text). The Bible Commentary (translated into Latin by J. F. Breithaupt, Gotha, 1710) exercised a great influence on Nicholas de Lyra, and, through him, on the Reformation (*Si Lyra non Lyrasset, Luther non Saltasset*). The Pentateuchal books have been rendered into German by L. Dukes (Prague, 1838), J. Dessauer (with text of Rashi vocalised and in square characters), and others, and have been the theme of many super-commentaries. A critical edition was published by A. Berliner (2d ed. Berlin, 1905). Rashi's Talmud Commentary is of such value that it is always printed with the Talmud. Parts were revised by his pupils and followers (the Tosafists), whose *Addamenta* always appear in a parallel column. Rashi wrote various other works, including *Responsa* and liturgical treatises. One of the latter, *Sefer ha-Pardes*, has been re-edited by H. L. Ehrenreich (Budapest, 1924) from the Constantinople edition of 1567. Rashi is noted for his terseness and simplicity. His interests were wide, but he was not a philosopher like Maimonides. He was a good grammarian, but inferior to Qimhi. Though his method was somewhat unscientific at times, his learning was always profound. Frequently he reproduces in Hebrew characters the vernacular equivalent of a word under discussion, and such glosses (*La'azim*) are of great value for Romance phonetics. Many have been edited by A. Darmesteter (*On the Pent.*, Paris, 1909), Brandin, D. S. Blondheim (*Les Pwlers Judéo-Romans* [the bibliography should be consulted], Paris, 1926), etc.

BIBLIOGRAPHY.—See art. in *Jew. Ency.* and bibliog. there given. See also M. Liber's *Rashi* (a concise Eng. biog. with bibliography), in 'Jew. Worthies Series' (Lond. and Phil. 1906); I. H. Weiss in *Be-Talmud*, ii, 2-10 (Vienna, 1882); S. A. Hirsch, pp. 139-166 of *The Cabbalists and other Essays* (Lond. 1922); I. Abrahams, ch. ix. of *Short Hist. of Jew. Lit.* (Lond. 1906); W. O. E. Osterley and O. H. Box, *Short Survey of Lit. of Jud.* (Lond. 1920); A. Berliner, *Beiträge z. Gesch. d. Raschi-Commentare* (Berl. 1903), contains much valuable information; to students beginning Rabbis, J. H. Lowe's critical analysis and dissected translation of the first half of the commentary on Genesis (Lond. 1926-27), with full notes, will be found indispensable.

Rask. RASMUS CHRISTIAN, philologist, was born at Brändekilde, near Odense, in the island of Fünen, 22d November 1787, studied at Copenhagen, and in 1808 published his first work on the rules of the Icelandic language. Appointed sub-librarian to the university, he drew up during the years 1807-12 grammatical systems for most of the

Germanic, Slavonic, and Romance tongues, comparing them with those of India. He then visited Sweden and Iceland, returning in 1816 to Copenhagen. In 1818 were published his splendid researches concerning the origin of the Icelandic language. He published in Stockholm (1817) his admirable Anglo-Saxon grammar and the first critical edition of the *Suorra Edda* and the *Edda Saemundar*. Going to St Petersburg, he there devoted himself for two years to the study of the oriental languages, principally Sanskrit, Persian, and Arabic, acquiring also a competent knowledge of Russian and Finnish. Thus equipped, he proceeded to Astrakhan, and then journeyed in the country of the Turkomans, the Caucasus, Persia (adding meanwhile the Mongol and Manchu dialects to his already enormous linguistic acquisitions), and finally Ceylon, where he acquainted himself with Singhalese and Pali, and wrote his *Singalesisk Skriftdaere* (1822). In 1823 Rask returned to Copenhagen, laden with learning and rare manuscript treasures, of which the greatest part was presented to the university. In 1825 he was appointed professor of Literary History, in 1828 of Oriental Languages, and in 1831 of Icelandic. He died, exhausted by his immense labours, 14th November 1832, at the early age of forty-five. Rask also wrote on Frisian grammar (1825), on ancient Egyptian (1827), and Hebrew chronology (1828), grammars of several languages, and a great number of miscellaneous articles in the learned journals of the North, which were collected after his death, and published (3 vols. 1834-38). There are English editions of his Anglo-Saxon, Danish, and Icelandic grammars. See the *Lives* by Petersen (1870) and Rönning (1887).

Raskolniks, the name of a variety of sects in the Russian Church. See RUSSIA.

Raspail, FRANÇOIS VINCENT (1794-1878), a French chemist, doctor, and revolutionist, whose camphor-system (1845) was a forerunner of antiseptic surgery. See a monograph on him by Saint-Martin (Paris, 1877).

Raspberry (*Rubus Idæus*), the most valued of all the species of *Rubus* (q.v.). The characters of the leaves, flowers, and fruit of raspberry are well



Raspberry (*Rubus Idæus*).

illustrated in the accompanying figure. The wild raspberry has scarlet fruit, and is found in thickets and woods throughout the whole of Europe and the north of Asia. It is common in Britain. The raspberry has long been in cultivation for its fruit. There are many cultivated varieties, with red, yellow, and white fruit, much exceeding the wild kind in size. The root is creeping, perennial; the stems only biennial, bearing fruit in the second year, woody, but with very large pith. Planta-

tions of raspberries are most easily made by means of suckers. The raspberry loves a light rich soil, and is rather partial to a shady situation. The tall kinds are unsuitable in situations much exposed to winds, as the stems are easily broken. The rows are generally about 4 feet apart, the plants 3 to 4 feet apart in the rows. The young stems are thinned out to allow free access of air to those that are left. Stakes are often used to support the stems, or they are variously tied together. One of the most dangerous diseases is caused by the fungus *Didymella applanata*, which causes the bark to come off in long strips. A prophylactic treatment consists in spraying healthy plants with a 1 per cent. solution of solbar or copper-lime. Raspberries, fermented either alone or along with currants and cherries, yield a strong and very agreeable wine, from which a very powerful spirit can be made. Some of the other species of *Rubus* most nearly resembling the raspberry produce also agreeable fruits. *R. odoratus* is a highly ornamental shrub, a native of Canada and the northern states of America, is frequent in gardens in Europe and America, but rarely produces fruit in Britain.

Raspberry Jam, a name given to the West Australian *Acacia acuminata*, a tree with a fairly heavy wood with a remarkable scent resembling that of pressed raspberries. The grain is very beautiful, and it is therefore much prized for cabinet-work.

Raspe, R. E. See MÜNCHHAUSEN.

Rasputin, GREGORY EFIMOVITCH (1871-1915), Russian religious fanatic, born of a poor peasant family in the Siberian province of Tobolsk. After thirty years of dissolute living he suddenly underwent conversion, accounted himself an emissary from God, and became a monk. Diffusing a gospel that smiled on licence and orgy, Rasputin soon preached his way high into Russian society, and, by his ardour and wonderful powers, established himself a favourite of the empress. Meanwhile his influence waxed great, and his rascally friends were given high appointments. But his enemies closed upon him, and, after two unsuccessful attempts to kill him, they laid him low with a treacherous bullet in December 1915.

Rassam, HORMUZD (1826-1910), Assyriologist, was born, the son of Chaldean Christian parents, at Mosul. He gained the friendship of Layard, and assisted him in his excavations at Nineveh in 1845-47 and 1849-51, and then succeeded him, until 1854, as British agent for conducting Assyrian explorations. His grandest success was the finding of the palace of Assurbani-Pal (Sardanapalus). After holding in the following years political offices at Aden and Muscat, he was sent (1864) by the British government to Abyssinia to demand the release of the Europeans held in prison by King Theodore; but that potentate cast him also into prison, and he was only released with the rest of the captives after the army had been defeated by Sir R. Napier in 1868. From 1876 to 1882 Rassam was employed by the trustees of the British Museum in making explorations in Mesopotamia, and discovered Sippara and Kuthah. He published *The British Mission to Theodore, King of Abyssinia* (1869).

Rastatt, or RASTADT, a town in Baden, stands on the Murg, 3 miles from its junction with the Rhine, and 15 miles SW. of Karlsruhe. It has steel manufactures. From 1725 to 1771 the town was the residence of the Margraves of Baden-Baden. Fortifications were erected in 1840-48 by Austrian engineers to protect the northern entrance to the Black Forest. Rastatt is memorable for two congresses—the first in 1714, when a treaty which ended the war of the Spanish Succession was signed

between Villars and Prince Eugene; and the second in 1797-99. On the breaking up of this latter congress without any definite result the three French plenipotentiaries set out for Strasburg; but they had scarcely got beyond the gates of Rastatt when they were attacked by Austrian hussars, and two of the three slain, whilst the third was left for dead in a ditch. Their papers were carried off, but no further spoil was taken. The town played a prominent part in 1849 as the stronghold of the revolutionists in Baden. Pop. 12,000.

Rat, a name applied to the larger species of the rodent genus *Mus*, e.g. to the two species occurring in Britain, the Brown Rat (*M. decumanus*) and the Black Rat (*M. rattus*). Like mice, which belong to the same genus, rats are agile, alert, and graceful animals, of catholic appetite, and prodigious fertility. In habit they are predominantly nocturnal. The bright eyes, prominent ears, naked muzzle, soft fur, and long scaly tail are familiar external characteristics. The so-called water-rat is a very different kind of animal, a vole, in the genus *Microtus*. Most 'Black Rats' are brown and many 'Brown Rats' are black, but the two species are quite distinct. The Black Rat is smaller, smarter, and lighter, with a sharper muzzle, and larger, almost naked, ears, with a slender tail at least as long as the head and body combined, with relatively large pads on the soles of the feet, and with more numerous harsh hairs in the fur. The Brown Rat is larger, heavier, and more robust, with a blue muzzle and shorter hairy ears, with a stout tail never so long as head and body combined, with relatively small pads on the soles of the feet, and with softer fur. There are also technical differences in the skull and differences in habit. The Black Rat is primarily an arboreal climbing animal; it rarely burrows; it does not



Black Rat (*Mus rattus*); Brown Rat (*Mus decumanus*).

like water or damp places. It usually enters ships by climbing along the cables, and is hardly to be baulked except by metal shields. The Brown Rat also climbs well, but is given to burrowing and is fond of water. It infests sewers and drains, and tries all sorts of habitats from haystacks to coal-mines. It is more adaptable, inquisitive, and aggressive than the Black Rat, also more voracious and cunning. The White Rat is an albino form of the Brown Rat, as all its structural details, including the form of the blood-crystals, incontrovertibly prove. Both species of rat are aliens, hailing from the East. The Black Rat, which probably had its original headquarters in India, seems to have been introduced into Western Europe by the ships of the Crusaders. The Brown Rat, also Oriental, arrived in Europe in the early 18th century, and, as it increased, its predecessor decreased. In the *Origin of Species* Darwin instanced the case of the two species of rat as an illustration of competition being most severe between closely related

forms, and it is true that for a time after the middle of the 19th century the Black Rat was very rare in Britain, except in or near shipping ports, where there was continual fresh immigration. Now, however, the Black Rat is quite common again, and, although the two species sometimes fight to the death, it is probable that there were other reasons for the decline of the first comer. Houses began to be built more carefully, drains and sewers multiplied, man became less tolerant of house rats; the rougher, tougher, bolder, more ferocious species survived where the other went to the wall, but hardly as the result of combative competition. While predominantly vegetarian, and grain-eaters by preference, rats will devour almost anything from eggs to the feet of captive elephants, from young rabbits to fish offal. It is often related that in a slaughter-house near Paris, thirty-five dead horses were picked to the bones by rats in a single night; and it is known that around one sugar factory in Java between 9000 and 12,000 rats were killed every day for several years. Much damage is also done by gnawing through obstacles, even cement, brick, and lead being attacked by the strong, chisel-edged teeth. The material thus gonged away does not pass beyond the front of the mouth. Cannibalism is not unknown, and starving rats have been known to attack sleeping children and even a wide-awake man.

The destructiveness of rats is the more serious because of the prolific multiplication. They may breed at any time of year; a female under eighteen months old (when she usually ceases to bear) may easily have six litters in the twelve months; the young are carried by the mother before birth for only about three weeks; there are often eight young ones in a litter; the offspring are ready to breed when about four months old. Mr Hinton calculated that the 10 million pairs of breeding rats in Britain on 1st January 1918 would be represented at the end of the year by over 40 million pairs of breeding age, allowing for a mortality of 95 per cent. ! Such a rat population would mean in 1919 a consumption of nine million pounds' worth of food. The annual damage to grain-stuffs alone in the United States is estimated at over 100 million dollars. Moreover, it has to be remembered that rats harbour the bacillus of bubonic plague and spread trichinosis and other diseases. Combative measures are urgently needed: (a) more careful treatment of all sorts of crumbs and refuse; (b) the protection of natural enemies, such as stoats and weasels, owls and kestrels; (c) concerted trapping, poisoning, and fumigation; and (d) the careful use of virus. See most conveniently M. A. C. Hinton, *Rats and Mice as Enemies of Mankind*, British Museum, 1918.

Rata (*Metrosideros robusta*), a New Zealand tree growing especially in North Island related to various species of Ironwood (q.v.). The seed germinates in the branch of another tree, borne thither by the wind, and throws down vines which take root in the ground, and grow up around the supporting tree, eventually stifling it. The rata, now strong enough to support itself, grows on as an independent tree to a height of about 100 feet. The wood is very hard, formerly much used for making clubs, and is valuable for many purposes, though mainly used at present as fuel. Other species, *M. lucida* and *M. tomentosa*, are remarkable for their flowers and foliage.

Ratafia, a flavouring essence made with the essential Oil of Almonds (q.v.). The name is sometimes given to other essences.

Ratak. See MARSHALL ISLANDS.

Ratcliffe Tables. See FRIENDLY SOCIETIES.

Ratel (*Mellivora*), a genus of quadrupeds of

the Bear group (Arctoidea), nearly allied to the Gluttons (q.v.), from which it differs in having one premolar less in each jaw and the upper tubercular teeth slightly developed. The general aspect is similar to that of the badgers, but heavier and more clumsy. Three species are known, which inhabit Africa and India; one species, the Cape Ratel (*M. ratel* or *capensis*), inhabits the south of



The Cape Ratel (*Mellivora capensis*).

Africa, and is said to feed much on bees and their honey, its thick fur protecting it against their stings; another inhabits the north of India, prowls about by night, is a voracious devourer of animal food, and often scratches up recently interred bodies from their graves. The Cape ratel is about the size of a badger, gray above, black below. It is easily tamed, and is amusingly active in confinement, continually running about its cage, and tumbling strange somersaults to attract the attention of spectators, from which it seems to derive great pleasure.

Rates.—A rate is a charge levied on an occupier of property for local purposes. The procedure for rating in England and Wales has been radically altered by the Rating and Valuation Act of 1925, which comes into operation on the 1st April 1927: the new valuation lists to be made will probably be effective on 1st April 1928 or 1929, and will normally be reviewed every five years thereafter. Till then, by the Poor Relief Act of 1601, overseers in England and Wales are empowered to raise money 'by taxation of every inhabitant, parson, vicar, and every occupier of lands, houses, tithes, impropriate and propriate, coal-mines, and saleable underwoods,' and by the Rating Act of 1874 occupiers of all 'mines, rights of shooting, advertising hoardings, and woods are also liable.' There are certain statutory exemptions, and the crown is not liable, because it is not specially mentioned in the rating statutes; it is, however, the practice of the government to make *ex gratia* payments. The basis of charge for rates in England and Wales is the 'rateable value'; it may be defined as 'the rent at which the property might reasonably be expected to let from year to year free of all the usual tenants' rates and taxes, and tithe commutation rent-charge, if any, and deducting therefrom the probable average annual cost of repairs. . . . 'Till the new 'General Rate' of the 1925 act comes into operation there may be levied in an urban district—outside the Metropolis—a Poor Rate, General Rate, and a Borough Rate, all for practical purposes, charged on the basis of the 'rateable value.' London is not affected by the new legislation, so that the existing 'General Rate' of the Metropolis will continue; by it the expenses of local govern-

ment are met. In a 'rural' area the expenses of local government, including those of the County Council, have usually been raised by means of the Poor Rate. The accuracy of the rateable value of property, as it is shown in the Valuation List, may be questioned by a ratepayer—firstly, by means of an 'objection' to the assessment committee, and then if he is 'aggrieved' by the decision of that body by an appeal to Special or General Sessions.

As soon as the Rating and Valuation Act, 1925, comes into force, it will apply to England and Wales, but not to Scotland, Northern Ireland, or London. It drastically alters the administrative machinery for the making of valuation lists and the collection of rates; it does not alter the basis on which rates are to be levied—viz. the rateable value. Overseers are superseded by the 'rating authority,' which is to make the valuation list and the rates founded on it. This 'rating authority' is practically the local government authority of the area. The parish, as a rating area, is abolished, and in its place is put the local government area. While there are minor exceptions, the rate which these new authorities will 'make, levy, and collect' is to be a consolidated rate known as the 'General Rate,' and will include all the rates heretofore made. It is to be assessed at a uniform amount in the pound over the whole rating area on the occupiers of the various properties on the basis of the rateable values. The procedure by which the rateable value of a property is to be fixed is by means of the making of a valuation list, which is to be prepared by the 'Rating Authority.' An objection may be made to this list to an assessment committee on account of its 'incorrectness or unfairness.' This objection must be heard and decided by the committee. If a ratepayer is still dissatisfied he may appeal to the Quarter Sessions for the county or place in which the property is situated, or by agreement the case may be taken to arbitration. If during the currency of a rate the value of a property is altered, the 1925 act provides procedure for the necessary adjustment, either by the rating authority or on the motion of the ratepayer.

The Rating and Valuation Act, 1925, deals with the rating of machinery by overriding the practice and law whereby practically all machinery and plant was rated, and providing that only machinery and plant used for the generation and storage of power, heating, cooling, lighting, ventilating, and draining premises, and plant in the nature of a building, such as a gas-holder, shall be treated as part of the property being rated; other plant and machinery is therefore exempt. This rule does not apply, however, to properties valued on a 'receipts and expenditure' basis.

The new 'General Rate' is to be made and collected as the old Poor Rate, so that the various statutory exemptions given to churches, chapels, and voluntary schools continue. Agricultural land, in which expression are now included buildings used solely for agricultural purposes (but not the farmhouses) is given a three-quarter exemption from the General Rate; and tithe, railways, canals, and woodlands are also given partial exemption conditioned by the amount of such exemption previously being received.

Both under the law as it exists to-day (1926) and as it will exist when the 1925 act comes into force, provision is made for the payment of the rates by the owners in the case of certain properties of the smaller classes instead of by the occupiers.

In Scotland the basis on which rates are levied is laid down in sect. 6 of the Lands Valuation (Scotland) Act of 1854 as 'the rent at which, one year with another, such lands and heritages might

in their actual state be reasonably expected to let from year to year.' Where a rent is paid under an agreement fixed by the higgling of the market at arm's length, without any grassum or consideration, then it is to be taken as the 'annual value,' except in the case of ordinary properties let upon a lease the stipulated duration of which is more than twenty-one years, or in the case of mineral properties more than thirty-one years, and then the 'annual value' must be arrived at by the assessor by estimating that value at the date of the making of the valuation list. Estimation of value is also necessary where a property is occupied by the owner. For a property to form the basis of liability for rates in Scotland it must consist of one or more of the following: 'lands, houses, shootings, deer forests, fishings, woods, copse and underwood from which revenue is actually derived, ferries, piers, harbours, quays, wharfs, docks, canals, railways, mines, minerals, quarries, coalworks, waterworks, lime-works, brickworks, ironworks, gasworks, and factories.' The deductions made for repairs and maintenance by the local authorities under sect. 37 of the Poor Rate Act of 1845 vary; the act simply provides that such deductions shall represent 'the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain such lands and heritages in their actual state.'

In many cases, prior to 1895, improvements carried out to a property during the currency of a tenancy escaped rating, owing to the fact that the rent paid was taken as the measure of annual value. It was not till such lease expired that these improvements could be allowed to affect the annual value. Now, however, such improvements may be brought to assessment, except in the case of improvements to agricultural properties and to some mineral properties. The accuracy of the annual value inserted in the valuation roll may be questioned by a ratepayer by getting the assessor to alter the list, failing that by appeal to county valuation committees or magistrates, or the burgh valuation committee, and lastly to the Lands Valuation Appeal Court.

BIBLIOGRAPHY.—For England and Wales: *The Law and Practice of Rating*, by W. C. Ryde; *Law of Rating*, by H. Davey; *Rating*, by P. M. Faraday and W. J. Jeeves; *Local Taxation*, by B. W. Adkin; *The Law and Practice of Rating and Assessment*, by C. A. Webb; *The General Rate of the Metropolitan Boroughs*, by G. W. Clarke; Reports of the County of London Assessment and Valuation Conferences; the Report of the Royal Commission on Local Taxation. For Scotland: 2d edition of *Valuation for Rating*, by Armour and Carmont; Report of the Select Committee on Rating and Valuation of 1888.

Rath, the Irish name for a prehistoric Hill-fort (q.v.).

Rathenau, WALTHER, German industrialist, financier, and statesman, born 29th September 1867 at Berlin, was educated there and at Strasburg. A prominent business magnate, Rathenau became conspicuous in the early years of the Great War by his activities to keep Germany supplied with raw material. As minister of reconstruction (1921), and foreign minister (1922) of the Wirth ministry, he negotiated several important agreements regarding reconstruction. He was murdered in Berlin 24th June 1922. A keen student of social and economic problems, Rathenau published numerous books, among them being *Zur Kritik der Zeit* (1916), *Von kommenden Dingen* (1917), and *Der Kaiser* (1921).

Rathenow, a town of Prussia, on the right bank of the Havel (here crossed by a stone bridge), 43 miles by rail W. by N. of Berlin. Optical

instruments, wooden wares, machinery, bricks and tiles, are made. Pop. (1925) 27,533.

Rathkeale, a town of Ireland, on the river Deel, 19 miles SW. of Limerick by rail; pop. (1926) 1550.

Rathlin, a crescent-shaped island off the coast of Antrim, $6\frac{1}{2}$ miles N. of Ballycastle. Measuring $6\frac{1}{2}$ by $1\frac{1}{2}$ miles, and 3398 acres in area, it has fine cliffs, consists of columnar basalt and limestone, and attains a maximum altitude of 449 feet. The soil in the valleys is fertile, but fishing is the leading industry. Rathlin is identified with the *Ricinia* of Ptolemy, *Ricina* of Pliny, and *Raghlín* or *Ragherin* ('fortress of Ireland') of later writers. St Columba established a church here in the 6th century; and Bruce in 1306 is fabled to have taken refuge in a castle, now a ruin. The population has fallen from over 1000 in 1841 to 350.

Ratibor, a town of Prussian Silesia, stands on the left bank of the Oder, 44 miles SSE. of Oppeln. It is the chief town of the former principality of Ratibor, which, a sovereign duchy from 1288 to 1532, became subject to Prussia in 1742. The town has foundries and engineering works. Pop. 41,000.

Ratich, WOLFGANG (sometimes called RATKE or Latinised as RATICHUS), educationist, was born at Holstein in 1571, based a new system of education on Bacon's philosophy, which he expounded to the German princes at Frankfurt in 1612, and had an opportunity of putting into practice at Köthen in 1618, by favour of the prince of Anhalt. His principle was the realistic one of proceeding from things to names, and from the mother-tongue to the study of foreign ones. But he got into bad relations with the clergy and with his patron, and was actually imprisoned for eight months. A second chance given him at Magdeburg in 1620 ended also in failure, and after some years of ineffective wanderings he died at Erfurt in 1635.

There are monographs on him by Krause (1872), Störl (1876), and Schumann (1876); and see R. H. Quick, *Essays on Educational Reformers* (1868; new ed. 1890).

Ratio. See PROPORTION, FLUXIONS.

Rationalism, as 'a system of belief regulated by reason,' might be expected to mean the opposite of irrationality, crass ignorance, and perverse prejudice; and the growth of rationalism would then mean the progress of civilisation, the development of the intellectual and moral nature of men and nations. It is nearly in this sense that Lecky uses the word; attributing to its wholesome influence the decay of the belief in magic, witchcraft, and other hideous superstitions, and the substitution of a kindly tolerance in place of blind zeal for persecution.

But in ordinary English usage, general as well as theological, the connotation of the word is substantially different. Rationalists in ordinary parlance are those who are more 'liberal' or 'advanced' than the main body of the orthodox; in especial those who take a 'low' view of inspiration, and explain away the miraculous. Rationalism is not so much a body of doctrine as a mood of mind, a tendency of thought shown in the attempt to apply to religious doctrine, to biblical literature and history, the same methods of research and proof as are used in science and history generally, and the literatures of all times and peoples. This feature is recognised with approval by Lecky in his wider use of the word: 'Rationalism,' he says, 'leads men on all occasions to subordinate dogmatic theology to the dictates of reason and conscience. . . . It predisposes men in history to attribute all kinds of phenomena to natural rather than to miraculous causes; in theology to esteem succeeding religious systems the expression of the wants and aspirations of that religious sentiment which is implanted in man; and in ethics to regard as duties only

those which conscience reveals to be such.' Rationalism, not being a system but a temper or drift of mind, has different aims at different times. Opinions are expounded in sermons and books by theological professors without proving serious stumbling-blocks to the majority, which thirty years earlier would by all but a small minority have been regarded as distinctly rationalistic. Thus, not very long ago, it was alarming rationalism to dispute the Mosaic authorship of Genesis, the Solomonic authorship of the Song of Songs, and the Davidic authorship of any of the Psalms; now the newer view is assumed by orthodox teachers. Rationalism of this kind is a transition stage, but not necessarily a transition to unbelief.

The rationalistic temper may be traced in almost every age of the church's history: no doubt the extreme representatives of the Petrine party in sub-apostolic times regarded Paul's views as lax and rationalistic. If the Reformation was not rooted in rationalism (as to Catholics it seems to have been), many of the contentions of the reformers were such as all rationalists accept and sympathise with. Zwingli was a rationalist to Luther and the Lutherans; Socinus was on some points a thorough rationalist. The dry and barren dogmatic orthodoxy of Germany in the 17th century fostered a rationalism as cold and unspiritual. In the England of the 18th century, during the Deistic controversies, the Evangelicals of Germany thought, not altogether unjustly, that some of the most conspicuous opponents of the deists were not themselves free from the charge of rationalism; and the Evangelicals of Scotland regarded the 'moderates' of the 18th century, however orthodox in dogma, as thoroughly rationalistic in spirit. Rationalism is not so much opposed to orthodoxy as to mysticism, and what was called variously fanaticism, enthusiasm, 'high-flying,' and methodism. A soulless orthodoxy has not seldom been opposed by a fervent piety that by a not unnatural antithesis has tended to run into heretical extremes; while, on the other hand, actual rationalists have often been foremost amongst the champions of religion, and of revealed religion, against radical freethinking, deism, naturalism, and materialism.

In Germany the term rationalism is more definite in its reference than in England, but is not always used in quite the same sense. The two defective and mutually opposed schools of thought that Kant sought to supersede by his critical philosophy were, on the one hand, a shallow empiricism, and on the other a baseless and overweening metaphysical dogmatism or rationalism. Bacon also contrasted empirical philosophers with rationalists who spin their systems as spiders do cobwebs out of their own bowels. Wolff presents the most conspicuous example of the philosophical rationalism which held that all that is in heaven above and earth beneath could be 'proved' by pseudo-mathematical methods: and as God, responsibility, and immortality were amongst the things that could be proved at endless length and in various ways, this philosophical rationalism led directly up to a rationalist theology, which consisted mainly in a series of dogmas to be demonstrated from the philosophical axioms, including some at least of the doctrines of revealed religion. What in revelation could not be demonstrated according to this scheme was disallowed or explained away. Practical religion became in the *Aufklärung* a system of mere utilitarian morals.

Kant prepared the way for a deeper view of man, history, and the universe; but his own explicit statements on positive religion were pronouncedly rationalistic: and the negative side of his philosophy was well calculated to lay the foundations

of another school of theological rationalists (often called *Vulgar-rationalismus*), of whom Tiefertunk (died 1837), Breitschneider (1776-1848), and Wegscheider (1771-1849) may be taken as representatives. De Wette (1780-1849) shows the transition to Schleiermacher, who (though in the English sense of the word he was an outspoken rationalist) combined what was best in the opposing schools of rationalists and supernaturalists, founded a higher and truer religious philosophy, and heralded even the 'pectoral theology' of the mediation school.

But it was not in the sphere of speculation and dogma, but in that of biblical criticism, that German rationalism accomplished its main work, and left its deepest mark on subsequent theological development. In the early 18th century the 'Germans in Greek were sadly to seek,' as English scholars thought: the Germans themselves admitted that in studying the Scriptures they failed to escape from dogmatic presuppositions, and that it was the English divines who approached the New Testament in a historical spirit, which in the Germany of that day caused misgivings. It is noteworthy that Semler (1725-91), 'the father of rationalism,' obtained the doctorate for a thesis written against Whiston, Bentley, and other English scholars in defence of the 'three heavenly witnesses' of 1 John, v. 7. Semler in the schools, supported by Lessing and Herder in literature, was soon teaching that the books of the Bible must be studied as human productions: Eichhorn (1752-1827) thoroughly accepted and applied that principle. Rationalist criticism was carried to an absurd length by Paulus (1761-1851), who taught that the Gospels contained natural and not supernatural events, and whose most ingenious but inept 'explanations' of the miracles of the New Testament, 'retaining everywhere the husk but surrendering the religious kernel,' were made a laughing-stock by Strauss. Strauss's 'mythical theory' (excessively rationalist in the English sense of the term) was in its turn superseded by Baur (q.v.) and the Tübingen school, whose work marked the opening of an important new period in scriptural criticism. The 'notes' of the newer criticism, whether more or less rationalist from the older English point of view, are the conviction that all truth is one, whencesoever derived, and the willingness to accept what is apparently established by the consensus of scholars even where this involves giving up the belief in the inerrancy of Scripture. Many of the contentions of self-confident and aggressive rationalism have long since mutually destroyed one another. Nothing can be more contrary to the true historic and scientific spirit than the assumptions of a reckless sciolism: there is a false and a true rationalism; and it should be remembered that much that is now most surely believed by all has at one time or another been branded as rationalistic.

See the church histories; Tholuck, *Vorgeschichte des Rationalismus* (1853) and *Geschichte des Rationalismus* (1863, unfinished), and earlier monographs by Stäudlin and Lütkeort; H. J. Rose's essay *On the State of Religion in Protestant Germany* (1825), and Pusey's *Historical Inquiry into the Causes of the Rationalist Character of the Theology of Germany* (1828-30); A. S. Farrar, *Critical History of Free Thought* (1862); R. W. Mackay, *The Tübingen School and its Antecedents* (1863); Strauss, *Leben Jesu* (1864); Lecky, *History of Rationalism in Europe* (1865); Tulloch's *Rational Theology* (1872) and *Movements of Religious Thought* (1885); Draper, *Intellectual Development of Europe* (1867) and *Conflict between Science and Religion* (1874); Cairns, *Unbelief in the Eighteenth Century* (1881); Pfeiderer, *Theology in Germany since Kant* (1890); J. McCabe, *Modern Rationalism* (1909); J. B. Barry, *A History of Freedom of Thought* (1913); J. M. Robertson, *A Short History of Free Thought* (3d ed. 1915); J. McCabe, *Dictionary of*

Modern Rationalists (1920); A. W. Benn, *English Rationalism in 19th Century* (1906); also CHURCH HISTORY, REFORMATION, DEISM, EXEGESIS, with the articles on the chief rationalist thinkers.

Ratisbon (Ger. REGENSBURG), a town of Bavaria, stands on the right bank of the Danube, 82 miles by rail NNE. of Munich. Formerly a free city of the empire and seat of the Diet, Ratisbon presents a strongly marked mediæval character, with narrow crooked streets, and high, many-cornered, gabled houses. Among its churches the most remarkable is the noble Gothic cathedral, begun in 1275, but not completed till 1534, and restored in the 19th century. The Church of St James, formerly belonging to the Irish (*Scotti*) Benedictines, dates from the 12th century, and is built in the pure Byzantine style. The old town-hall was used for a century and a half (1645-1806) as the place of meeting for the imperial diet. At the Golden Cross Inn Charles V. met the mother of his son Don John of Austria. There are numerous interesting private dwellings, as the Thurn and Taxis Palace, with library, picture-gallery, &c., the royal villa, and others. A stone bridge (1135-46), 1024 feet long, connects Ratisbon with the busy trading suburb of Stadt am Hof. The manufactures include porcelain and stoneware, brass and steel wares, leather, tobacco, lead-pencils, chemicals, &c.; and there is an active trade, especially in corn and salt. Pop. (1875) 31,487; (1890) 37,365; (1925) 76,918. Originally a Celtic town, Radasbona (whence Ratisbon) was made by the Romans a frontier fortress. Later it was the capital of the Dukes of Bavaria. Frederick II. declared it (1245) a free imperial city. During the 14th century it was one of the most populous cities of southern Germany. Here were signed the Ratisbon Interim (q.v.) in 1541 and the armistice between France and Austria in 1684. The city was stormed by Duke Bernhard of Weimar in 1633, and by both the Austrians and the French in 1809. It was ceded to Bavaria in 1810.

Ratnagiri, a coast-town of India, 136 miles S. by E. of Bombay, with a fort and sardine-fishery; pop. 18,500.

Rattan, a walking-stick made from the stem of a palm that grows in Sumatra. See PALM.

Rattany. See RHATANY.

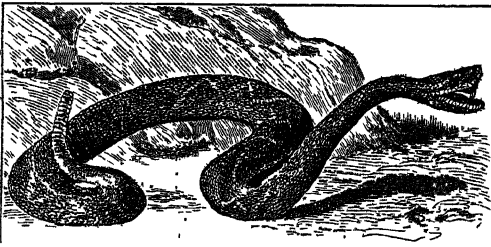
Rattazzi, URBANO, an Italian statesman, was born at Alessandria, June 29, 1808. He studied law at Turin and practised as an advocate with great success at Casale. After the proclamation of the constitution in 1848 he was elected member of the Second Chamber for Alessandria, and began his political career as a democrat. His eloquence and liberal principles raised him to the ministry: Gioberti made him minister of the Interior and later of Justice; but after the defeat of Novara he was obliged to retire along with the rest of the ministry. When Napoleon III. threatened the liberty of Piedmont, Cavour, Rattazzi, and their parties joined together to defeat his schemes, and in 1853 Rattazzi took the portfolio of Justice under Cavour, and presented the bill for the abolition of convents. Being accused of weakness in suppressing the Mazzinian movement in 1857, he retired from office early in the following year. In 1859, however, he was back again in office as minister of the Interior. The threatened cession of Savoy and Nice, which he opposed, led to his retirement in 1860. Having changed his views on this point, he was in March 1862 entrusted with the formation of a new ministry, but had to resign at the end of the year in consequence of his opposition to Garibaldi; and once more prime-minister for six months in 1867, he lost the post for the same reason. He

died at Frosinone, 5th June 1873. A want of stability was his chief drawback as a statesman.

His Speeches were edited by Scovazzi (8 vols. Rome, 1876-80). See a Life by Morelli (Padua, 1874), and Madame Rattazzi's *Rattazzi et son Temps* (Paris, 1881).

Rattlesnake (*Crotalus*), a genus of highly specialised venomous snakes in the sub-family Crotalinae or pit-vipers, so called because of a sensory pit between the eye and the nostril. At the end of the tail is the 'rattle,' an instrument composed of a number of horny balls formed at successive moults. As they get worn some break off and others replace them, the total number at one time rarely reaching twelve. The bells are loosely jointed on one another, so that they produce a shrill noise (like that of an alarm-clock) when very rapidly vibrated by the excited snake. Rattlesnakes range from Southern Canada to Northern Argentina. The common species of the United States is *C. horridus*, about 4 feet long; and there are some ten others—e.g. *C. durissus*, which attains a length of 8 feet. Nearly related genera without rattles are *Ancistrodon* (including the Moccasin-snake or Copper-head) and *Lachesis* (including the *Fer-de-lance* of South America).

Rattlesnakes are naturally sluggish and prefer defensive to offensive tactics, except when on the track of their natural prey—rabbits, rats, squirrels, and other small mammals. Not a few ideas about rattlesnakes must be dismissed as false: they do not fascinate or charm mammals or birds, though these may be overcome by an almost paralysing



Rattlesnake (*Crotalus horridus*) in act of striking.

fear; the rattling does not lure prey nor attract mates, but is rather a reflex expression of excitement, apparently warning off molesters on whom the snake is doubtless unwilling to expend energy in the exhausting act of striking; finally, the number of rings does not necessarily indicate the age of the animal, though new rings seem to be added at successive sloughings. Rattlesnakes are generally nocturnal. The young are brought forth alive. The poison is very deadly, rapidly paralysing the nerve-centres and affecting the respiratory and circulatory functions. When a man is bitten it is customary to ligature above the wound, to suck out the poison, to use stimulants freely, and to inject antidotes such as permanganate of potash. Often, however, the result of the bite is fatal (see SNAKE).

Rattray, a police burgh of Perthshire, on the Erich, opposite Blairgowrie. Pop. 1700.

Rauch, CHRISTIAN DANIEL, sculptor, was born at Arolsen, in Waldeck, 2d January 1777. In 1797 he became valet to Frederick-William III., king of Prussia, but, resolving to devote himself to art, was enabled by the generosity of a nobleman to study at Rome, where he enjoyed the friendship of Thorwaldsen, Canova, and Wilhelm von Humboldt, the Prussian minister. In 1811 he was called by the king of Prussia to Berlin to execute the monumental statue of Queen Louisa now at Charlottenburg. Rauch was not, however, quite satisfied

with this triumph of his art, but commenced a new statue of the queen, which he finished eleven years afterwards, a masterpiece of sculpture, now in the palace of Sans Souci. After this he lived principally at Berlin, but occasionally visited Rome, Carrara, and Munich. He laboured indefatigably in his profession, and by 1824 had executed seventy busts in marble, of which twenty were of colossal size. His works include two colossal bronze statues of Field-marshal Blücher (1827), a bronze statue of Maximilian of Bavaria (1835), and statues of Albrecht Dürer, Goethe, Schiller, and Schleiermacher. His masterpiece is the magnificent monument of Frederick the Great (1851) which adorns Berlin. He died at Dresden, 3d December 1857. See Life by Eggers (1873-90).

Rauhes Haus ('the Rough House,' so called) is the name of a great institution founded on 1st November 1831 and managed by Johann Heinrich Wichern (1808-81) at Horn, near Hamburg, in connection with the German Home Mission (*Innere Mission*). It is partly a refuge for morally neglected children; partly a boarding-school for the moral and intellectual education of children of the higher classes; lastly, a training-school for those who wish to become teachers or officials in houses of correction, hospitals, &c., in promotion of the objects of the Home Mission. Opened by Wichern with twelve neglected children, it has since then been very much enlarged. See works on the subject by Wichern (1833-83).

Raumer, FRIEDRICH LUDWIG GEORG VON, German historian, was born at Wörlitz, in Anhalt, on 14th May 1781, studied law at Halle and Göttingen, and entered the Prussian state service in 1801. In 1811 he accepted the chair of History and Politics at Breslau; in 1819 he was called to fill the similar chair at Berlin. He was for some time secretary of the Berlin Academy. In 1848 he was sent to Paris as ambassador of the German parliament. He died on 14th June 1873. The first scientific historian to popularise history in German, Von Raumer wrote *Geschichte der Hohenstufen* (6 vols. 1823-25), his best book, based on critical research, and agreeably written; *Geschichte Europas seit dem Ende des 15. Jahrhunderts* (8 vols. 1832-50); *Beiträge zur neueren Geschichte* (5 vols. 1836-39); and edited the useful *Historisches Taschenbuch* from 1830. In the years 1830-43 he journeyed in England, Italy, and the United States, and wrote books dealing with each country. See his *Lebens-erinnerungen und Briefwechsel* (2 vols. 1861).

Raumer, KARL GEORG VON, geologist and geographer, a brother of the foregoing, was born 9th April 1783 at Wörlitz, studied at Göttingen and Halle, and at the Mining Academy at Freiberg, was appointed professor of Mineralogy at Breslau in 1811, was translated in 1819 to Halle, and finally, in 1827, was appointed professor of Natural History at Erlangen, where he died 2d June 1865. His most ambitious book was *Geschichte der Pädagogik* (1843-51), a portion of which was issued separately as *Die Erziehung der Mädchen*. His most popular books were, after these, *Beschreibung der Erdoberfläche* (6th ed. 1866); *Palästina* (4th ed. 1860); and *Lehrbuch der allgemeinen Geographie* (1832; 3d ed. 1848). He also wrote books on his special study, as *Geognostische Fragmente* (1811) and *ABC-Buch der Kristallkunde* (1820-21). See his Autobiography (1866).—His son, RUDOLF VON RAUMER (1815-76), professor at Erlangen, won high repute in Teutonic philology.

Ravallac, FRANÇOIS (1578-1610), a bankrupt schoolmaster, who, after long imprisonment and a brief service in the Order of Feuillants, was moved by Catholic fanaticism to stab the heretic Henry IV. (q.v.) of France. He was tried (with awful

tortures), and torn asunder by horses. See Loiseau, *Ravaillac et ses Complices* (1873); J. and J. Tharaud, *La Tragédie de Ravaillac* (1913).

Ravel, MAURICE, French composer, was born 7th March 1875 at Ciboure (Pyrenees), and studied music at Paris under Fauré. His output comprises two one-act operas, *L'Heure espagnole* (1907) and *L'Enfant et les Sortilèges* (1925), a ballet *Daphnis et Chloé* (1912), a string quartet (1903), a trio (1914), *Gaspard de la Nuit* (1908) and other piano works, *Histoires Naturelles* (1906) and other songs, and various works for orchestra. Ravel's style, influenced perhaps by that of Chabrier, is characterised by an exquisite clarity and reticence worthy of the 18th-century French clavichord writers; with a certain ironic humour, Ravel looks at classical forms through highly coloured modern harmonic spectacles, and brings them up to date, so to speak. His chamber music, especially, is of great brilliance and charm.

Ravelin. See FORTIFICATION.

Raven (*Corvus corax*), a species of Crow (q.v.), now somewhat rare in Britain except in remote regions or on rocky islands. It is, however, widely distributed in Europe, northern Asia, and North



Raven (*Corvus corax*).

America. The plumage is glossy black, with a purplish-blue lustre on some parts. The bill and legs are also black. In length the raven measures about two feet. The males are rather larger and more lustrous than the females. Very early in the year the bulky nest is built on a cliff or tree; the three to five eggs are bluish-green, with brownish spots. The raven's note tends to be harsh, but is refined at the pairing season, and the bird may be trained to parrot-like imitation with remarkable success. The flight is powerful, and the bird often soars high. On small mammals, such as rats, the raven is fond of feeding, and its attacks on game and even lambs have led to its extermination in many districts. In Scandinavia the raven was sacred to Odin, but in many countries it is a bird of ill omen. Instances are on record of ravens which lived for four-score years, and there is no doubt that its natural longevity is great. Three varieties or sub-species of the raven are recognised in North America. See CROW; and R. W. Shufeldt, *The Myology of the Raven* (1890).

Ravenala. See TRAVELLER'S TREE.

Ravenna, a city of Italy, 45 miles E. of Bologna, once close to, but now some 5 miles from, the Adriatic, with which it is connected by the Corsini Canal, is enclosed by walls 3 miles long, built by the Venetians in 1457 sqq., with five gates. It has been the seat of an archbishop since 438, and

possesses a museum, a public library, a picture gallery, &c. It has manufactures of silk, linen, paper, and glass, and a trade in wine and agricultural products. Agriculture has been much favoured by extensive drainage and reclamation works. The streets are wide, and the squares are adorned with statues of the popes. The exterior aspect of the town is not striking; but the interiors of the churches are exceedingly interesting. Pop. (1921) 22,442; of commune, 72,023.

Possibly a Thessalian settlement, afterwards held by the Umbrians, Ravenna passed to Rome as one of the cities of Cisalpine Gaul south of the Po. It first became famous under Augustus as the station of the Adriatic fleet, with Classis—a flourishing suburb—as its port, a site marked now only by a church, and separated from the sea by the pine forest celebrated by Dante, Boccaccio, Dryden, and Byron. Deserted by the sea, and strongly entrenched by canals and marshes, Ravenna became the refuge of the Emperor Honorius (402), and the capital of Italy for the next 350 years. Imperial until Romulus Augustulus doffed the purple at the bidding of Odoacer (see ITALY), who ruled at Ravenna 476–493, it attained its greatest glory under Theodoric the Ostigoth (493–526). Conquered by the generals of Justinian, Ravenna was the seat of Exarchs (q.v.) from Constantinople until 752, when it was taken by the Lombards, and afterwards by the Franks, by whom it was gifted to the pope. A republic in the early part of the 13th century, governed by its own dukes in the 14th, subject to Venice after 1440, it was won by Pope Julius II. in 1509, and continued papal until it became national in 1860.

Ravenna, chiefly on account of its numerous ancient churches, holds a unique position as 'the Pompeii of the 5th and 6th centuries'—that marked transitional period in late classical (or early medieval) history. Many features of its architecture, as has recently been shown by Rivoira, are derived rather from Roman classical models than from the East. There are six churches of the time of Galla Placidia (390–450), the sister of Honorius and mother of Valentinian III., including her mausoleum. Theodoric, leaving, with rare religious toleration, the cathedral of S. Ursus (almost entirely rebuilt, 1734, though the baptistery with its splendid mosaics remains) and the other churches to the Catholics, erected for his Arian Goths the basilica of St Martin (now S. Apollinare Nuovo, with its marvellous mosaic processions of martyrs added about 560, when it was 'reconciled') as a cathedral, a baptistery (now Sta. Maria in Cosmedin), and S. Teodoro (now S. Spirito). He also built himself a large palace, remains of which were found in 1870 and 1908; while the building that bears the name is really a later guard-house; and a circular mausoleum outside the city walls, surmounted by an enormous block of Istrian stone, weighing over 300 tons. S. Vitale (well restored by Ricci, with contemporary portraits in mosaic of the emperor and Theodora)—the model for Charlemagne's cathedral at Aix-la-Chapelle—and the magnificent basilica of S. Apollinare in Classe belong to the age of Justinian. The round campaniles, perhaps of the 9th century, form another architectural feature peculiar to Ravenna.

Dante died at Ravenna, 14th September 1321, and is buried there. A column, 2 miles from the walls, commemorates the fall of Gaston de Foix at the head of the French army of Louis XII., after a bloody victory over the papal and Spanish troops, 11th April 1512. Byron resided at Ravenna from June 1819 to October 1821.

See Rivoira, *Lombard Architecture* (London, 1903), *passim*; Hutton, *Ravenna* (London, 1913).

Ravensburg, a town of Wurttemberg, 11 miles by rail N.E. of Friedrichshafen, on the Lake of Constance; pop. 17,000.

Ravenscroft, EDWARD, English dramatist of the later 17th century, evinced great skill in the writing of farce and in adapting themes of other dramatists. Of his plays, a dozen in number, the more important are *Alamouchie* (1671), taken from Molière's *Le Bourgeois Gentilhomme*, *The Careless Lovers* (1673), *The London Cuckolds* (1683), *Dame Dobson* (1683), and *The Anatomist* (1697).

Ravenscroft, THOMAS (1592?-1635?), musical composer and author of *Melismata* (1611), and of a collection of psalm-tunes for four voices, *The Whole Book of Psalms* (1621) by various composers. Some of the tunes, such as St Davids, Canterbury, Bangor, and many others, which have since become popular, are by Ravenscroft himself.

Ravenspur. See HUMBER.

Ravignan, GUSTAVE FRANÇOIS XAVIER DELACROIX DE, a celebrated Jesuit preacher, was born at Bayonne, 2d December 1795, was professor at Montongue, and became famous in 1837 as preacher at Notre Dame in Paris. He died 26th February 1858. He published an Apology of his order in 1844, and in 1854 a more lengthened work with the same view, *Clément XIII. et Clément XIV.* See memoirs by Poujoulat (1858) and De Poulevoy (1860; Eng. trans. New York, 1873).

Rawal Pindi, a town and important military station of the Punjab, lies between the rivers Indus and Jhelum, 160 miles by rail N.W. of Lahore. Since the extension of the railway to Peshawar, and since the last Afghan war, the town has increased at a rapid rate. Pop. (1868) 28,586; (1881) 52,980; (1911) 86,483; (1921) 101,142. The place carries on an active transit-trade with Kashmir and Afghanistan. Here the Sikhs surrendered after their defeat at Gujrat (1849), and here too was held, in 1835, a great durbar or review, at which the Amir of Afghanistan met Lord Dufferin, Governor-general of India.

Rawitsch (Polish *Ruwicz*), a town of Poland, 64 miles by rail S. of Posen; pop. 10,000.

Rawlinson, SIR HENRY CRESWICKE, Bart., orientalist and diplomatist, was born at Chadlington in Oxfordshire, 11th April 1810, and entered the East India Company's army in 1827. In 1833 he proceeded to Persia to assist in organising the Persian army. During the six years he spent in that country he began to study the cuneiform inscriptions, and made a translation of Darius's famous Behistun inscription, which he published in the *Journal of the Royal Asiatic Society*. After he left Persia he was political agent in Kandahar during the troublesome times of 1840-42 (see AFGHANISTAN); he was appointed political agent at Bagdad in 1844, and consul-general there in 1851. He showed great bravery in the field, and remarkable skill and resource in diplomacy. In 1856, now made K.C.B., he was appointed director of the East India Company. In 1858-59 he was again in Persia as British minister; and was successively member (1868) and vice-president (1876) of the Council of India. In 1865-68 he sat in parliament for Frome. He held the presidency of the Royal Geographical Society (1871), to whose *Proceedings* he contributed valuable papers, a trusteeship of the British Museum (1879), and a directorship of the Royal Asiatic Society. He was made a baronet in 1891; and he died 5th March 1895. The 'father of Assyriology,' he wrote *A Commentary on the Cuneiform Inscriptions of Babylon and Assyria* (1850), *Outline of the History of Assyria* (1852), *The Cuneiform Inscriptions of Western*

Asia (with Norris and George Smith, 6 vols. 1861-80), and *England and Russia* (2d ed. 1875). See the Life by his brother (1898).

That brother, GEORGE RAWLINSON, orientalist and historian, was born at Chadlington in 1812, took a first-class in classics from Trinity College, Oxford, in 1838, and was elected a Fellow of Exeter College in 1840. In 1859 he preached as Bampton Lecturer on *Historical Evidences of the Truth of the Scripture Records*, and two years later was chosen Camden professor of Ancient History. In 1872 he was made a canon of Canterbury. His historical publications cover nearly the entire history of the ancient Orient. The series opens with an annotated translation of Herodotus (4 vols. 1858-60; 3d ed. 1876), which was followed by *The Five Great Monarchies of the Ancient Eastern World* (4 vols. 1862-67), *The Sixth Great Oriental Monarchy of Parthia* (1873), *The Seventh or Sassanian Empire* (1876), *History of Ancient Egypt* (1881), and *History of Phœnicia* (1889). He also wrote smaller popular works, commentaries, books on Scripture characters, sermons, and the article PHœNICIA in a former edition of the present work. He died 7th October 1902.

Rawlinson, SIR ROBERT, K.C.B. (1810-98), a great sanitary reformer in the Crimea and at home under the Local Government Board, and consulting engineer on water-supply and river pollution.

Rawmarsh, a town in the West Riding of Yorkshire, 2½ miles N.E. of Rotherham (included in Rotherham parliamentary borough), with iron-works and collieries; pop. 18,000.

Rawtenstall, a municipal borough of Lancashire (incorporated 1891), 8 miles N. of Bury, forms part of Rossendale parliamentary borough. It manufactures cottons, woollens, shoes and slippers. Pop. 28,000.

Ray, a popular name applied to many of the flat cartilaginous fishes or Elasmobranchs. Skate (*Raja batia*), Thornbacks (*R. clavata*), Electric Rays (Torpedo), Sting-rays (e.g. Trygon), Eagle-rays (e.g. Myliobatis) are representative. They lead a somewhat sedentary life at the bottom of the sea, moving sluggishly by undulations of the pectoral fins which form a large part of the flat body. They are all carnivorous. The true rays, of which skate and thornback are typical and very common species, form the family Rajidae. Many attain a large size, sometimes measuring six feet across. The flesh is edible, but strongly flavoured and not very highly esteemed. See CARTILAGINOUS FISHES, DEVIL-FISH, ELECTRIC FISHES, SKATE, STING-RAY.

Ray, or WRAY, JOHN, naturalist, was born a blacksmith's son at Black Notley, near Braintree, in 1627. From Braintree free-school he went up to Cambridge, where he was fellow, Greek lecturer, mathematical tutor, and junior dean in Trinity College, but after a time began to devote himself entirely to the study of natural history. At the Restoration he accepted Episcopal ordination, but was ejected by the 'Black Bartholomew' (1662). Thereupon, accompanied by a kindred spirit, Francis Willughby, a friend and former pupil of his own, Ray travelled over most of the United Kingdom, collecting and investigating botanical and zoological specimens; and in 1663 they started on a tour through the Low Countries, Germany, Italy, and France, with a similar object, Willughby taking the zoology under his charge, and Ray the botany. In 1667 Ray was elected a Fellow of the Royal Society, to whose *Transactions* he occasionally contributed valuable papers. In 1672 his friend Willughby died, leaving him guardian to his two sons. After several changes of residence, in 1679 Ray settled down in his native village, where he died, 17th January 1705. As a botanist and zoologist he ranks very high, the

classification of plants which he proposed being practically in the main the foundation of what is now known as the 'Natural System' of classification (see BOTANY). Ray's zoological works are considered by Cuvier as the foundation of modern zoology. The chief of his works on botany are *Methodus Plantarum Nova* (1682); *Catalogus Plantarum Angliæ* (1670), the basis of all the subsequent floras of Britain; and *Historia Plantarum* (3 vols. 1686-1704). His zoological works include the *Synopsis Methodica Animalium* (1693) and three posthumous volumes on Birds, Fishes, and Insects, published by Dr Derham. He was also the author of some theological works. His friend Willughby, having collected the materials for an extensive work on the animal kingdom, left to Ray the task of arranging and classifying them (see WILLUGHBY). See *Memorials of Ray* (1846), and his *Correspondence* (1848), both edited by Dr E. Lankester for the Ray Society, which was founded in 1844.

Rayahs, the Christian peasantry, labourers, and small farmers, who lived under Turkish rule, or rather misrule, in the Balkan peninsula. The word means 'cattle,' and as cattle these people were treated by their Turkish masters in Bosnia, Serbia, Bulgaria, and the neighbouring states.

Rayleigh, JOHN WILLIAM STRUTT, third BARON, P.C. (1905), O.M. (1902), P.R.S. (1905-8), was born 12th November 1842, studied at Trinity College, Cambridge, and was the senior wrangler (1865), Smith's prizeman, and fellow of his college (1866). He was professor of Experimental Physics at Cambridge from 1879 to 1884; in 1881-1905 Tyndall's successor as professor of Natural Philosophy at the Royal Institution; and was Chancellor of Cambridge University. He was mainly instrumental in founding and fostering the National Physical Laboratory. He edited Clerk-Maxwell's *Heat*, and was author of *The Theory of Sound* (1877-78). His *Scientific Papers* were collected in 6 vols. (1899-1920). In 1894, with Sir William Ramsay, he separated from atmospheric nitrogen the new gas argon—hitherto undetected, but constituting about 1 per cent. of the atmosphere. He died 30th June 1919. See *Life* by his son the fourth baron (1924).

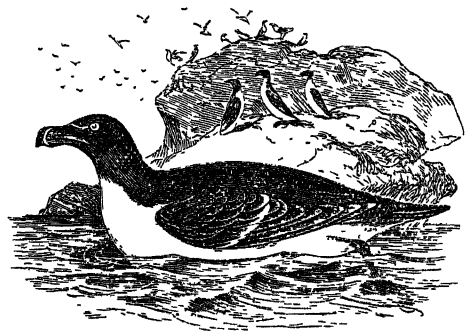
Raynouard, FRANÇOIS JUSTE MARIE, poet and philologist, was born at Brignoles, 8th September 1761, studied at Aix, and in 1791, an advocate and a deputy, joined the Girondins, and was for a time imprisoned. His poems and tragedies were successful, and in 1807 he was elected to the Academy, of which he became perpetual secretary in 1817. A member of the imperial legislative body from 1806, he continued to produce dramas, but towards the fall of the Empire turned his attention to linguistic and particularly Provençal studies. His researches into the origin and transformations of this tongue led to many valuable discoveries, though his theories of the relation of the language of the troubadours to the other Romance tongues are not now accepted. Raynouard died at Passy, near Paris, 27th October 1836.

Razi. See RHAZES.

Razor. See BEARD, CUTLERY.

Razor-bill, or RAZOR-BILLED AUK (*Alca torda*), a species of Auk (q.v.), very common on the coasts of Britain and of all the northern parts of the Atlantic Ocean. In March and April they congregate in great numbers on cliffs and islands for the breeding season. A single egg, measuring about 3 inches in length, and of a white or light brown colour streaked with dark brown, is laid in a crevice or under a ledge of rock. The male helps to sit on the eggs. The razor-bill

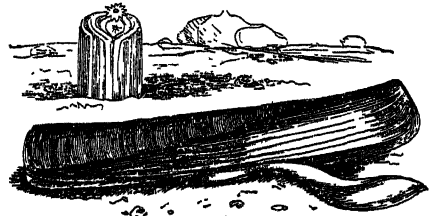
measures about 17 inches. The plumage is of a glossy greenish-black on the upper parts and dazzling white underneath. It is a handsomer bird than the Guillemot (q.v.), and can be readily distinguished from it at a distance by its upturned



Razor-bill (*Alca torda*).

tail. The flesh of the razor-bill is used for food, and the eggs are esteemed a delicacy. They are less easily obtained than those of the guillemot, being usually laid in concealed situations.

Razor-fish, or RAZOR-SHELL (*Solen*), a genus of bivalves of which the common British species *S. siliqua* and *S. ensis* are familiar examples. The shell is remarkably elongated, and gapes at both ends, the siphons are short, the foot is large and powerful. The species are numerous, and inhabit



Razor or Solen-fish (*Solen siliqua*).

the sands of all seas except in the coldest parts of the world. Some of the tropical species have shells of great beauty. The solens burrow in sand, making vertical holes 2 or 3 feet in depth, and ascending and descending by means of their foot, which is capable of being elongated and contracted to bore a passage for the animal, and to drag it through. They are used for food, and also by fishermen for bait. To obtain them, a hooked iron implement is used. Another method is to drop a quantity of salt on the mouth of the hole, which causes them to come up, when they are quickly seized.

Ré, ÎLE DE (*Rex insula*), is a small, low-lying island off the coast of the French department of Charente-Inférieure, opposite the city of La Rochelle, from which it is separated by the Pertuis Breton. It is about 18 miles long and 3 broad, and measures 28 sq. m. The west coast is rocky; on the east side there are some good harbours. The inhabitants are chiefly engaged in the preparation of salt, with oyster-farming and wine-making.

Reade, CHARLES, novelist and playwright, was born at Ipsden House on 8th June 1814. The youngest of eleven, he came on both sides of good lineage, his father an Oxfordshire squire, his mother a clever Evangelical; from her he

'inherited his dramatic instinct.' After five years (all flogging) at Ilfley, and six under two other and milder private tutors, in 1831 he gained a demyship at Magdalen College, Oxford, and in 1835, having taken a third class in honours, was duly elected to a lay fellowship. Next year he entered at Lincoln's Inn, and in 1843 was called to the bar, meanwhile having made the first of many tours abroad and at home, and developed a craze for trading in violins. 'I studied,' he tells us, 'the great art of Fiction for fifteen years before I presumed to write a line of it;' and it was not till 1850 that he put pen seriously to paper, 'writing first for the stage—about thirteen dramas, which nobody would play.' Through one of these dramas, however, he formed his platonic friendship with Mrs Seymour, a warm-hearted actress, who from 1854 till her death in 1879 kept house for him. She animated, counselled, guided him; and, apart from his quarrels and lawsuits (which were many), his life after 1852 is little except a record of the production of plays and novels, by the former of which he generally lost money, by the latter won profit and fame. The plays include *Masks and Faces* (1852), written in conjunction with Tom Taylor, and having Peg Woffington for its leading character; *Gold* (1853), the germ, and *Sera Nunquam* (1865), the dramatised form, of *Never too Late*; and *Drink* (1879), an adaptation of Zola's *L'Assommoir*. Of his eighteen novels may be mentioned *Peg Woffington* (1853); *Christie Johnstone* (1853), the Newhaven fisher lass; *It is Never too Late to Mend* (1856), a tale of prison abuses and life in Australia; *The Cloister and the Hearth* (1861), its hero Erasmus' father, condemned, like Reade himself, to celibacy; *Hard Cash* (1863), against private lunatic asylums; *Griffith Gwunt*, or *Jealousy* (1866); *Foul Play* (1869), in conjunction with Dion Boucicault, against ship-knackers; *Put Yourself in his Place* (1870), against trades-unions; *A Terrible Temptation* (1871); and *A Woman-hater* (1877), for woman's rights. His last years clouded by sorrow and ill-health, he died at Shepherd's Bush on Good Friday, 11th April 1884, and was buried in Willesden churchyard beside his 'beloved friend.'

Charles Reade was not one of the greatest novelists of the century (who number three, at most four); but of the second order he is perhaps the best. He is sometimes coarse, theatrical sometimes rather than dramatic, and sometimes even dull, weighed down with authorities—the blue-books, books of travel, and the like, with which he fettered his imagination. With the greatest novelists one is conscious only of the story, with him one is always conscious of the story-teller; some tone or mannerism from time to time jars upon us. And yet what a story-teller it is. How he carries us with him, stirs us, saddens, gladdens, terrifies, delights. No novels are better than his to read aloud. For they hold the listeners spell-bound, and 'Bravo!' or oftener just a long-drawn 'Oh!' attests Reade's magnificent powers far better than can all the fine-spun criticisms in which A. concedes and B. denies him the gifts of humour and pathos; in which M. declares that 'Reade invented the True Woman,' and N. that 'of the woman who is essentially of our time he has never had even the faintest conception;' in which X. discovers 'in the short *Wandering Heir* at least half a dozen situations all new and all strong,' and Y. pronounces it 'very decidedly the worst of Reade's shorter stories.' These things need not perplex us, the simple admirers of *Griffith Gwunt*, of the fight with the pirates, of the bursting of the reservoir, and of the scenes at the gold-diggings. At the same time we may rejoice in the unanimous verdict that is passed by the critics on *The*

Cloister and the Hearth. Swinburne—from whom praise is praise indeed—placed it 'among the very greatest masterpieces of narrative.'

Charles Reade: *A Memoir* (2 vols. 1887), by his brother and a nephew, is a most unhappy piece of biography. See Swinburne's *Miscellanies* (1886); *Readiana* (1882), a collection of fragments; Justin McCarthy's *Reminiscences* (1899); and Coleman's *Charles Reade as I knew Him* (1903).

Reading, a municipal, parliamentary, and county borough, the capital of Berkshire; on the Kennet, near its influx to the Thames, 36 miles by rail W. of London (by road 39, by river 74). Its strong castle was wholly demolished by Henry II.; and the splendid Benedictine abbey, founded in 1121 by Henry I., who was buried here, is represented by considerable ruins and a fine gateway, restored in 1861, and surrounded by public gardens. Nine parliaments were held within its hall; and the last of its mitred abbots was hanged by Henry VIII., with two of the brethren. There are handsome municipal buildings and two excellent town-halls, a lofty clock-tower, a free library, museum, &c. Other buildings are the Italian assize courts (1861); a large grammar-school (1486; re-built 1870-71), of which Dr Valpy was long headmaster; St Laurence's Church (1434; restored 1868); and the Royal Berkshire Hospital. The university (1926) grew out of the University Extension College, founded in 1892 and made a university college ten years later. It is strong in agriculture and dairying. There are many excellent schools. One of the largest of the public parks was gifted in 1891 by Mr G. Palmer. Reading is an important mart for corn and other agricultural produce, and has manufactures of iron, paper, sauce, &c., whilst two of its industrial establishments are world-famous—Huntley and Palmer's huge biscuit-factory and Sutton's seed emporium. Reading, which is in the diocese of Oxford, gives title to a suffragan bishop. Its representation was reduced from two to one in 1885. The first charter was granted by Edward III. Pop. (1851) 21,456; (1881) 46,054; (1891) 55,752; (1921) 92,278. Reading suffered much from the Danes between 868 and 1006, and in 1643 surrendered to Essex after a ten days' siege. It was the birthplace of Archbishop Laud, Justice Talfourd, and Goldwin Smith, but not of Miss Edgeworth, who is often claimed as a native. It has memories also of Chaucer and Bunyan.

Reading, a city of Pennsylvania, capital of Berks county, on the left bank of the Schuylkill River, 51 miles by rail NW. of Philadelphia. It is pleasantly situated on an ascending plain, and from the neighbouring hills draws its water-supply and abundant iron ore. The principal factories are iron and steel works. These include many rolling-mills, forges, foundries, furnaces, machine-shops, nail-works, &c. Reading also manufactures shoes, hats, cigars, leather, paper, bricks, &c. Settled in 1748, it became a city in 1847, and is the seat of an Episcopal bishop. Pop. 110,000.

Reading, a town of Massachusetts, 12 miles by rail N. by W. of Boston, with boot and shoe and radio apparatus manufactures. Pop. 7500.

Reading Beds. See Eocene SYSTEM.

Reading In. See INDUCTION.

Real, an old silver coin and money of account of Portugal, Spain, Mexico, and the old Spanish possessions, the $\frac{1}{4}$ th part of the piastre, or $\frac{1}{4}$ th of the *peseta*, the franc of the Spanish decimal system, which took its place after 1868. The real, not now a current coin, was first coined in Spain in the time of Pedro the Cruel. In Java the name was also applied to a weight for gold and silver articles, equal to 17 dwt. 14 gr. troy weight.

Real is a term used by lawyers to describe the nature of certain rights and actions. The rights of an owner of property are real rights—i.e. he has a right to claim some specific thing and hold it against all other persons. Contractual rights, on the other hand, are personal—i.e. they are good only against the person who is bound to perform the contract. Forms of action are classified according to the nature of the right which is in dispute. The Roman law gave an action *in rem* for the recovery of any thing, whether movable or immovable, which was withheld from the person entitled; an action *in personam* was the form in which compensation could be obtained for breach of contract or other wrongful act. In Scotland, and in other countries where the Roman law has been studied and followed, real rights and real actions are defined very much as they were defined by the civilians; England has taken a course of its own. At the time when the common law was taking shape land was of primary importance. The owner of chattels (movable things) was entitled to damages if his property was detained from him or converted to the use of another; but he had no real action to recover the thing itself. A real action was an action to recover land or some right connected with land. Some interests in land (e.g. the interest of a tenant under a lease) were regarded as personal rights against the owner; in technical language the interest of a tenant for years is a chattel real, or a chattel which savours of the realty. The English law of property framed all its rules with reference to these somewhat arbitrary distinctions. But the Land Transfer Act of 1897 enacted that real property, which used to pass to the heir or devise, should devolve, like personal property (and chattels real), in the first instance on the executors or administrators for distribution among the persons named in the will or the next of kin. This enactment applies only in cases of death after the year 1897, and, as regards deaths occurring after 1925, it is now replaced. But, as regards such deaths, the provision of the Act of 1897 is in substance re-enacted by the Administration of Estates Act, 1925, which provides that real estate to which a deceased person was entitled for an interest not ceasing on his death is to devolve on his personal representative just like a chattel real, and the personal representative, i.e. the executor, original or by representation, or administrator, for the time being, is to be deemed the heirs and assigns of the deceased within the meaning of all trusts and powers, and is to be his representative in regard to such real estate as well as in regard to his personal estate. The new enactment is, however, more explicit than the old as to what is meant by real estate. The expression real estate is defined to include chattels real, and land in possession, remainder or reversion, and every interest in or over land to which the deceased was entitled at his death, and real estate held in trust (including settled land) or by way of mortgage or security, but not money to arise under a trust for sale of land, nor money secured or charged on land.

Realgar. See ARSENIC.

Realism in philosophy is diametrically opposed to Nominalism (q.v.), as involving the belief that genus and species are *real* things, existing independently of our conceptions and their expression, and that these are alike actually the object of our thoughts when we make use of the terms. Again, as opposed to Idealism, the word implies an intuitive cognition of the external object, instead of merely a mediate and representative knowledge of it.

In art and literature the word Realism or Naturalism is employed to describe a method of representa-

tion without idealisation, which in France was raised to a system and claimed a monopoly of truth in its artistic treatment of the facts of nature and life. It claimed that the enthusiasms and exaggerations of romanticism must give place to a period of reflection and criticism; that we must not select from the facts put before our eyes, but merely register them and the sensations they engender for themselves alone, apart from all considerations of mere beauty, to say nothing of religion or morality; and that the experimental romance must follow the rigid methods of science, in being based alone on 'human documents' supplied from the close observation of the present, or from laborious erudition—the retrospective observation of the past. This militant Realism was the offspring of the Positive philosophy and the physiology and psychology of its age; and in effect, in the hands of its apostles, it became a new morality which reformed not by precept but example, not by the attraction of the good, but by the repulsion of the evil. The practical result is that for French realists there is in the moral world only the evil, in the visible world only the ugly.

Real Presence. See LORD'S SUPPER, TRANSUBSTANTIATION.

Realschulen. See EDUCATION.

Reaping, the act of cutting corn, was from time immemorial until far through the 19th century performed with an instrument called a reaping-hook or sickle. The sickles in use among the ancient Egyptians, Jews, and Chinese appear to have differed very little in form from those employed in Great Britain. The reaping-hook is a curved instrument of about a foot and a half in length, tapering from a breadth of about two inches at the butt-end, where it is fixed into a wooden handle. The edge is sometimes serrated; but, as a rule, it has long been made plain and sharp like a knife.

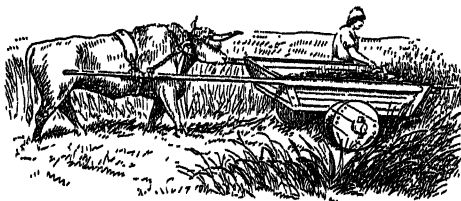


Fig. 1.—Ancient Reaping-machine.

In many parts of the British Islands it was supplanted by the scythe in the earlier half of the 19th century. In other parts it lived until the modern reaping-machine was ready to take the place of it as well as of the scythe. The sickle or hook did its work admirably, but it was necessarily slow. On small farms in some districts it is still employed; and occasionally on large farms, when the crop is much laid and twisted, it is resorted to. By the scythe the corn can be cut at a rather less cost per acre than with the hook; but the work is not always so neatly done. As nice a stubble will be left by a good hand with the scythe, and often nicer than by the hook, but the sheaves are not, as a rule, so tidy after the scythe, though they will stack rather earlier. Of a fair working crop an adept at the scythe would cut 2 or 2½ acres per diem. The average, however, would not exceed 1½ acres. In fact, if the crop is heavy, that extent is a very hard day's work.

An attempt to trace the history of the reaping-machine would carry us far back into the earlier stages of agriculture. Pliny the Elder, who was born early in the 1st century of the Christian era, found a reaping-machine in Gaul. He says: 'In

the extensive fields in the lowlands of Gaul vans of large size, with projecting teeth on the edge, are driven on two wheels through the standing corn by an ox yoked in a reverse position. In this manner the ears are torn off, and fall into the van. Palladius, about four centuries later, found a similar appliance for reaping corn in Gaul. He gives a more detailed but similar description of the machine. Fig. 1, copied from Mr Woodcroft's *Appendix to the Specifications of English Patents for Reaping machines*, represents what is conceived, from the descriptions, to have been the form of this ancient reaper.

In modern times the idea of a mechanical reaper appears to have originated with Capel Lofft (q.v.),

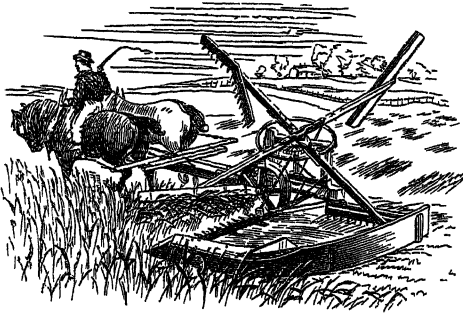


Fig. 2.—Samuelson's Self-delivery Reaping-machine.

who in 1785 suggested a machine something after the pattern of the ancient one described above. Between that time and the Great Exhibition of 1851 in London, from which the general use of mechanical reapers may be said to date, the patents taken out for reaping-machines were very numerous. Among the most promising of these may be mentioned those of Mr Gladstone of Castle-Douglas; Mr Smith of Deanston; Mr Kerr, Edinburgh; Mr Scott of Oimiston; Mr Dobbs, an actor in Birmingham; Mr Mann of Raby, near Wigton; and the Rev. Patrick Bell of Carnyllie, Forfarshire. In 1826 Mr Bell constructed an efficient

to agriculture. In America Mr Hussey and Mr M'Cormick took out patents for reaping machines of superior character in 1833 and 1834 respectively. The movements of the cutters of these machines were various. A few were advancing only, some sidelong and advancing, others reciprocating and advancing, a large number continuous and advancing, and others continuous and alternate. The reciprocating and advancing motion is that now employed on the machines in use.

The principal difference in the machines now so largely used for cutting corn is in the form and character of the cutters, and in the mode of delivering the grain after it is cut.

The cutting knives are of two kinds—one obtuse-angled and serrated; the other, acute-angled and for the most part plain. Both are attached to a bar, and are made to work through another bar of iron fitted with hollow fingers, called guard-fingers, which, projecting forwards, catch the standing corn, and retain it firmly until it is cut. The serrated knife saws through it, the plain knife clips it, as it were, the finger-guard forming the fixed blade of the scissors.

The delivery of the sheaves divides the machines into three kinds—(1) those delivered by manual labour; (2) those delivered by mechanical labour, or self-delivers; and (3) combined reapers and binders, which deliver the sheaves ready bound. The delivery of the sheaves by manual labour is now chiefly at the back of the machine, the side-delivery being generally abandoned, unless in the self-deliveries. In delivering the grain, a man, with a short-handled rake in his hand, sits upon the machine almost opposite the cutting apparatus. With this he inclines the grain towards the knife; and, when enough has been cut to make a sheaf, he rakes it off the platform of the machine, on to which it has fallen, and deposits it on the ground. With the back-delivery the sheaves must be tied up and removed out of the way of the machine before it comes round again. Such a reaper, therefore, always requires a full supply of hands to attend upon it. Carefully handled, this machine will take up laid and twisted crops admirably.

The mechanical or self-delivery machines, as they are generally called, are of two kinds—one lays the cut corn in swathes, the other deposits it in sheaves. Samuelson's sheaf-deliverer will be made plain by fig. 2. The machinery consists of a series of four rakes—two toothed and two plain—attached to an upright shaft in such a manner as to admit of a free ascending, descending, and horizontal motion. The two toothless rakes or 'dummies' are shorter in the arms by six inches than the other two, and are merely employed to incline the grain towards the cutter. By an ingenious eccentric motion, the rakes are made to sweep the sheaves off the platform at intervals of about 12 feet apart, to the side, and out of the way of the horses.

The more recent automatic combined reaper and binder has now almost entirely superseded other reaping-machines. The general appearance and arrangement of Howard's light steel-frame sheaf-binder is shown in fig. 3. The cutting portion of the binder is very similar to that of an ordinary reaping-machine. The cut grain as it falls back on the machine is conveyed by an endless web over the top of the

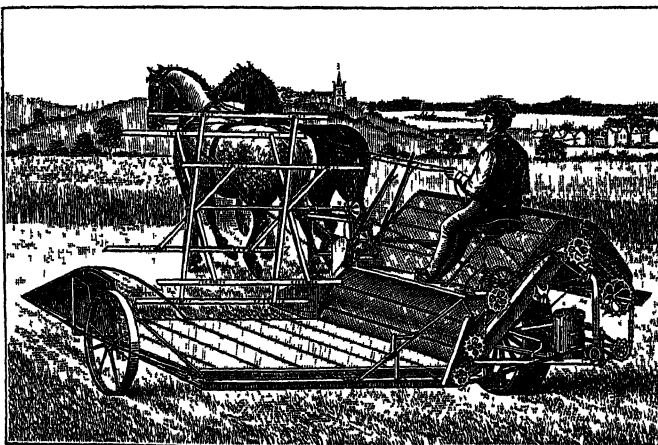


Fig. 3.—Howard's Binder.

and simple machine, which long continued in use, and several features of which are observable in the reapers of the present day. The inventor of this, the first machine of the kind in Scotland, received a public testimonial from agriculturists in consideration of the services he thus rendered

driving-wheel to the knotter. Here it falls into two arms called compressor jaws. These retain it on the knotter table till a sheaf of the prescribed size has accumulated. 'Whenever a sheaf of the desired size has been delivered to the compressors these relieve the tipper, which sets in motion the needle (carrying the binding twine) and the knotting apparatus. The needle is circular, and in its course it passes the band (twine) round the sheaf, when the band is caught by the knotter, and almost instantaneously a firm and secure knot is tied, while the needle is drawn back ready to operate on a new sheaf. As soon as the knot is tied and the string cut, the sheaf is ejected from the machine in a horizontal position, dropping gently on the ground on its side quite clear of the machine' (*Book of the Farm*). With a moderate crop of standing grain the binder in its various improved forms does its work in a most admirable manner, though when the crop is badly 'laid' it cannot be used satisfactorily. It is expeditious, and surpasses all other methods in neatness and thoroughness of work. When the binder was first introduced wire was the binding material. There were strong objections to its use, however, and it was not until twine was substituted that the invention made any headway. There are now several British firms engaged in making binders, which are gaining in popularity year by year.

See Woodcroft's *Appendix to Patents for Reaping-machines*; Jacob Wilson's 'Essay on Reaping-machines,' in *Transactions of Highland Society* for January 1864; Henry Stephens, *Book of Farm Implements and Book of the Farm*; Bond, *Farm Implements and Machinery*.

Reason. See the articles in this work on Psychology, Logic, Induction, Kant, Philosophy, and works cited under these.

Réaumur, RENÉ ANTOINE FERCHAULT DE, physicist, was born at La Rochelle, 28th February 1683, and studied in the Jesuits' College at Poitiers, and afterwards at Bourges. In 1703 he went to Paris, where he attracted general attention by the publication of three geometrical memoirs; and in 1708 he was elected a member of the Academy of Sciences, and was charged with the supervision of the *Description des Divers Arts et Métiers*, published under the auspices of the government. Réaumur lightened his labours with occasional researches into various subjects of natural history. These studies occupied him from 1708 to 1715, and were followed by a series of investigations into the condition of the woods, auriferous rivers, and turquoise mines of France. The collections of Memoirs of the Academy of Sciences from 1722 till 1725 contain a number of papers by Réaumur, in which he details his discoveries of the mode of producing steel from iron, and of the mode of tinning iron. For his researches he received from government 12,000 livres, which he spent in promoting the industrial arts. In 1739 he produced an opaque glass equal to the porcelain of Saxony and Japan. He invented the Thermometer (q.v.) which bears his name. He died of a fall from a horse, 17th October 1757, leaving behind him a voluminous collection of works on all the subjects above stated, also a treatise on 'the silk of spiders,' a number of memoirs (1731-40), containing his thermometric researches on air, and on mixtures of fluids with fluids or solids, and his *Mémoires pour servir à l'Histoire des Insectes* (Amsterdam, 12 vols. 1737-48).

Rebec (Arabic *rebab*), an ancient musical instrument of the violin kind, like the mandoline in shape, was narrow towards the neck, and gradually enlarged till it rounded off at the lower end. Milton, in his *L'Allegro*, characterises this instru-

ment as the 'jocund rebec.' It is still used in North Africa and in the East.

Rebecca Riots, a series of popular outbreaks which originated in Carmathenshire in 1843-44, and quickly spread over Pembroke, Cardigan, and Brecon. They grew out of the impatience of the people at the great increase of toll-gates on public roads, and owed their singular name to their adopting as a motto Genesis, xxiv. 60. Bands of men five hundred strong, then leaders disguised in women's clothes, scoured the country by night, threw down the toll bars, and then dispersed. A strong force of soldiers was poured into the country, but the rioters offered an obstinate resistance, and were not put down without great difficulty and considerable bloodshed. The commission appointed by government to inquire into the causes of the outbreak found that it grew out of a genuine public grievance, whereupon measures of relief were introduced, and those rioters seized were punished lightly.

Rebellion. 'The Great Rebellion' generally means the revolt of the Long Parliament against the authority of Charles I (q.v.). See also CROMWELL, FALKLAND, HAMPDEN, &c.; ENGLAND; and the works of S. R. Gardiner. The revolts on behalf of the House of Stuart in 1715 and 1745 are often, particularly in Scotland, spoken of emphatically as 'The Rebellion' (see JACOBITES). The term is applied to the events in Ireland in 1798 and 1916, and in the United States to the secession of the southern states.

Rebus, an enigmatical representation of a name or thing by using pictorial devices for letters, syllables, or parts of words—*non verbis sed rebus*. Devices of this kind, allusive to the bearer's name, were common in the middle ages, particularly in England; see BADGE.

Recall. See INITIATIVE AND REFERENDUM.

Récamiér, MADAME (née JEANNE FRANÇOISE JULIE ADÉLAÏDE BERNARD), a famous Frenchwoman, was born at Lyons, 4th December 1777. She grew up a girl of remarkable grace and beauty, and at fifteen she was married to M. Jacques Récamiér, a rich banker about thrice her own age. Her salon was soon filled with the brightest wits of the literary and political circles of the day, but fortunately for herself Madame Récamiér possessed a temperament that saved her from temptation and almost scandal. For Madame de Staël she had a warm affection that survived the exile required by the jealousy of Napoleon. Soon after this her husband was completely ruined, and Madame Récamiér visited Madame de Staël at Coppet in Switzerland (1806). Here she met Prince August of Prussia, who alone of all her innumerable admirers is supposed to have touched her heart. Indeed a marriage was arranged, provided M. Récamiér would consent to a divorce. The good man did not refuse, but his kindness was too much for the generous heart of Madame Récamiér, who declared she could not leave him in his adversity. The most distinguished friend of her later years was M. de Chateaubriand. In 1846 he became a widower, and he then wished to marry Madame Récamiér, whose husband had been dead since 1830, but the lady declined the honour without interrupting the current of their friendship. Chateaubriand died 4th July 1848, and she followed him to the grave on 11th May 1849.

Recanati, a town of Italy, 15 miles S. of Ancona, has a Gothic cathedral with a monument to Pope Gregory XII. (who died here) and some fine Renaissance buildings. Here Leopardi was

born. Pop. 16,000. Porto Recanati, 6 miles NE. on the Adriatic coast, has a pop. of 5000.

Receipt is the technical as well as popular term signifying a legal acknowledgment of money received in discharge of a debt or demand. In England it is often believed that a written receipt is the only legal proof of payment; the fact being that it is only one mode of proving it. If the money be paid in presence of witnesses, or even without witnesses, provided a jury or judge believe the statement on oath of the party paying it, this is in England quite as good evidence of the payment as if a written receipt were given; and even a written receipt is conclusive only where it is under seal, or endorsed on a conveyance under the Conveyancing Act of 1881, unless the purchaser had notice to the contrary, or on a marine policy between assured and underwriter. In other cases a receipt is only *prima facie* evidence, and may be explained. If a receipt (except for salary, &c.) is in writing and the sum paid is 40s. or more, it must be stamped with a 2d. receipt-stamp (which may be an adhesive stamp), to be cancelled before delivery, otherwise the receipt is inadmissible as evidence of payment; but on payment of certain penalties the receipt may be after-stamped with an impressed stamp. Not only is a receipt proper subject to stamp-duty, but also any note or memorandum given to a person on payment of money, and acknowledging payment of any part of a debt or demand, whether signed or not; so receipts given on payment of bills of exchange or promissory-notes are liable to stamp-duty. But a mere acknowledgment of indebtedness, as a receipt 'on loan,' or an I O U, is not stampable as a receipt. There are several exceptions from liability to stamp-duty. Such are receipts for deposits with bankers to be accounted for; receipts for any parliamentary taxes or duties, or for any payment to the Sovereign; receipts by officers, seamen, marines, or soldiers for wages or pay; receipts for purchase of government stock or for money due under Exchequer Bill; receipts written on any bill or note of the Bank of England or of Ireland, on the back of duly stamped bills of exchange or promissory-notes, or upon the back of duly stamped instruments acknowledging the receipt of money; and generally receipts to or by government departments. At one time, under the Act of 1803, it was supposed to be the duty of the debtor to provide stamped paper for a receipt, the creditor being liable in a penalty of £10 if he refused to sign. This act, however, is repealed, and the better view is that when the debtor tenders payment the creditor is bound to give a proper discharge, its form being regulated by custom. In Scotland the receipt of money cannot be proved by witnesses where the debt was created by writing, and it is not allowed to dispute the validity of a written receipt duly delivered except in cases of fraud. It is only in the case of ready-money sales that receipt of the price can be proved by parole. See *Alpe's Law of Stamp Duties* (18th ed. 1925).

Receiving Stolen Goods. See THEFT.

Recent Period. See POSTGLACIAL AND RECENT SYSTEM.

Rechabites, members of one of those Friendly Societies (q.v.) which make total abstinence (see Jer. xxxv. 6) a fundamental principle.

Recidivists is a modification of the French term for habitual criminals, many of whom have been sent to Cayenne and New Caledonia.

Recife. See PERNAMBUCO.

Reciprocity, in Political Economy, a term for an arrangement between two countries having a protective tariff against other countries, to admit

each from the other's territories certain specified taxable articles of commerce duty-free or at exceptionally light duties. The classes of articles are arranged to balance one another on one side and the other. Such mutual arrangements are sometimes called Fair Trade as opposed to Free Trade (q.v.) and thoroughgoing Protection (q.v.), and have been advocated for Britain and her colonies.

Recitative. See MUSIC, OPERA.

Reclamation. See WASTE LANDS, BOG, &c.

Reclus, JEAN JACQUES ÉLISÉE, géographe, was born at Sainte-Foix la Grande (Gironde) on 15th March 1830, and educated at Montauban and under Carl Ritter at Berlin. In consequence of his extreme democratic views he left France after the *coup d'état* of 1851, and spent the next seven years in England, Ireland, North and Central America, and Colombia. He returned to Paris in 1858, and published *Voyage à la Sierra Nevada de Sainte-Marthe* (1861). For his share in the Commune (1871) he was banished, but returned in 1879; and from 1893 he was a professor at Brussels. He died 5th July 1905. His masterpiece was the *Nouvelle Géographie Universelle* (19 vols. 1876-94). Other works were *La Terre* (1867-68), *Histoire d'un Ruisseau* (1866), *Les Phénomènes Terrestres* (1873), *Histoire d'une Montagne* (1880), and *L'Idéal Anarchique* (1903).—His elder brother, MICHEL ÉLIE RECLUS (1827-1904), was also an anarchist, a geographer, and a professor at Brussels, and wrote on the natives of Australia.

Recluse. See ASCETICISM, HERMIT, MONACHISM.

Recognisance is a kind of judicial bond entered into with a court of record, the object of which is to secure the doing of some act, as the appearance of witnesses at a criminal trial, or the keeping of the peace by one who has threatened or assaulted another. The form of it is thus: 'A B doth acknowledge to owe to our lord the King the sum of ten pounds,' or some other sum, to be levied of his goods if he fail in the condition endorsed; and then a condition is added, which states that, if the thing secured is done, then the recognisance is to be void. This is the mode by which justices of the peace secure the attendance of the prosecutor and witnesses at the trial of a prisoner who has been committed for trial, or the future good behaviour of one who has committed a breach of the peace. If the thing secured is not performed, then the recognisance is estreated—i.e. extracted and put in force, a debt of the amount specified being forthwith due to the crown. In Scotland, the place of recognisances is filled by cautions; a caution in law burrows corresponds very nearly to a recognisance to keep the peace (see CAUTION). In the United States recognisances are used for much the same purposes as in England.

Recoil. See CANNON, MONCRIEFF.

Recollet (Lat. *recollectus*, 'gathered together'). See FRANCISCANS.

Record, as a legal term, is used in the United Kingdom to signify anything entered in the rolls of a court, and especially the formal statements or pleadings of parties in a litigation. In general the rule is well settled that the pleadings which make up the record do not enter into details of the evidence, but merely set forth the conclusions or inferences, leaving the details of evidence to be supplied at the trial before a jury, or, if there is no jury, at the hearing before the judge or court. One of the incidents of a Court of Record is that the court or judge can commit for contempt any person who insults the court or wilfully obstructs the business. A trial by record means that one

of the parties has set up some former decision of the court, while the other denies that such a decision ever existed; whereupon the only mode of solving the question is by producing the record of the former action, and so settling the dispute. In Scotland the closing of the record is a step which requires the sanction of the judge, who closes the record after each party has said all he wishes to say by way of statement and answer.

Recordre, ROBERT, mathematician, was born about 1510 at Tenby. He studied at Oxford, but, wishing to make medicine his profession, removed to Cambridge, where in 1545 he received the degree of M.D. In 1547 he was in London, engaged in the composition of *The Urinal of Physic* (1548), and was about the same time appointed physician to Edward VI., as afterwards to Queen Mary. Ten years later he died miserably in the debtors' prison in London. His works, in the form of dialogues between a master and his pupil, and written in the rude English of his time, are *The Grounde of Artes, teaching the Perfect Woork and Practice of Arithmetike* (1543); *The Pathwaye to Knowledge* (1551), an abridgment of Euclid's *Elements*; *The Castle of Knowledge, containing the Explication of the Sphere both Celestial and Material*, (1551), an astronomical work, in which he compares the Ptolemaic and Copernican systems; *The Whetstone of Wit* (1557), a treatise upon algebra. In the appreciation of the general results derivable from algebraic formulæ he is far beyond his contemporaries, with the sole exception of Vieta (q.v.).

Recorder is a judge of a city or borough court of quarter sessions. He must be a barrister of not less than five years' standing, is appointed by the crown, holds office during good behaviour, and the salary is paid by the city or borough out of the borough fund. He sits as sole judge of the court of quarter sessions for his district, but he cannot grant licenses or be an official in licensing matters, or order rates to be levied. The recorder is not prohibited from practising at the bar, and indeed his salary is usually small. He can appoint as deputy, in case of necessity, a barrister of five years' standing, and, if need be, an assistant-recorder. In London he is elected by the Lord Mayor and aldermen, and as 'mouthpiece of the city' he certifies the customs of London. He is chief judge in the Mayor's Court of London, and is one of the judges sitting at the Central Criminal Court, commonly called the Old Bailey. Among the many well-known men who have held this post were Lord Coke and Lord-chancellor Jeffreys. There is no such office in Scotland, but the sheriff discharges similar duties.

Recorder, the name of an old musical instrument something like a flageolet, but with the lower part wider than the upper, and a mouthpiece resembling the beak of a bird.

Records, PUBLIC (Lat. *recordari*, 'to remember'), may be described as contemporary statements of acts and proceedings in public affairs, officially authenticated and preserved in the public interest. The technical application of the term in England is fixed by the Public Record Office Act of 1838, and an Order in Council of 1852. The act included 'all rolls, records, writs, books, proceedings, decrees, bills, warrants, accounts, papers and documents whatsoever of a public nature belonging to Her Majesty,' and deposited in certain specified places. In effect the Master of the Rolls became custodian of the whole body of legal records. The Order in Council brought all departmental and state papers 'under the charge and superintendence' of the Master of the Rolls, though not actually into his 'custody.' By a working compromise the depart-

ments retain the power of regulating access to their documents.

In 1800 a select committee reported upon the state of the public records; but up till 1836 nothing practical was done to remedy the defect that they were scattered in various repositories, not very suitable and sometimes dangerous, such as the Tower, the Chapter House at Westminster, and the Rolls House and Chapel, and that they were under no general charge. The Select Committee of 1836 insisted upon the importance of 'proper custody,' and recommended the erection of a Record Office. In 1851 the present Public Record Office in Fetter Lane was begun. In 1900 it was finished; but extension will soon be necessary.

Though the report of 1800 did not immediately lead to reform in the matter of custody, or effective steps towards reducing the records to order, there was some activity in publication. Before the Public Record Office Act of 1838, various Record Commissions and the State Paper Commission issued more than 100 volumes. About 1856 the printing of national documents came under the superintendence of the Master of the Rolls, and the field of operations was enlarged in the interests of historical research. Calendars of Domestic, Colonial, and Foreign State Papers were successively undertaken. Materials relating to British history in the continental archives were examined and prepared for publication; at home recourse was had to various libraries, such as the British Museum or the Bodleian. In the 'Rolls Series,' which extends to more than 250 volumes, matter was derived from sources outside the Record Office; but, as these publications tended to divert energy from what lay within the office, practically no new work in the series was undertaken after 1886. The policy of issuing calendars of State Papers was pursued; and, in order to compensate for the termination of the Rolls Series, calendars of medieval records were begun. In 1890 'Record Office Lists and Indexes' were announced. This series, with the calendars, was intended to 'constitute a general catalogue of the contents of the Public Record Office.' The purpose of calendars is to make the contents of documents sufficiently accessible for ordinary reference, and to obviate the necessity of recourse to the original. In this respect a mere catalogue of documents is obviously deficient. The practical problem is to hit the mean between an excessively full, and therefore slowly executed, calendar, and a bare list which fails to indicate the nature of the subject-matter.

By the Act of 1838 the Master of the Rolls became responsible head of the Record Office Department; as, however, he had to attend to the business of his own special court, a Deputy-keeper of the Records was appointed to conduct administration and publication. When the Master of the Rolls became President of the Court of Appeal, he continued to be responsible keeper, but his deputy, in theory a subordinate official, assumed in practice the control of the Record Office. Though the Select Committee of 1836 did not recommend that the functions of preserving and publishing the archives should be permanently combined in one hand, the actual development since the Act of 1838 has, in this respect, differentiated English usage from continental.

The records under the superintendence of the Master of the Rolls include those (1) of the Courts of Chancery, King's Bench, Common Pleas and Exchequer; (2) of Special and Abolished Jurisdictions, such as the Marshalsea and Palace Courts, the Courts of Requests, Star Chamber, and Wards and Liveries; (3) of the High Court of Admiralty; (4) of the Palatinate of Durham; and (5) the

Palatinate of Lancaster; (6) of the Principality of Wales, with those of the Palatinate of Chester; (7) of the Duchy of Lancaster; (8) the State Papers, domestic, colonial, and foreign, formerly in the State Paper Office at Westminster, which was merged in the Record Office in 1854; (9) the records of the Government Departments; and (10) records of Abolished Offices and Expired Commissions of Enquiry.

Since 1890 much has been effected under Sir H. Maxwell Lyte, as deputy-keeper, to classify the contents of the Record Office, and make them accessible to the public. The first *Handbook to the Public Records*, published in 1853 by F. S. Thomas, was superseded by a *Guide to the Public Records*, compiled by S. R. Scargill-Bird (3d ed. 1908). Lists of Record Publications, printed by the Stationery Office, were inserted in each volume issued. H. Hall's *Studies in English Official Historical Documents* (1908), *Formula Book of Diplomatic Documents* (1908), *Formula Book of Legal Records* (1909) were important for the student.

A Commission on Public Records (England and Wales) was appointed in 1910, and the three Reports (1912-19) contain a great mass of statistical and historical information. It is stated that 'nowhere is the concentration of all public records and state papers in a single repository carried to the same extent as it is in England,' and that, abroad, 'the practical difficulties which might result from the division of the public records amongst a number of repositories are met by centralising the administration of the archives, instead of centralising the documents themselves.' The existence of provincial offices, the technical training required of archivists, and the scientific classification of documents, are held to assist historical education and encourage the study of local history.

During recent years the study of records as historical sources has been developed at the universities, notably at Manchester, Oxford, and London. This interest, represented in the 1910 Commission, has led to several publications, official and unofficial, since the Great War. A new *Guide to the Public Records* (2 vols., 1923-24) has been compiled by M. S. Giuseppe. The Royal Historical Society produced in 1920 a *Repertory of British Archives (England)*, by H. Hall, which contains a valuable historical introduction and surveys the local records. In 1925 the same author issued *British Archives and the Sources for the History of the World War*.

The Historical MSS. Commission was appointed in 1869 to describe the contents of private or semi-public local records of the United Kingdom. An account of the work will be found in the *Transactions of the Royal Historical Society* (3d series, vol. iv.). Some of the documents inspected are in the Public Record Office, of which the Commission acts almost as a branch; but it has reported upon very many local collections of records, which may be classified as (a) public, (b) semi-public, and (c) private. In spite of the centralising tendency in England, already noted, there is of course a great mass of local records which are of a public character. For example, we have (1) civil records, both administrative and judicial, such as those of counties and municipalities, and (2) ecclesiastical records, notably the old parish registers. Full information on this subject will be found in the Report of the Local Records Committee (1902), which contains matter relating also to Scotland and Ireland, and in Hall's *Repertory of British Archives*. Useful aids in consulting the Historical MSS. Reports are the *Topographical Guide* and the lists in Report XVII., both issued by the Commission.

Students desiring to work at the Public Record

Office must apply for tickets, as in the case of the British Museum. Access to the records of Government Departments, which are not in the 'custody' of the Master of the Rolls, is not uniformly regulated, and depends upon the departmental authority. In certain cases a permit is necessary.

Scotland.—An inventory of 1282 gives a list of some of the writs deposited in the King's treasury at Edinburgh. Edward I. removed from the Castle those affecting the contested succession (1291), and subsequently transferred them from Berwick to Westminster. Documents bearing upon the administration did not elude his grasp, and found their way to London, where such of these early Scottish records as survive are still retained. Another misfortune occurred in the Commonwealth period. Cromwell possessed himself of the national records on the surrender of Stirling Castle (1651). The Register of the Privy Seal, however, escaped capture. The books were carried for concealment to the Highlands, and were returned to public custody only in 1707. In 1657 no fewer than 1547 volumes relating to private rights were sent back to Edinburgh. On the Restoration the *Eagle* frigate was ordered to transport the rest of the captured records to Leith. The greater part of the cargo, however, was put on board a merchant ship at Yarmouth, and went down with her. The exact extent of the loss is not known, and may be exaggerated; but important ecclesiastical records, taken from the Bass (1652) and sent to London, may have been involved in the disaster. Additional particulars regarding these vicissitudes will be found in the published Acts of the Scottish Parliament (v. Index, under 'Records'), General Assembly Reports (1889), the official handbook mentioned below, and Thomson's lectures on *The Public Records of Scotland* (1922).

After the Restoration the records ceased to be preserved in Edinburgh Castle, and were deposited in the Laigh Parliament House, where they suffered from damp and neglect. Some of the hogsheads returned from London were not unpacked for almost a century. The absence of a suitable repository, and the practice of keeping registers in the private houses of clerks, account for some additional losses. The project of a Register House, taken up in 1765, was realised some twenty years later, and the building was gradually completed after the designs of Robert Adam.

The development in Scotland from the time of Alexander III., when we hear of a 'Clerk of the Rolls of the King's Chapel,' tended to place the national archives in the charge of a single official. The Lord Clerk-Register, as he was ultimately styled, came to be concerned *ex officio* with the proceedings of Parliament, Privy Council, Court of Session, and Court of Exchequer; his custody was also extended to registers relating to private rights. By an Act of 1879 the Lord Clerk-Register's duties were practically confined to the process of electing the representative peers, and the Deputy-Clerk-Register became Keeper of the Records. This official also exercised the function of Registrar-General, and a Deputy-keeper of the Records acted under him in the administration of the Record Office. At present the office of Deputy-Clerk-Register has been for some years vacant, and there is no properly constituted Record authority.

The tendency towards centralisation has prevailed in Scotland. Any detailed account of the records at present deposited in the Register House is rendered unnecessary by a *Guide to the Public Records of Scotland* (1905), by M. Livingstone, late Deputy-keeper. This book not only gives a classification and inventory of the various registers and collections preserved there, but also contains much information relating to their history and contents.

It is important to note that an appendix to the volume gives some account of certain records which are retained in departmental custody, such as those of the Court of Teinds and the Lyon Court, or Court of Arms. In the office of H.M. Chancery is retained the record of Retours, or returns made by juries proceeding upon brieves or royal warrants, the great majority of which are verdicts serving heirs to their ancestors. It is believed that the earlier records of Chancery were destroyed at Holyrood in Hertford's invasion (1544). The Services of Heirs from 1545 to 1700 were abridged and printed (1811); from 1700 to 1859 there is a printed index arranged by decades. Another important class of records not deposited with the Keeper of the Records are those of the High Court of Justiciary, and no description of them will be found in the handbook. For an explanatory account of the Scottish Records, based upon unique knowledge, the reader should consult Maitland Thomson's lectures, already mentioned.

Of the records in charge of the Deputy-Clerk-Register, the first class relates to the Crown, Parliament (to 1707), Revenue, and Administration. The Judicial records, secondly, comprise those connected with the Session as supreme civil court, and include the important Register of Deeds. Books and papers of the old episcopal or Commissary Courts, involving the valuable registers of Testaments, were fortunately brought in for preservation. There are also deposited many records of defunct local and heritable jurisdictions. Under the third head of titles to land, dignities, and offices, besides the Registers of the Great Seal (from 1306) and the Privy Seal (from 1488), there is the Register of Sasines, which extends to more than 20,000 volumes, and records the formal transfer of land to new proprietors. This register was fairly established in 1617, after more than half a century of experiment. There is also a valuable collection of original charters, calendared and indexed nearly to the end of the 16th century, and a number of protocol books, in which notaries recorded their official acts. The Burgh Registers of Sasines (from 1681) are an exception to the complete centralisation of land records. A fourth and miscellaneous class of books and documents contains certain important ecclesiastical records. The extant parochial registers, in the charge of the Registrar-General, are in the New Register House.

Publication of the Scottish Records was begun early in the 19th century, and more than 115 volumes have been issued; but there is also much information accessible in the English calendars, the Reports of the Historical MSS. Commission ('Index,' by Terry, 1908), and the various historical club books ('Catalogue,' by Terry, 1909). The Report of the Committee on Local Records (1902) contains returns for Scotland. The public records in local custody include not only the Burgh Registers of Sasines already mentioned, but the more important Sheriff Court Records. A Committee (1925) recommended that the latter should be centralised for preservation and accessibility.

Historical students who desire to prosecute researches in the Record Office must satisfy the Keeper of the Records in order to obtain a free permit.

Ireland.—Many records perished during the wars of conquest. A Record Commission, appointed in 1810, continued till 1830, and did much for the preservation and arrangement of the Irish archives. After a new Commission in 1848 a bill for proper custody was drafted, but was not carried. The public records were kept by several persons and often in unsuitable places; but a Record Office was ultimately established, and a Public Records (Ireland) Act was passed in 1867, in many respects based on the English Act of 1838. The Master

of the Rolls in Ireland took charge of records relating to the Chancery, Common Law, Probate, Admiralty, and Prerogative Courts, records in the Dublin Customs House, original wills, various rolls and parliamentary records, State Papers of the age of fifty years and upwards, and documents of defunct courts, commissions, and offices. Certain county records were included under powers conferred by the Act upon the Lord-lieutenant in Council. Most of the parochial registers of the Disestablished Irish Church were transmitted; but centralisation was unfortunately not compulsory, and some confusion resulted. As in Scotland, the local records which remained outside the capital were relatively fewer than those which are preserved locally in England. In 1919 a *Guide to the Public Records of Ireland* (H. Wood) was issued, with an introductory historical sketch.

Among the English Record Publications are a number of calendars relating to Ireland. There are also Irish Record Publications. The regular Reports of the Deputy-keeper (from 1869) contain calendars, lists, and indexes. These issues, with the Reports of the Historical MSS. Commission and volumes in the Rolls Series, are included in the general catalogue appended to the English Record Publications as they appear.

In June 1922 a great disaster befel the Irish Records in the destruction of the Four Courts in Dublin. Northern Ireland made a separate office for the custody of its records, as there was no repository in Dublin, even if political conditions had permitted a common centre. In his First Report (1924) the Deputy-keeper for Northern Ireland stated that, in view of the enormous destruction in Dublin, efforts were made to obtain copies from every possible source, and that one of the worst losses, viz. original wills, had been partially repaired.

Colonial and Foreign.—Information regarding continental systems appears in the *Reports of the English Commission* (1910). A recent and exceedingly useful review of record systems is due to the enlightened action of the South African Government. A report (C. G. Botha: Pretoria, 1921) contains an interesting comparative study dealing with practical questions, and a list which includes publications relating to records in Canada and the United States.

Recovery. See **ENTAIL**.

Recruit. See **ENLISTMENT, ARMY**.

Rectifying is a process applied to alcohol, chloroform, or other volatile liquid, by which the last traces of impurities are removed by distillation. Many varieties of stills and condensers have been devised for this purpose, for further reference to which see **DISTILLATION**, and **ALCOHOL**.

Rector (Lat. 'ruler'), in the Church of England, is a clergyman who has the charge and cure of a parish where the tithes are not inappropriate, and who accordingly has the whole right to the ecclesiastical dues therein; where the tithes are inappropriate the parson is a Vicar (q.v.). In the Episcopal Churches of the United States and (since 1890) Scotland all incumbents are called rectors. See also **EDUCATION**, and **UNIVERSITIES**.

Rectum, the terminal portion of the intestinal canal, named, from its comparatively straight course, the rectum (see **DIGESTION**), is the seat of various affections requiring medical or surgical assistance. Some of these affections, as fistula, fissure (see **ANUS**), piles, prolapsus ani, have already been considered. Amongst the other diseases of the rectum of sufficient importance to claim notice in these pages are—

(1) *Stricture of the Rectum*, which may be either of a simple or malignant nature. *Simple stricture*

consists in a thickening and induration of the sub-mucous tissue, less often of the muscular or mucous coat of the rectum, so as to form a ring encroaching on the calibre of the tube. It may occur as the result of injury or operation, of old ulceration (e.g. from dysentery), of syphilis, or without ascertainable cause. The symptoms are constipation and great pain, and a straining in evacuating the fæces, which, if not liquid, are passed in a narrow, flattened, or worm-like form that is very significant of the nature of the case. In an advanced stage of the disease diarrhœa often supervenes. However great may be the constipation, strong purgatives must be altogether avoided. Soft and unirritating evacuations must be procured by such medicines as the confection of senna combined with sulphur (see PILES), or by salines, which make the intestinal contents more fluid, or injections of castor-oil or of tepid water. The diet should be regulated so as to assist the action of the medicines. Gradual dilatation by suitable bougies often gives great relief, but must be steadily persevered with, as the contraction is almost certain to recur. *Malignant stricture*—most commonly due to the scirrhus, but sometimes to the epithelial form of cancer—is by no means a very rare affection. Until ulceration sets in the symptoms are like those of simple stricture, only exaggerated in degree; but afterwards there is a discharge of fetid muco-purulent matter streaked with blood. In this disease the treatment can, in most cases, be only palliative. Sometimes, however, if the tumour is low down and localised it may be removed with at least temporary relief. If complete obstruction occur, or is threatened, the surgeon may resort to the formation of an artificial anus in the groin, which not only may prolong life for several years, but leads to great relief in the symptoms of the tumour, which is no longer irritated by the fæces.

(2) *Spasm of the sphincter ani* muscle is characterised by extreme pain in the region of the anus, especially when an attempt is made to evacuate the bowels. The muscle contracts so firmly that the surgeon cannot easily introduce the finger into the rectum. The spasm may be caused by piles, especially by fissure of the anus, by ulceration of the rectum, and sometimes apparently by mere constipation. It is often relieved by the application of belladonna ointment or by a simple operation.

(3) *Neuralgia of the rectum*, known also as *proctalgia*, is sometimes met with, and is especially prone to attack children and gouty persons. It is usually relieved by the judicious use of aperient medicines and such treatment as is used for other forms of Neuralgia (q.v.).

(4) *Pruritus ani*, or *itching of the anus*, is a very common and extremely troublesome affection. Sometimes it depends on the presence of thread-worms, of old piles, constipation, or some other local cause of irritation, while in other cases it is one of the manifestations of some constitutional condition. The treatment must depend upon the exciting cause, but for this condition suppositories of zinc oxide and cocoa butter in equal parts are especially soothing.

Reculver, a village on the coast of Kent, 9 miles W. of Margate, with remains of the Roman station *Regulbium*.

Recusants, persons who refused or neglected to attend at the worship of the established church on Sundays and other days appointed for the purpose. The offence as a legal one may be held to date from 1 Elizabeth, chap. 2; but there were four classes punishable under the statutes against recusancy—simple 'recusants'; 'recusants convict,' who

absented themselves after conviction; 'popish recusants,' who absented themselves because of their being Roman Catholics; and 'popish recusants convict,' who absented themselves after conviction. Protestant dissenting recusants were relieved from the penalties of recusation by the Toleration Act of 1 Will. and Mary, chap. 18. Catholics were partially relieved in the year 1791, and completely by the Emancipation Act of 1829.

Red. Most of the important red pigments are separately noticed. For carmine and crimson lake prepared from cochineal, and also for the madder reds, see LAKES. The reds of which oxide of iron is the colouring ingredient—viz. Indian red, Venetian red, and light red—are referred to under OCHRES. Vermilion (q.v.) is one of the finest and most beautiful reds, though not always so permanent, at least as a water-colour pigment, as was formerly supposed. For house-painters' use this colour is often adulterated with red lead, which, though forming a useful paint for some common purposes, is fugitive. See also DYEING.

Redan. See FORTIFICATION, SEBASTOPOL.

Redbreast (*Erithacus rubecula*), a bird of the family Sylviidae, well known in the British Isles because of its very general distribution, its early and legendary associations, its conspicuous plumage, and the fact of its being resident. Its range is gradually extending northwards, and now it is found breeding in the Hebrides and Orkneys; in spring it is found on the island of Jan Mayen, in autumn it visits the Faeroes. Southwards it breeds throughout Europe (but only locally in the south of Spain), in North-west Africa and the Canaries, Madeira, and the Azores; eastwards to the Ural Mountains. In winter its migrations extend to the Sahara, Egypt, Palestine, and Persia. The redbreast, known familiarly as Robin or Robin Redbreast, is about 5½ inches long, olive-brown in colour on the upper parts; chin, throat, and upper breast reddish orange, bordered with bluish gray on the sides of the neck and shoulders; under parts dull white; bill black; legs and feet brown; the body fairly full and round, the legs slender. The female is usually but not always duller than the male. In habit robins are domineering and pugnacious; solitary, or found only in pairs, preferring plantations, but coming near dwelling-houses when forced by severe weather. Nesting begins in March. The nest of dead leaves, dried grass and moss, lined with hair and feathers, is made in banks, hollow trees, and sometimes in strange and extraordinary places. The eggs, five to seven, are usually white with light reddish blotches, or pure white. Two or three broods are produced in the season. In autumn the young are forced by their parents to migrate, and at this season there is generally a great influx of robins from the northern parts of the Continent, where they have been passing the summer. The food consists chiefly of insects and worms; often of berries and other fruits; and in winter bread-crumbs and scraps of meat. Its song is sweet and plaintive, but of little compass, and not much noticed when other songsters abound. The widely distributed robin of the United States and Canada is a Thrush (*Turdus migratorius*).

Redcar, a popular bathing-resort in the North Riding of Yorkshire, 10 miles by rail N.E. of Middlesbrough. Its smooth, firm sands stretch 10 miles from the mouth of the Tees to Saltburn. Pop. (1921) 16,399.

Red Cedar. See JUNIPER.

Red Clay. See SEA.

Red Crag. See PLIOCENE SYSTEM.

Red Cross, THE, is the badge and flag adopted by every society, of whatever nation, formed for

the aid of the sick and wounded in time of war, recognised and authorised by the military authorities of its own nation, and enjoying certain privileges and immunities under the treaty known as the Convention of Geneva. Hence 'Red Cross Society' has become a generic name for all such voluntary efforts, and cannot be monopolised by any one of them. For three centuries and more a medical service has been attached to armies, and was long thought sufficient for every emergency, but the revelations made during the Crimean war (1853-56) were terrible. The merciful mission of Florence Nightingale and her companions, while reducing the losses by one-half, threw light upon shocking defects, and compelled the acknowledgment of want of organisation in everything connected with the health of the troops and care of the wounded. Nevertheless, when war broke out in Lombardy (1859) similar inefficiency was apparent. Loud complaints arose, but the first practical result ensued from the publication by M. Dunant of his *Souvenir de Solferino*. The account of this battle (June 24, 1859), which lasted fifteen hours and in which 300,000 combatants were engaged, was so heart-rending as to force public attention to the necessity for supplementing the medical and sanitary service by volunteer societies trained and organised in time of peace. The book was discussed at Geneva at a meeting of the *Société Genevoise d'Utilité Publique*, February 9, 1863, a date which may be taken as the starting-point of the Red Cross. An international conference assembled at Geneva, October 26, 1863, and included among its thirty-six members delegates from fourteen governments and six associations. The main recommendations agreed to were (1) the formation in each country of a committee to co-operate with the army sanitary service in communication with the government, and occupying itself in time of peace with preparing supplies of hospital stores, training nurses, &c., and during wars furnishing the same in aid of their respective armies, neutral nations being invited to assist such national committees; (2) the declaration of the neutrality of hospitals, of the officials of the sanitary service, of the unpaid nurses, of the inhabitants of the country aiding the wounded, and even of the wounded themselves. The conference suggested the adoption of the same distinctive and uniform badge (the red cross on a white ground) for all hospitals and sanitary officials as well as for the volunteer relief agents. A treaty, the Convention of Geneva, embodying these resolutions was signed at a second conference at Geneva in 1864 by twelve out of sixteen representatives there assembled, and it has since been acceded to by every civilised nation. International conferences have been held at Paris (when the convention was extended to naval warfare), Berlin, and Vienna, but the resolutions passed at Geneva have undergone no material alteration. By the Covenant of the League of Nations 'The members of the League agree to encourage and promote the establishment and co-operation of duly authorised voluntary national Red Cross organisations having as purposes the improvement of health, the prevention of disease, and the mitigation of suffering throughout the world.' (Art. xxv.) For some years prior to the Great War the British Red Cross Society and the Order of St John (see HOSPITALIERS) had occupied themselves in the training of Voluntary Aid Detachments throughout the country, primarily for service with the territorial force in time of need. During the Great War, however, these became a vital part of the general Red Cross organisation, and did valuable work in all branches of the army at home and abroad. The two British organisations were for war-time purposes directed by a joint-committee, which

co-ordinated their services, and which was continued after the declaration of peace in order to facilitate the work proposed by the League of Nations.

See an American book by Davison (1920); A. de Lisle, *The Story of the Red Cross* (1905); a series of articles in the *Times*, September 24-29, 1917; and Hall, *International Law* (1924).

Red Cross, THE ROYAL. This decoration was instituted by Queen Victoria in 1883. It is conferred on any ladies, English or foreign, recommended by the Secretary of State for War, for special exertions in providing for the nursing, or for attending to sick and wounded soldiers and sailors. The decoration is a cross of crimson enamel gold-edged, attached to a dark-blue ribbon red-edged, one inch in width, tied in a bow and worn on the left shoulder.

Red Deer, or STAG (*Cervus elaphus*), a large and very handsome animal, inhabiting some of the forests of Europe, West Asia, and North Africa. Those living in the more northern parts are smaller. In Britain red deer are found on Exmoor, in the Highlands of Scotland, and in some parts of Ireland.



Stag, Hind, and Calf (*Cervus elaphus*).

The full-grown animal stands over 4 feet at the withers, and is dark reddish brown in colour, slightly grayish in winter. The antlers (q.v.), with which the rival males fight, belong to what is called the elaphine type, having protrusive brow-tines, well-marked bez-tines, a rounded beam, and terminal snags 'arranged in a cup or crown.' As usual, they are shed in the spring of each year, and gain 'points' with each year's fresh growth, a 'royal stag' having twelve, though this is not the maximum. Darwin mentions an antler 30 inches in length with fifteen snags, and another with thirty-three, while Flower refers to 'a pair of antlers, weighing 74 lb., and with forty-five points.'

The male stags are distinguished by the possession of antlers, and are rather larger and stronger than the females. Their voice is also stronger, for they bellow very loudly when enraged or when challenging their rivals. The combats are very fierce, and sometimes fatal even to both combatants, for their antlers sometimes interlock inextricably. In fighting, the projecting brow-tines form most effective weapons. The breeding season is in September or October, but the young are not born till the end of May or the beginning of June. As in most species of *Cervus* they are first slightly spotted with white. In the first year the young male has only a hint of antlers, in the second year

only small unbranched beams; thereafter a tine is gained each year. Nearly allied is the North American Wapiti (*C. canadensis*), and there are closely related species or varieties in Persia, Kashmir, and Tibet. Scottish red deer—the poorest breed in Europe, as the animal is naturally a woodland deer—have of late been successfully crossed with Canadian and Asiatic Wapiti.

See DEER, DEER FORESTS, STAG-HOUND; *Red Deer*, by Jefferies (1884); *The Red Deer*, by Macpherson and others (1896); and Winans, *Deer-breeding for Time Heads* (1913).

Redditch, a town on the borders of Worcester and Warwick shires, on an acclivity 13 miles SSW. of Birmingham, makes needles, pins, fish-hooks, fishing-tackle, motor-cycles, cycles, and springs. Pop. (1851) 4302; (1911) 15,463; (1921) 16,231.

Reddle, RADDLE, or RED CHALK (Scot. *keel*), an impure peroxide of iron (ferric oxide) associated with very variable proportions of clay or chalk, or sometimes other substances. It varies greatly too in hardness, some kinds being difficult to crush and others quite soft. In colour it passes from a pale brick-red to a tint occasionally nearly as bright as vermilion. It is found in many places abroad, and in England in Somersetshire, the Forest of Dean, at Wastwater in Cumberland, and, of a quality valuable for polishing optical glasses, near Rotherham in Yorkshire. Some kinds of it are used for marking sheep, others for carpenters' and masons' pencils, and the finer qualities for artists' crayons. Red ochre is one of the varieties.

Red Earth, the name given to the reddish loam or earth which so frequently occurs in regions composed of limestones. This earth is the insoluble residue of those portions of the calcareous rock which have been dissolved by rain. Such red earths are of common occurrence in limestone caverns. See CAVE.

Redemptionists, one of the names of an order of monks devoted to the redemption of Christian captives from slavery. They are more frequently called Trinitarians (q.v.).

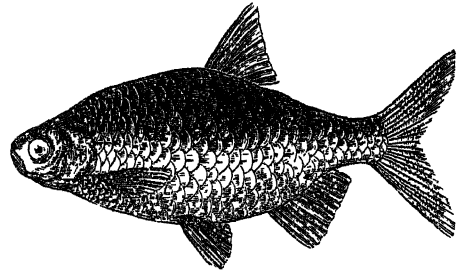
Redemptorists, called also LIGUORIANS, a congregation founded by St Alfonso Liguori (q.v.).

Redesdale, the valley of the river Reed in Northumberland, extending almost from the Scottish border in a south-easterly direction for over 16 miles, until it opens up into the valley of the Tyne, the river joining the North Tyne at Reedsmouth. It is for miles a mere mountain vale, sloping upwards into bleak and dreary moorland, but it has a quiet beauty of its own that is not easily forgotten by the traveller. The river springs out of the Cheviot Hills, which lie athwart the head of the dale, and down its course from Carter Toll on the border lay one of the chief roads into England. Dere Street traverses it. Near the southern end of Redesdale is the famous field of Otterburn (q.v.), but 16 miles from the border, which point again is but 10 miles from Jedburgh. The men of Redesdale of old were brave and turbulent, and bore more than their share in Border feuds and forays.

Redeswire, RAID OF THE, a battle fought 7th July 1575 close to the English border at the pass leading across the Cheviots into Redesdale. A party of Scots was being beaten back and on the point of utter rout, when the provost and townsmen of Jedburgh arrived hot from the 10 miles' march, and at once set on the enemy. The Englishmen were soon completely defeated, with the loss of several considerable prisoners. There is a prosy ballad on the subject in Scott's *Border Minstrelsy*.

Red-eye, or RUDD (*Scardinius erythrophthalmus*), a fresh-water fish related to the Roach (q.v.), with which it may hybridise. It is common in

England and Ireland in lakes, slow rivers, and fens; and extends through Europe to Siberia. It



Red-eye or Rudd (*Scardinius erythrophthalmus*).

has a general coppery colour, with red fins and red iris, and may attain a length of 18 inches. Its flesh is not of much account.

Redgrave, RICHARD, painter, born in London on 30th April 1804, in 1826 was admitted a student of the Academy, and was elected an A.R.A. in 1840, an R.A. in 1851. From 1847 onwards he took a prominent part in art instruction, and in 1857 was appointed Inspector-general of Art Schools, which office, with that of Surveyor of the Royal Pictures, he resigned in 1880. In 1883 he ceased to exhibit. He wrote, with his brother, *A Century of English Painters* (1866), and edited several valuable catalogues. He died 14th December 1888. See *Memoir* by his daughter (1891).

Red-letter Days. See BLACK LETTER.

Redmond, JOHN EDWARD, Irish politician, was born, of an old Catholic family of Wexford, at Dublin in 1857. He was educated at Clongowes Jesuit College, Trinity College, and King's Inn, Dublin, but in 1879 his father, member of parliament for Ballytrent, obtained for him a post as clerk in the vote office of the House of Commons. Two years later he entered parliament as the member for New Ross, becoming in 1885 member for N. Wexford, and in 1891 for Waterford. In the same year he assumed the leadership of the Parnellite party, and in 1900 that of the united Nationalist party. Until his death in London, 6th March 1918, he laboured unceasingly in the cause of Home Rule. See IRELAND (*History*), and books by W. B. Wells (1919) and S. Gwynn (1919).

Redoubt. See FORTIFICATION.

Redout Kalé, a fortified post on the Black Sea coast of Georgia, is in a marshy region, about 10 miles N. of Poti. It was the chief shipping-place for Circassian girls to Turkey, and was captured by the British fleet in 1854.

Redpoll. See LINNET.

Red River, the lowest western branch of the Mississippi, rises near the eastern border of New Mexico, flows eastward through Texas, forming the entire southern boundary of Oklahoma, thence south-east through Arkansas and Louisiana, and enters the Mississippi below 31° N. lat. It is 1600 miles long, and receives numerous branches, the Washita (Quachita) the most important. It is navigable for seven months to Shreveport (350 miles). A few miles above was formed the Great Raft, of driftwood, which blocked up the river.

Red River of the North, a navigable river of the United States and Canada, rises in Elbow Lake, Minnesota, near the sources of the Mississippi, and flows south and west to Breckinridge, then north, forming the boundary between Minnesota and North Dakota, and so into Manitoba and through a flat country to Lake Winnipeg. Its course is 665 miles (525 in the United States). The

Red River Settlement was the origin of Manitoba (q.v.). For the Red River Expedition, see CANADA and RIEL.

Red Root (*Ceanothus*), a genus of shrubs of the family Rhamnaceæ. The common Red Root of North America (*C. americanus*), which abounds from Canada to Florida, is a shrub of two to four feet high, with beautiful thyrsi of numerous small white flowers. *New Jersey Tea* is an infusion of its leaves, or of those of *C. ovatus* (Canada to Texas). A Mexican species (*C. azureus*) has blue flowers, and a Californian kind (*C. thyrsiflorus*) is used for evergreen hedges.

Redruth, a town of Cornwall, on a hillside (414 feet) in the centre of a great mining-district, 9 miles by rail W. by S. of Truro. It has a town-hall (1850), public rooms (1861), &c. William Murdock (q.v.) here in 1792 first used gas for lighting purposes. Pop. 10,000.

Red Sea. The Red Sea is an arm of the Indian Ocean, running north-north-west from the Gulf of Aden, with which it communicates by the Strait of Bab-el-Mandeb, 13½ miles across. Its length is about 1200 miles, and its width in the central portion is between 100 and 200 miles, the greatest breadth being about 250 miles; it narrows towards the southern entrance, while in the north it is divided by the peninsula of Sinai into two gulfs, the Gulf of Suez, 170 miles long by 30 miles wide, and the Gulf of Akaba, 100 miles in length.

The Arabian coasts of the Red Sea are usually narrow sandy plains backed by ranges of barren mountains; the African coasts towards the north are flat and sandy, but farther south high tablelands rise some distance inland, culminating still farther south in the lofty mountains of Abyssinia. A marked feature in the configuration of the Red Sea is found in the large existing and upraised coral-reefs running parallel to both the eastern and western shores, those to the east being more extensive and farther from the coast than those to the west; the most important are the Farisan Archipelago in the eastern reef, and the large island of Dahlak, lying off Annesley Bay, in the western reef. In addition to the islands of organic formation mention may be made of the volcanic group lying in 14° N. lat., the largest of which, Jebel Zuger, is 10 miles long, 7 miles wide, and 2074 feet in height; farther north, on the islet of Jebel Teir is a volcano not very long extinct. A dangerous reef, the Dædalus, lies directly in the path of steamers in 24½° N. lat., and a lighthouse has been placed on it. The principal harbours are Mocha, Hodeida, Lokeyyah, Jiddah, and Yenbo on the Arabian coast, Massaua, Suakin, El Kosseir, and Port Sudan on the African coast.

In ancient times the Red Sea was used as a means of communication by the Phœnicians and other maritime peoples, until the discovery of the route round the Cape of Good Hope diverted the traffic into another channel, only to be revived, however, on a much more extensive scale with the construction of the Suez Canal.

The tides are very variable, depending largely on the direction and force of the winds, which also to a great extent determine the direction and velocity of the surface currents. The hot climate is due to the almost cloudless sky, and consequent want of rain, the altitude of the sun, and the absence of rivers. The mean temperature of the air generally ranges between 70° and 94° F. during the day, though readings of over 100° are often registered in the shade; but during the night the temperature may fall to the freezing-point, owing to radiation in the clear atmosphere. The prevailing wind on shore is north-north-west almost universally, but from October to May south-south-east

winds prevail over the southern portions of the sea, a belt of calms and variable winds occurring in the central regions, while in the northern portions the usual north-north-west winds are met with. Evaporation is very great, and the air over the water is always very moist in the summer; hurricanes are unusual, but rain-squalls frequently occur with the southerly winds, and moderate gales and sandstorms, called 'dragons' in the popular language of the Arabs, are not uncommon.

The mean temperature of the surface water in the Red Sea varies at the northern end between about 65° and 79° F., in the central regions between 75° and 86°, and at the southern end between 78° and 89°; readings of over 100° have been recorded at the south end of the sea. The temperature of the water below the surface decreases down to a depth of about 200 fathoms, from whence down to the bottom a mean temperature of about 71° is found all the year round; this agrees with the temperature conditions prevailing in the enclosed seas of the East Indies, for instance, according to the observations made on board the *Challenger*, the depth at which the minimum temperature occurs (i.e. 200 fathoms in the Red Sea) indicating the depth of water over the barrier separating the Sea from the open ocean. In winter, in the northern part, the whole body of water from surface to bottom usually has a mean temperature of 71°.

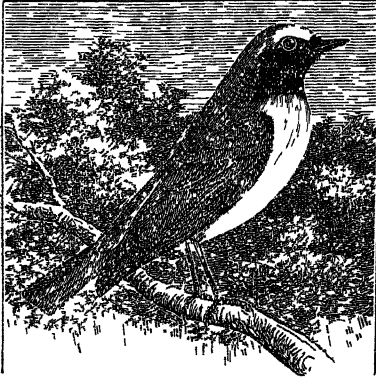
The salinity of the water is almost constant at about 1.030 (ordinary ocean water is about 1.026), and this is due to the fact that no rivers flow into it, little rain falls, and the evaporation is excessive. It has been estimated that, were the Red Sea entirely enclosed, it would become a solid mass of salt in less than two thousand years, but this is prevented by an inflow of water through the Strait of Bab-el-Mandeb, and it is also known that a current of very salt water flows out underneath the incoming surface current.

The greatest depth in the Red Sea is about 1200 fathoms, and the mean depth of the whole area about 375 fathoms. From the point of greatest depth, which is near the centre, the bottom rises towards each end. Owing to the absence of rivers the deposits approach in character those formed in the open ocean, being largely composed of Foraminifera, Pteropods, and other pelagic shells. The marine fauna and flora are extensive; a migration of the Red Sea and Mediterranean faunæ is taking place along the Suez Canal. The origin of the name—the Lat. *Mare Rubrum* and the Gr. *Erythra Thalassa*—is much disputed.

Redshank. See SANDPIPER.

Redstart (*Ruticilla phœnicurus*), a bird of the family Sylviidæ, ranging in Europe from the North Cape to the wooded regions of central and southern Europe; in Asia to the valley of the Yenesei in summer, and to Palestine, Arabia, and Persia in winter; in Africa from the Canaries and Madeira and Senegal to Abyssinia in winter. In Great Britain it is a summer visitor to most parts, though unaccountably absent from some; in Ireland it has been very seldom recorded, but since the summer of 1885 it has nested annually at Power's Court, County Wicklow. The male is about 5½ inches long, has the head, back, and wing-coverts slate-gray; the forehead and eye-streak white; chin, throat, and cheeks jet black; wings brown, with pale outer edges; the tail and upper tail-coverts bright rufous chestnut; the rest of the under parts buff; bill black; legs and feet brown. The female has the upper parts grayish brown, under parts lighter, the tail less brilliant, and no bright colours on the head. The redstart is a bird of lively manners. Its food consists of flies, gnats, small butterflies, and other insects; the young are fed

largely on caterpillars. The nest is built of moss and dry grass, lined with hair and feathers, in holes in trees or walls; the eggs are usually six in number, and of a light blue colour. The song is slight, but soft and melodious; the alarm note is a plaintive *whet*. In some parts of the country this bird is called the 'Fire-tail,' *start* being derived from the Old English *steort*, 'tail.' The Black



Redstart (*Ruticilla phoeniceus*).

Redstart (*R. titys*) is now a well-known visitor to many parts of the English coasts, especially of Devon and Cornwall, in autumn and winter, and also to the east and south coasts of Ireland. It is more rare in Scotland, but it has been found as far north as the Pentland Skerries. It has been recorded in Iceland, the Faeroes, southern Scandinavia, and Denmark. From Holland southwards it is abundant in spring. Its home is in southern Europe and Northern Africa, whence it ranges eastwards to the Ural Mountains, Palestine, and Nubia. Other species of redstart are found, one (*R. mesoleuca*) in Cyprus, Asia Minor, and Persia; another (the Indian Redstart, *R. rufiventris*) from Lebanon eastward; and a third (*R. ochrurus*) in the Caucasus and Armenia.

Red Water. See BLACK WATER.

Red Water (*Piroplasmiasis*), a cattle disease known on the Continent as *Hæmoglobinæmia* or *Hæmoglobinuria*, in the United States as Texas Fever, in South America as *Tristeza* or Bovine Malaria, in Australia as Tick Fever. It was first scientifically studied in the United States by Smith and Kilborne from 1889 to 1892. They found it was due to a somewhat pear-shaped parasite found in the red blood corpuscles, generally in pairs, hence they called it the *Piroplasma bigeminum*. It is not a contagious disease in the ordinary sense of the word, but is only communicated from animal to animal by the bites of ticks. It is much more fatal to adult cattle than to young animals; and in countries, or even districts, where it is indigenous and prevalent, the calves grow up practically immune to it. But there is great risk in introducing cattle from a country where it is not known to a Red Water country or district. Hence the danger of sending cattle from Britain to South Africa, even as far north as Rhodesia. Animals can be rendered almost immune by inoculation.

Redwing (*Turdus iliacus*), a species of Thrush (q.v.), well known in Britain as a winter bird of passage. It spends the summer in the northern parts of Europe and Asia; it occurs in Iceland, and straggles even to Greenland: its winter range extends to the Mediterranean, Persia, Northern India, and Siberia as far as Lake Baikal. In size it is somewhat smaller than the song-thrush or

mavis. Its flight is remarkably rapid. The general colour is a rich clove-brown on the head, upper parts of the body, and tail; the wing-feathers darker, but with lighter external edges; the lower parts mostly whitish, tinged and streaked with



Redwing (*Turdus iliacus*).

brown; the under wing-coverts and axillary feathers bright reddish orange. The redwing arrives in Britain rather earlier than the Fieldfare (q.v.), and, like it, congregates in large flocks, but is less numerous and less gregarious. Its food consists of insects, small snails, and berries. It has an exquisite, clear, flute-like song, which it pours forth from the summit of a high tree, gladdening the woods of the north.

Redwood. See PINE, SANDALWOOD. The Redwood of Australia is *Eucalyptus transcontinentalis*, one of the chief tannin-bearing species, common in the Western Australian goldfields.

Ree, LOUGH, a lake in the centre of Ireland, between Connought and Leinster, is an expansion of the river Shannon (q.v.)

Reed, the common English name of certain tall grasses, growing in moist or marshy places, and having a very hard or almost woody culm. The Common Reed (*Phragmites communis*, formerly *Arundo Phragmites*) is abundant in Britain and continental Europe, in wet meadows and stagnant waters, and by the banks of rivers and ditches. It grows chiefly in rich alluvial soils. The culms are 5 to 10 feet high (the variety *P. c. pseudodonax* reaches 33 feet near Luckau in Lusatia), and bear at the top a large, much-branched panicle, of a reddish-brown or yellowish colour, having a shining appearance, from numerous long silky hairs which spring from the base of the spikelets. The two outer glumes are very unequal; and the spikelet contains 3 to 4 perfect florets, with a barren one at the base. The culms are used for making garden-screens, for light fences, for thatching, for making a frame-work to be covered with clay in partitions and floors, &c. So useful are reeds in these ways, and particularly for thatching, that it is found profitable in some places to plant them in old clay-pits. Probably they might be planted with advantage in many peat-mosses where they are now unknown. The plant is not very common in Scotland; but in the fenny districts of the east of England it covers large tracts called *reed-ronds*, and similar tracts occur in many parts of Europe. Nearly allied to this is *Arundo Donax*, plentiful in the south of Europe. It is 6 to 12 feet high, and has very thick, hollow, woody culms, and a purplish-yellow panicle, silvery and shining from silky hairs. The woody stems are an article of commerce, and are used for reeds of clarionets, mouth-pieces of oboes, &c., walking-sticks and fishing-rods. (See also WRITING.) The creeping roots contain much farina and some sugar. Of

Arundo Karka (called *Sur* in Sind) the flower-stalks are very fibrous; and the fibres, being partially separated by beating, are twisted into twine and ropes. The Sea Reed is *Ammophila*—or *Psamma*—*arundinacea*.

Reed, in Music, the sounding part of several instruments, such as the clarinet, bassoon, oboe, saxophone, and bagpipe, so called from its being made from the outer layer of a reed (*Arundo Donax*) found in the south of Europe. The name is also applied to the speaking part of the organ, though made of metal. Reeds are generally divided into two kinds—the *beating* reed, used in the organ, clarinet, &c., requiring to be placed within a tube to produce a musical sound, and the *free* reed, used in instruments of the harmonium and concertina kind. The Organ (q.v.) reed (fig. 1) consists of a metal tube, *a*, with the front part cut away and having a metal (brass, German silver, or steel) tongue, *b*, covering the orifice, attached at the upper end, and bent forward at the lower end to permit of vibration. The admission of a current of air to the outer tube causes the tongue to vibrate against the edge of the opening in the tube *a*, producing a musical note, the pitch of which is determined by the length of the free end of the reed;

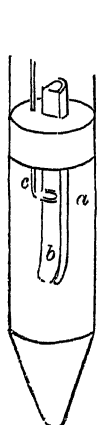


Fig. 1.

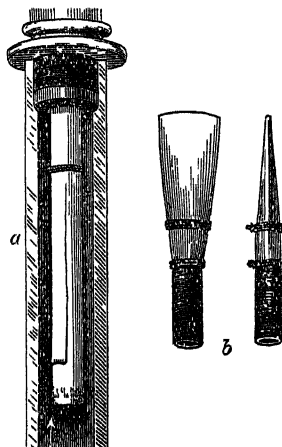


Fig. 2.

this is regulated by a strong movable spring, *c*, pressing against it, the quality of the sound depending on the length and form of the outer tube. In the Clarinet (q.v.) reed the mouth forms the outer tube. The reed in the drone of the bagpipe is on the same principle as the organ reed, and is made of a piece of reed tube a few inches long, cut across a knot at one end so as to make a stop. A slit is cut in it with a knife to make the tongue. It is shown in fig. 2, *a*, *in situ*, the outer tube being shown in section, the air enters from the

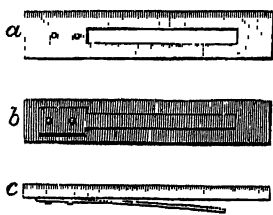


Fig. 3.

or without the aid of a metal pipe, to fit the end of the instrument, and thinned away at the other

end, where the two meet with a little space between them in the centre. The air being blown into the thin end causes the two reeds to vibrate against one another. The free reed, shown in fig. 3, consists of a metal tongue, *b* and *c*, fixed at one end to a metal plate, *a*, having an elongated slot large enough to allow the free end of the tongue to vibrate through it on the admission of a current of air; and this vibration forms the note, the pitch of which is regulated by the length of the reed.

Reed Bird, Reed Mace, Reed Warbler. See BOB-O-LINK, BULRUSH, WARBLER.

Reel, a lively dance, popular in Scotland, which may be danced by two couples, but admits a greater number. The music is in general written in common time of four crotchets in a measure, but sometimes in jig time of six quavers.

Rees, ABRAHAM (1743-1825), a native of Montgomeryshire, and Unitarian minister for forty years at the Old Jewry, London, re-edited the *Encyclopædia* (q.v.) of Ephraim Chambers (1778, 1781), and compiled one of his own (1802-1820).

Reeve (O.E. *gerefa*), an old English magistrate; thus there were *borough-reeves*, *port-reeves*, &c. The Sheriff (q.v.) is the *shire reeve*. The reeve in Chaucer is the Scottish *grieve* or land-steward.

Reeve, CLARA, novelist, daughter of the rector of Freston in Suffolk, was born at Ipswich in 1729, lived a quiet life, and died unmarried, 3d December 1807. She translated Barclay's *Argenis* (1772), and in 1777 published the *Champion of Virtue*, a *Gothic Story*, renamed next year *The Old English Baron*, avowedly an imitation of Walpole's *Castle of Otranto*. She produced four other novels, and *The Progress of Romance* (1785).

Reeve, HENRY, C.B. (1813-95), was born at Norwich, and educated there and on the Continent, where he formed many acquaintances with French men of letters. He was registrar to the Privy Council (1843-87), and editor of the *Edinburgh Review* (from 1855), and edited the *Greville Memoirs* (1875, 1885, 1887).

Reeves, JOHN SIMS (1818-1900), born at Shooter's Hill, Kent, appeared in public as a baritone at Newcastle in 1839, and acquired fresh fame, but as a tenor, in London. He studied at Paris (1843), sang at Milan, and was recognised as the first English tenor. Leaving the operatic stage (after 1860) he became popular as a ballad-singer at concerts and in oratorio. See his own *My Jubilee* (1889), and the *Lives by Sutherland Edwards and Pearce*.

Referendum. See INITIATIVE AND REFERENDUM.

Reflection. A surface on which a beam of light falls may be either rough or smooth. If it be rough, the greater part of the incident light is irregularly scattered by the innumerable surface-facets, so as to be reflected or dispersed in all directions; if it be smooth, a proportion (but never the whole) of the incident light is regularly reflected or turned back in definite paths. A smooth, dustless mirror is not visible to an eye outside the track of rays reflected from it. If the polished surface be that of a transparent substance (e.g. glass) optically denser than the medium conveying the light to it, comparatively little light is reflected; but the more oblique the incidence, the smoother the polish, and the greater the difference between the optical density of the glass and that of the medium in which it is immersed, the greater the proportion reflected. Thus less light is reflected from glass

under water than from glass in air; and conversely, if the light travel in the denser medium and strike the bounding surface between it and a rarer medium—as where light ascending through water strikes its upper free surface—it will, if its obliquity of incidence exceed a certain limit, be almost totally reflected; the small loss that ensues arising wholly from absorption, while no light is transmitted into the air above. This may be shown by holding a clear tumbler of water above the head: the image of objects beneath is seen reflected in a bright mirror surface; and a phenomenon of the same order is seen on thrusting a test-tube containing air below the surface of water, when it will appear to have a lustre like quicksilver. If the reflecting surface be that of an opaque body the bulk of the incident light is reflected, a percentage being lost by absorption. What has been said about light applies equally to ether-undulations of all kinds, and therefore the theory of reflection has general reference to radiant heat, light, actinic radiation, and electro-magnetic undulations (see MAGNETISM). Reflection arises in all cases from a difference in the transmissibility of ether-disturbances on the two sides of the bounding surface.

On reflection from polished surfaces we have, so far as regards the directions of the reflected rays, the following laws observed: (1) The incident 'ray,' the normal (i.e. a line drawn perpendicular) to the surface at the point of incidence, and the reflected 'ray' all lie in one plane, the 'plane of incidence;' and (2) the angle of incidence (the angle which the incident 'ray' makes with the normal to the reflecting surface) is equal to the angle of reflection (the corresponding angle between the normal and the reflected 'ray'). These laws apply equally to ether-waves of all lengths, and therefore to light of all colours; and they also hold good whatever be the shape of the surface. If the surface be plane their application is simple; and if the surface be curved we have, in effect, to consider the curved surface as made up of indefinitely small facets, to each of which the above laws can be applied. The geometrical consequences of these laws make up what used to be called Catoptrics, that part of geometrical optics which deals with reflection; and this coincides in its propositions with that part of kinematics which gives an account of the reflection of waves. Here the ether-waves (using the term 'waves' in its most general sense) are assumed to travel through optically homogeneous media, and can consequently be traced out by imaginary lines drawn at right angles to the wave fronts or along the directions pursued by the waves, these imaginary lines being called 'rays.'

Plane Reflecting Surfaces.—(1) Rays which are parallel to one another before striking a plane reflecting surface are parallel after reflection. (2) If light diverging from or converging towards a point, Q , be reflected from a plane mirror, it will appear after reflection to diverge from or converge towards a point, q , situated on the opposite side of the mirror and at an equal distance from it. In fig. 1, the rays diverge from Q ; after reflection they appear to diverge from q . If, on the other hand, the course of the light is such that the rays appear before reflection to converge upon Q , they will after reflection actually pass through Q . (3) A consequence of the preceding proposition is that when an object is placed before

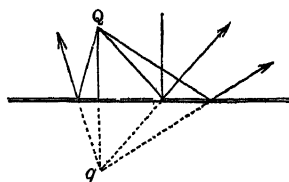


Fig. 1.

a plane mirror the virtual image is of the same form and magnitude as the object, and at an equal distance from the mirror on the other side of it. The right hand of the image, taken as looking towards the mirror, is necessarily opposite to the left hand of the object; so that no one ever

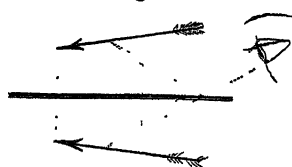


Fig. 2.

sees himself in a single plane mirror as others see him or as a photograph shows him, but he sees all his features reversed. (4) When two mirrors are placed parallel to one another, light from an object between them is reflected back and fore, so as to appear on each occasion of reflection as if it came from images more and more remote from the mirrors. On each occasion the course of the rays of light is the same as if the virtual image behind the mirror had been a real object; and a new virtual image is produced, apparently as far behind the reflecting mirror as the virtual object had been in front of it. Thus, in fig. 3, where AB and CD are mirrors, the distance $Q \cdot CD = CD \cdot q1$; $q1 \cdot AB = AB \cdot q2$; and so on indefinitely; and also $Q \cdot AB = AB \cdot q'$; $q' \cdot CD = CD \cdot q''$; and so on indefinitely; so that if the mirrors were perfectly plane and parallel, and if they reflected all the light

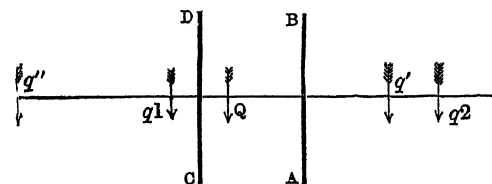


Fig. 3.

which fell on them, an observer between the mirrors would see in this experiment (which is called the endless gallery) an indefinite number of images. A variation of this experiment, carried out with mirrors not parallel to one another, but inclined at an angle which is some aliquot part of 360° , gives the principle of the Kaleidoscope (q.v.).

(5) When a beam of light is reflected from a mirror and the mirror is turned through a given angle the reflected beam is swept through an angle twice as great. This principle is utilised in the construction of many scientific instruments, in which the reflected beam of light serves as a weightless pointer, and enables us to measure the deflection of the object which carries the mirror. (6) When a beam of light is reflected at each of two mirrors inclined at a given angle the ultimate deviation of the beam is (if the whole path of the light be within one plane) equal to twice the angle between the mirrors; for example, in fig. 4, the angle SDB , which measures the ultimate deviation of the original beam SA , is easily proved equal to twice the angle BCA between the two mirrors. This proposition is applied in the Quadrant (q.v.) and Sextant (q.v.). (7) When a wave of any form is reflected at a plane surface it retains after reflection the form which it would

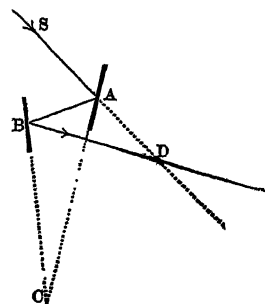


Fig. 4.

on the other hand, the course of the light is such that the rays appear before reflection to converge upon Q , they will after reflection actually pass through Q . (3) A consequence of the preceding proposition is that when an object is placed before

When a wave of any form is reflected at a plane surface it retains after reflection the form which it would

have assumed but for the reflection, this form being, however, guided by reflection into a different direction.

Curved Reflecting Surfaces.—In these we have to trace out the mode of reflection of incident rays from each 'element' or little bit of the reflecting surface; and this leads, through geometrical working, to such propositions as the following: (1) Parallel rays, SP , travelling parallel to the axis of a concave paraboloid mirror (fig. 5) are made to converge so as all actually to pass accurately through F , the geometrical focus of the paraboloid; and, conversely, if the source of light be at F , the rays reflected from the mirror emerge parallel to one another—a proposition of great utility in lighthouse work, search-lights, &c. (2) If the paraboloid mirror be convex, parallel incident rays have, after reflection, the same course as if they had come from the geometrical focus of the paraboloid. (3) In a concave ellipsoid mirror, light diverging from one 'focus' of the ellipsoid is reflected so as to converge upon the other 'focus' of the curved surface; and by a convex ellipsoidal mirror light converging towards the one focus is made to diverge as if it had come directly from the other focus. (4) In a hyperboloid reflector the two geometrical foci have properties corresponding to those of the ellipsoid. (5) In spherical reflectors, which are those most easily made, there is no accurate focus except for rays proceeding from the centre and returning to it. When parallel rays are incident on a concave spherical mirror we see from fig. 6 that if they be parallel to the axis of the mirror each ray is made to pass after reflection through a point, q , which is nearer to F (a point midway between the mirror and its centre, O) the narrower is the pencil of rays. If, therefore, the pencil of rays be very narrow in comparison with the radius, OA , the rays will after reflection approximately converge upon F , which is called the principal focus of the mirror; and the principal focal distance, $AF = \frac{1}{2}AO = \frac{1}{2}r$, where r is the radius of the spherical mirror. The farther any ray is from the axis AO , the

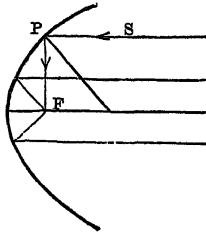


Fig. 5.

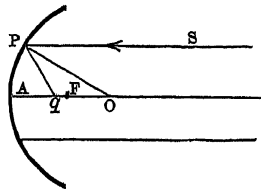


Fig. 6.

farther any ray is from the axis AO , the farther from F is the point, q , to which that ray is reflected; and the difference, Fq , is called the longitudinal aberration for that ray. The reflected rays from the various parts of the mirror form by their intersection a Caustic (q.v.), the apex or cusp of which is at F . If, instead of using a parallel beam of incident light, we have light coming from a point at a definite distance along the axis, we find (see fig. 7) first that any ray from Q to A travels back along AO , whence the focus of reflection is somewhere in the line AOQ ; and that any ray, QP , is reflected to a point, q , such that the angle $QPO = qPO$; and

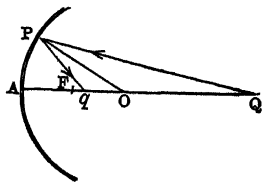


Fig. 7.

therefore (since by Euclid, vi. 3, $QO : qO :: QP : qP$) if the pencil be relatively very narrow, so that QP comes to be equal to QA , and qP to qA , we have $QO : qO :: QA : qA$. This proportion reduces to the equation $1/Aq + 1/AQ = 2/AO$; whence we can readily find Aq when AQ and AO are known. Thus, if, for example, the radius of curvature AO be 12 inches (the principal focal length being then 6 inches), and if Q be 30 inches from A , we have $1/Aq + 1/30 = 2/12$; whence $1/Aq = 8/60$ and $Aq = 7\frac{1}{2}$ inches. The same formula may be written $1/d + 1/d' = 1/f$, where d and d' are the distances from A of the two 'conjugate' foci, q and Q , and f is the principal focal length. The two 'conjugate' foci are reciprocal; if light start from q it will be reflected to Q . As Q , the source of light, approaches O , q also approaches O ; when Q is at O , q also is at O ; as Q continues to move towards F , q moves out more and more rapidly beyond O ; when Q is at F , q is at an infinite distance, or the reflected rays are parallel; when Q is between F and A the reflected rays are divergent, as if from a virtual focus on the opposite side of A . If the mirror be convex, fig. 8 shows that AO and AQ have, with respect to the reflecting surface, opposite signs; so also have AO and AQ ; so the equation

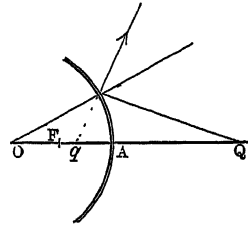


Fig. 8.

above becomes $1/Aq + 1/AQ = -1/AO$; whence, taking the same numbers as before, Aq is equal to -5 inches; a virtual image, seeming to come from a point 5 inches on the other side of the reflecting surface.

In the foregoing it has been assumed not only that light is propagated with equal velocities in all directions, but also that the mirror itself is at rest. The guiding principle is then Huyghens's Principle. Assume a plane wave-front to strike a plane mirror obliquely; the different elements of the plane wave-front impinge upon the plane mirror at successive instants of time. Consider the instant t at which the wave-front has come to encounter a more remote point of the mirror; at that point and that instant reflection is merely beginning; but at that same instant reflected light must have already travelled in space from an earlier reflection point as far as somewhere on the surface of a sphere whose centre is the earlier reflection point and whose radius depends on the interval of time involved in the expression 'earlier.' Consider an array of such earlier reflection points, each with its own time-interval, and its own smaller or larger sphere; the aggregate result will be that the light will, at the instant t , have reached a reflected plane wave-front the direction of whose propagation (the 'reflected ray') follows the fundamental laws (1) and (2) above. If, however, the mirror be itself *in motion*, the centres of the respective spheres are progressively displaced in space and the geometry of the construction is distorted; we still have a reflected plane wave-front which follows law (1), and we still have an 'angle of reflection,' but law (2) is departed from and replaced by a much more complicated expression.

As to the quality of the light reflected there are some peculiarities to be observed. From the surface of a transparent body, of greater optical density than the surrounding medium, light polarised in the plane of incidence and reflection is more largely reflected at oblique incidences than light polarised at right angles to that plane; when the angle of incidence is such that the

reflected and refracted rays tend to be at right angles to one another, the whole of the light reflected is polarised in the plane of incidence and reflection; and if light polarised at right angles to that plane be made to fall upon glass at the particular angle of incidence just referred to, it will not be reflected at all, but will wholly enter the glass. Plane-polarised light polarised in any other plane than that of incidence or one at right angles to it, is, after total reflection in glass, found to be elliptically polarised (see POLARISATION); and this phenomenon is always presented in reflection from metals. In the case of electro-magnetic radiation (see MAGNETISM) theory and practice concur in indicating that conductors are good while non-conductors are bad reflectors; and the same general proposition holds good with reference to those more frequent but otherwise similar ether-oscillations to which the phenomena of Radiant Heat, Light, and Actinism are due.

Reflex Action. See NERVOUS SYSTEM.

Reform is a comprehensive name for those changes in the law by which the House of Commons has been made a more truly representative body. In the 18th century only freeholders voted in English county elections; in many boroughs the franchise was restricted to members of the corporation; boroughs of this class were usually under the influence of the crown or of some wealthy individual who regarded them as a part of his property. In 1745 Sir F. Dashwood moved an amendment to the address, claiming for the people the right to be freely and fairly represented; in 1766 Lord Chatham took up the cause of Reform; Wilkes proposed an excellent scheme of redistribution in 1776; in 1780 the Duke of Richmond proposed annual parliaments, universal suffrage, and equal electoral districts; but his plan met with no support. Pitt entered public life as an avowed reformer, and in 1785 he introduced a measure of redistribution; the part of his scheme most open to objection was the proposal to compensate owners of rotten boroughs. His bill was rejected, and he dropped the subject. The king was opposed to change, and in the public mind reform came to be identified with the revolutionary opinions which were beginning to prevail in France. Fox kept alive the demand for a wider franchise and a better distribution of power. Lord J. Russell's first motion on the subject was proposed in 1820, and in 1830 he accepted office under Lord Grey. A Reform Bill was brought in, and the second reading was carried by a majority of one. A subsequent defeat in committee compelled the government to dissolve. The country declared unmistakably for Lord Grey; his second Reform Bill was passed in the Commons by a large majority. It was rejected by the Lords, and the same fate would have befallen a third bill introduced in 1832, but the resistance of the Lords was overcome by the threat to create as many new peers as might be necessary to pass the bill. After something like a century of discussion the first Reform Act received the royal assent. The greater part of the labouring classes were still unenfranchised; the Radical reformers were still unsatisfied; but the Whigs and Tories were unwilling to disturb the settlement of 1832. Agitation was stimulated by the so-called People's Charter put forth in 1838; but it was not till 1852 that Lord J. Russell reopened the question of Reform. Successive governments continued to bring in abortive schemes, until at last in 1867 Lord Derby and Disraeli succeeded in passing the act by which household and lodger franchises were extended to the boroughs. In 1884 Gladstone proposed to assimilate the franchise in counties to that which had been given to the boroughs; but the Lords refused to pass any bill for extending the

franchise until the details of the government scheme of redistribution were before them. The bill was reintroduced in autumn, and the question at issue between the two Houses was settled by a compromise. The government agreed not only to communicate their plan of redistribution to the leaders of the opposition, but to settle the details by mutual arrangement; Lord Salisbury and Sir S. Northcote attended meetings of the cabinet, and conferred with ministers. The results were embodied in bills which were passed into law before the general election of 1885. The Representation of the People Act (1918), besides redistributing seats on the basis of one member for every 70,000 of the population (43,000 in Ireland by another act), enfranchised all men of twenty-one years not specially incapacitated, who were qualified by residence or by occupation of business premises of £10 yearly value; and all women of thirty years who were, or whose husbands were, so qualified. The lodger franchise (for furnished rooms) was abolished.

At the end of the reign of George III. there were, in a population of 22,000,000, only 440,000 voters. The Reform Bill of 1832 added less than 500,000; the reform of 1867-68 increased the electorate from 1,136,000 to 2,448,000. At the passing of the measures of 1884-85 the electorate had by natural growth risen to about 3,000,000; the Act of 1884 added 2,000,000 voters. In 1918 the number was raised from about 8,350,000 to 21,370,000.

See PARLIAMENT, REPRESENTATION, CHARTISM, GLADSTONE, GREY (EARL), RUSSELL; May's *Constitutional History*; Butler's *Passing of the Great Reform Bill* (1914); and the speeches of Gladstone, Bright, Disraeli, &c.

Reformation. The religious revolution of the 16th century, known as the Reformation, is the greatest event in the history of civilisation since Paganism gave place to Christianity as the faith of the leading nations of the world. It marks the supreme importance of this revolution that the age which preceded and the age which followed it belong to two different phases of the human spirit. With the Reformation begins what is distinctively known as *Modern Europe*, while the epoch that preceded it bears the equally distinctive designation of the *Middle Ages*. As a revolution in which all the countries of western Europe were more or less directly involved, the subject of the Reformation has necessarily been treated in the different accounts of these countries. In the articles on Luther, Charles V., Henry VIII., Calvin, Knox, and others further details will be found regarding the aims and methods of the revolution in the various countries where it declared itself. Here, therefore, it will be sufficient to indicate briefly the general causes which produced it, the special course and character it took among the different peoples, and its chief results for the human spirit at large.

The central fact of the Reformation was the detachment from papal Christianity of the nations distinguished by the general name of Protestant. By this severance an order of things came to an end under which Christian Europe had been content to exist from the close of the 8th century. From the year 800, when, by a mutual understanding of their respective functions, Charlemagne was crowned emperor of the Romans by Pope Leo III., western Europe had come to regard the papacy as the essential condition of individual and corporate life, as prime a necessity in human affairs as the sun in the course of nature. Thus conceived, the power of the church underlay all human relations. It was the consecration of the church that constituted the family; the church defined the relations of rulers and their subjects, and the church was the final court of appeal on the ultimate questions of human life and destiny.

In the nature of things such a power could never be realised as it was ideally conceived. Yet during the 11th and 12th centuries, the period when the power of the popes was most adequate to their claims, they undoubtedly went far to make the idea a reality. But the energies of the human spirit were bound sooner or later to issue in developments with which mediæval conceptions were fundamentally irreconcilable. By the 13th century, along every line of man's activity, there were already protests, conscious and unconscious, against the system typified in the pope at Rome.

The most remarkable of these protests was the order of ideas associated with the name of Joachim of Flora in Calabria (died 1202). Under the name of the 'Eternal Gospel' (used for the first time in 1234) these ideas ran a course which for a time seriously threatened the existence of the mediæval church. The new teaching struck at the very root of the papal system, for its essence was that the hour had come when a new dispensation, that of the Holy Spirit, should supersede the provisional gospel delivered by Christ. During the second half of the 13th and the first half of the 14th century the influence of these ideas is traceable in every country of Christendom, and it was only the unflinching action of the church that postponed its disintegration for other three centuries. The numerous sects which either sprang from or were quickened by this movement speak clearly to the revolutionary fever that had seized on men's spirits and was impelling them to other ideals than the traditions of Rome. Mainly the offspring of the third order of St Francis, these sects swarmed throughout every Christian country under the names of Beguins, Beghards, Fratricelli, Flagellants, Lollards, Apostolic Brethren, &c., and everywhere spread discontent with the existing church. Even John Knox (in answer to a letter by James Tyrie, a Scottish Jesuit) claims Joachim of Flora as an ally in the work which it was the labour of his own life to achieve—the ruin of the papacy, and the promotion of what he deemed a purer gospel.

Simultaneously with this manifestation of revolutionary feeling there were tendencies in the sphere of pure thought in essential antagonism to the teaching of the church. The labour of the thinkers of the middle ages was to reconcile faith, as inculcated by religious authority, with human reason as they found it embodied in the accessible writings of Aristotle. In the 13th century, however, the Arabic texts of Aristotle, and notably that of the great commentator Averroes, made their way into the Christian schools, and thenceforward a leaven of scepticism was a present element in all the universities of Europe. As the result of the teaching of Averroes, a name of the most sinister import to every true son of the church, materialism and pantheism became common creeds among thinkers, and the notion spread even among intelligent laymen that Christianity was not the absolute thing the church had taught them to believe. In Dante's (died 1321) fierce exclamation that the knife is the one reply to him who denies the immortality of the soul we have the outburst of a passionate faith in presence of a widespread libertinism of thought.

But the most serious menace against the integrity of the papal system lay in the political development of Europe during the last three centuries of the middle ages. As the countries of western Europe became more and more individualised, their peoples grew every year into a fuller consciousness of distinct national interests and national ideals. While this was the tendency of the various nations, the pope during these centuries gradually lost his position as the disinterested umpire of Europe, and sank into an Italian prince, with a temporal

policy of his own which led him to seek allies among other potentates as they fell in with his own special ends of the moment. But such alliances naturally gave offence to the princes excluded from them, and led to a suspicious discontent with the Roman see, which, as was afterwards proved in the case of England, needed only the requisite occasion to flame into outright rebellion. The saying of Philip Augustus (died 1223)—'Happy Saladin, who has no pope!'—expressed the feeling, which every century grew stronger, that the pope would become an impossible factor in European politics. To this feeling should be added the fact that, as the middle classes grew in intelligence and well-being, they looked with envy on the immense wealth of the clergy, and grumbled at the large sums that annually went to the coffers of Rome.

During the 14th and 15th centuries mediævalism gave every sign of an exhausted phase of human development. By the so-called Babylonish Captivity, when the papal residence was fixed for seventy years at Avignon (1305-76), and by the Great Schism (1378-1417), during which the spectacle was seen of first two and afterwards three popes claiming to be the vicar of God on earth, the papacy suffered a loss of prestige in the eyes of all Europe which it never afterwards fully recovered. It was the further misfortune of the church during this eclipse of its ancient glory that all spiritual life seemed to have gone out of every rank of its clergy. Testimonies from every country prove beyond question that by the end of the 15th century the clergy had become grossly unfit to be the spiritual guides of the people. The sources of intellectual life had equally failed wherever the old philosophy authorised by the church continued to be the subject of teaching and study. In the later half of the 15th century scholasticism had become the veriest trifling which ever engaged the mind of man. In all the interests of man's well-being, therefore, a renaissance was needed to evoke new motives and supply new ideals which should lift humanity to a higher plane of endeavour. Such a renaissance came, and fortunately the church did not prove equal to suppressing this second burst of life as it had suppressed that of the 12th and 13th centuries.

It was again in Italy that the new life first declared itself. While north of the Alps scholasticism reigned in all the schools, the movement known as the Renaissance (q.v.) had in Italy been in full course for above a century. In itself the Renaissance was as far as possible from leading men to higher ideals in religion; yet in two of its results it gave a direct impetus to the Reformation. Inspired by the life of antiquity, the humanism of the Renaissance paganised the church and quickened that moral disintegration which was the prime cause of the religious revolution. On the other hand, through its opening of men's minds by new studies and new measures of things, the Renaissance lightened the load of tradition, and made a new departure in the life of Christendom a less formidable conception. In Erasmus (1467-1536), who has always been regarded as a true nursing father of the Reformation, we clearly discern these two results of the revival of the ancient literatures. In so many words he states his grave fears lest the church should be wholly paganised by the universal imitation of classical modes of thought and speech; while his own unsparing criticism of the church and its traditions proves how much he owed to the so-called 'new learning.'

The very zeal with which the revival of antiquity was pursued in Italy was itself a countercheck to religious reform in the country that of all others needed it the most. All contemporary literature

proves that during the later part of the 15th and the opening of the 16th century the court of Rome was as profoundly immoral as that of any of the heathen emperors had been in the same city. The spiritual claims of the papacy were the jest of ecclesiastics themselves. 'This fable of Christ,' a certain dignitary of the church is reported to have said in the Vatican, 'has been to us a source of great gain.' Among the Italian people, however, there was never the slightest indication of a national movement towards any serious breach with the papacy. The religious melodrama enacted by Savonarola at Florence (1489-98) never struck at the central ideas of papal Christianity; and Savonarola, besides, never like Luther or Knox woke a deep response in the national consciousness. While in Italy, therefore, there was no widespread religious quickening as in other countries of Christendom, there was no political reason such as elsewhere produced a breach with the papacy. For the Italian people the pope was not a foreign prince with temporal interests of his own conflicting with those of the nation at large. The different republics which partitioned the country might at times regard the pope as an enemy to their individual ambitions; but the nation as a whole was fully conscious of the honour of having the vicar of God in their midst, and as in the past they had stood by him against the emperors, so in the great religious revolution of the 16th century they also remained faithful to him throughout the gradual dismemberment of his spiritual dominion.

Of the countries north of the Alps Germany was the first to be widely influenced by that revival of learning which had its origin in Italy. In Germany, however, the new spirit wrought under fundamentally different conditions, and lighted the way to vastly different issues. There was every reason why Germany should lead the way in the schism from Rome. Outside Italy Germany was the country where every abuse of the mediæval church was seen in its grossest form. The ignorance and sensuality of the clergy, the scandalous sale of livings, the disproportionate papal exactions—all these evils came to be vividly realised by the quickened consciousness of the nation. Between Rome and Germany, moreover, an antagonism existed in the very conditions from which mediævalism had sprung. It was in virtue of the mutual understanding between pope and emperor that the church came to fill the place it did in western Europe. But almost from the first the interests of Rome and the empire had been in collision, so that pope and emperor came to be mere rivals for the first place among the western powers. It was natural, therefore, that in Germany Rome should be regarded with a jealousy and suspicion which might easily grow into irreconcilable hostility.

These workings of the national mind found intensified expression in the acts and writings of Martin Luther, who, with a genius and audacity which have given him a place among the moulders of man's destinies, proclaimed the need of a new departure in the religious life of humanity. In rejecting the traditional claims of the papacy Luther at the same time supplied a new principle by which, as he contended, a higher and truer life of the soul might be lived. By his doctrine of Justification by Faith Luther threw each individual on his own responsibility for the reason and life which is entrusted to him. Hitherto the deepest concerns of men had been inextricably bound up with pope and priest, and in this had lain the essential principle of mediæval Christianity. By the new principle Luther made the pope no longer an indispensable factor in individual or corporate

life, and thus initiated a new phase in the development of society. As was to be expected, this principle, so organic in its working, cleft the German nation in twain, and gave rise to a struggle which did not close till more than a century after the death of Luther himself. Luther's attack on the sale of indulgences (1517), the burning of the papal bull (1520), Luther's condemnation by the Emperor Charles V. at the diet of Worms (1521), his temporary triumph at the first diet of Spire in 1526 (the beginning of modern Germany, according to Ranke), the confession of the Protestant faith at Augsburg (1530), are the outstanding events in the contest closed by the peace of Augsburg in 1555, nine years after Luther's own death, but again renewed in the disastrous Thirty Years' War (1618-48), and finally settled by the peace of Westphalia (1648).

The religious revolt of Germany left no country of Christendom unmoved. Before the 16th century had closed the bulk of the Teutonic peoples had followed her example and broken with the papacy. Under one aspect, indeed, the Reformation may almost be regarded as a Teutonic revolt against the domination of the Latin races. Between 1525 and 1560 Denmark and Sweden, taking the occasion of a political revolution, both declared for Protestantism; and in 1581 the United Provinces definitively threw off their double allegiance to Spain and the pope. But it is more important to trace the course of the revolution in the great powers of the West.

In Spain heresy of all kinds had no chance of finding a home. In its terrible Inquisition, reorganised in 1478, it had an institution ready made for effectually dealing with all attempts at reform or revolution. Luther found followers in Spain as in other countries; but they were literally extinguished before their voices could be heard, and of all the great powers Spain profited least by the quickening spirit of the Reformation.

Much more interesting and important is the history of religious reform in France. Between 1520 and 1530, the period of Luther's greatest activity, both renaissance and reform found a firm footing in France, and so many circumstances seemed to favour the future of both that for a time it was doubtful with which side the victory would eventually lie. On the one side was the university of Paris, which throughout the middle ages had claimed for itself the right—denied to the pope himself—of sovereign decree on the truth or falsity of all religious doctrine. As its decrees had in every case the strenuous support of the parliament of Paris, the university was a formidable force to be reckoned with by every innovator in studies or religion. In 1519 Luther's dispute with Eck had been referred to the doctors of Paris for decision, and their judgment, delayed for two years, had been the unqualified censure of Luther's position. Thenceforward every advocate of the new religion, and they daily grew in numbers, especially among the middle class, both in Paris and in the provinces, was pursued by the unrelenting hate of the parliament and the university. On the other hand, the king (Francis I.), eagerly encouraged by his famous sister, Margaret of Navarre, who herself had strong Protestant leanings, was at first disposed to use the new religious movement as a weapon to his hand in his dealings with the court of Rome. In the end Francis saw that separation from Rome meant the disruption of the French nation, and after 1534 he resolutely set himself to the extermination of every heretic in his dominions. His son and successor, Henry II. (1547-59), carried out this policy with even greater rigour, but in spite of all efforts to suppress them the French Protestants grew into a body formidable alike by their position,

wealth, and intelligence. The Huguenot wars, the Massacre of St Bartholomew (1572), and the Edict of Nantes (1598) are the outstanding events in this long struggle, which, involving political as well as religious questions of the first importance, threatened the very existence of France by suggesting to Philip II. the possibility of annexing the divided country as a province of Spain. By the Edict of Nantes the French Protestants attained a certain measure of religious freedom; by its revocation in 1685 Protestantism was stamped out of the country, and France thus deprived of the noblest elements in its society.

The religious revolution in Switzerland is second only to that of Germany in its direct influence on the subsequent fortunes of the European nations. In Switzerland we have the case of a double revolt from Rome springing from the same conditions, yet each having a character and an animating soul of its own. At Zurich, as early as 1519, and independently of Luther, Ulrich Zwingli, who, according to Ranke, combined in himself the best elements of renaissance and reform, gave rise to a movement which split the Swiss cantons into two hostile sections, and issued in the peace of Cappel (1531), which permitted to each canton the choice of its own form of faith. More important than the movement of Zwingli at Zurich is that associated with Calvin and Geneva. As in almost every other case of revolt, political considerations wrought with religious zeal in the breach of Geneva with Rome. Before 1530 the town had received the new religion from French refugees, who thus gave its peculiar character to the creed eventually associated with Calvin and Geneva. But it was in the successful effort of the town in throwing off the yoke of the Catholic Dukes of Savoy (1534) that it found itself forced to join the great Protestant schism, and to fashion a civil and religious polity compatible with an independent corporate life. It was in the accomplishment of this task that Calvin proved himself the great consolidator of the tendencies that underlay the Protestant movement. Inspired by Calvin, it was the pre-eminent destiny of Geneva at once to produce a reasoned civil and religious creed and a type of Christian believer that offered a solid front against the vast powers still at the command of the Roman see, and assured to Protestantism its own independent course in the history of mankind.

In 1532 the schism of England from Rome also became an accomplished fact. In this result had issued the negotiations of Henry VIII. with Pope Clement VII. for his divorce from Catharine of Aragon. But the view summed up in Gray's line, 'And gospel light first dawned from Bullen's eyes,' implies a totally inadequate recognition of the many forces that went to produce the English Reformation. The king's divorce was the mere occasion of what must sooner or later have been the only solution of England's relations with the popedom. In England all the forces, in greater or less degree, were at work which had produced the religious revolution in Germany. As in Germany, the church alike in its teaching and practice no longer represented the highest consciousness of the nation. It has been shown that its degradation was far from being so general or so complete as the official reports of Henry had seemed to prove; yet the state to which it had come was clearly such as to lend some countenance to the most drastic measures against it. By the end of the 15th century, also, the Renaissance, which was everywhere the solvent of tradition, had found its representatives in England. Linacre, Grocyn, Colet, and Sir Thomas More were all men more or less emancipated from mediævalism, though none of them broke communion with Rome. Both More

and Colet spoke their minds freely on the unworthy lives of the clergy; and the latter by his foundation of St Paul's School in 1510, and by his placing it under lay supervision, took a step of the highest importance in the direction of the new order. But it is in the political development of England that we find the adequate explanation of her final breach with Rome. For centuries the pope had come to be more and more regarded as a foreign prince, whose powers, as he claimed the right to exercise them over Englishmen and English property, were incompatible with English interests and English liberty. Moreover, by the date of Henry's accession the pope was a mere Italian prince, whose own interests led him to seek the support of the strongest arm. When Clement VII., therefore, declared against the divorce from Catharine, Henry regarded the decision not as the oracle of Christendom, but as the counsel of an earthly prince whose own interests left him no other alternative.

The breach with Rome was thus inevitable; but it still remained to be settled whether the old or the new religion should finally gain the English people. Henry himself to the close of his life professed to have broken with the old only in the one point of the headship of the church. In the reign of Edward VI. a clear departure was made from the doctrinal system of the ancient church; but the temporary reaction under Mary showed how strong a hold that system still possessed on the hearts of the people. When Elizabeth came to the throne in 1558 it was only her prudent policy that saved the country from the intestine divisions of France and Germany. Three parties were equally bent on realising their own conceptions of a religious settlement. The adherents of the old religion, who still probably made a half of the people, had not lost hope of a return to the old spiritual allegiance. Those who had renounced the papacy themselves made two distinct parties, each bent on ends so conflicting, that it was evident from the first that they could never work in common. The governing principle of the one party, from which eventually sprang the Church of England, was to minimise the differences between the old faith and the new, and as far as possible to maintain the continuity of the religious tradition in the country. The other, which drew its inspiration from Calvin and Geneva, and was afterwards known as the Puritan party, aimed at a root and branch rejection of papal Christianity as at once in the interest of what they thought a purer creed, and as the only safeguard against a return to the old constitution. It was owing to her politic handling of these conflicting parties that at Elizabeth's death England was of one mind regarding the question of the papal supremacy, and that the severance from Rome became a definitive fact in the development of the country. By happy turns of events, such as her excommunication by Pius V. in 1570, and by the extraordinary issue of the Spanish Armada in 1588, not only was the number of Catholics reduced, but such as still clung to the ancient faith thenceforward put their allegiance to their native prince before any claim of the Roman see. It was this final triumph of the Protestant revolution in England that saved the movement in all the other countries of Europe.

The triumph of the Protestant movement in Scotland is likewise a fact of the first importance in European history. In Scotland, from the very beginning of Luther's revolt, we find the presence of the same elements which elsewhere led to revolution. In Scotland as elsewhere the clergy had lost the respect of the country. As early as 1525 Lutheran books were so widely read that an act of parliament was passed forbidding

their importation. The very efforts of the church to stamp out the new heresy, as in the burning of Patrick Hamilton in 1528, and of George Wishart in 1546, served only to hasten the turn of affairs which it had dreaded. Jealousy of the wealth and political influence of the clergy disposed the nobility to throw in their lot with the party of revolution. When in 1559 Knox returned from his long sojourn abroad, his unflinching zeal and personal force supplied the momentum that was needed to complete a revolution already in full course; and in the following year Protestantism was formally established as the religion of the country. The consequences of this revolution extended far beyond Scotland. Had Mary on her return in 1561 found Scotland united in the Catholic faith, she would have commanded the destinies of England. Elizabeth could never have effected a religious settlement, and, with England paralysed, Protestantism could not have held its own against the united forces of Catholicism.

Thus, by the middle of the 16th century, it seemed as if the revolution must sweep all before it, and the papal system be as completely effaced by Protestantism as Paganism had been effaced by Christianity. At the beginning of the revolt the authorities of the ancient church did not fully realise that the forces arrayed against them menaced their very existence. When the true extent of the danger was realised the church displayed all the resources of an institution whose roots were in the very heart of Christendom, and which, alike by its traditions and by its special adaptations to the wants of the human spirit, appealed to the deepest instincts of a large section of all the peoples of western Europe. The Society of Jesus, founded in 1540, supplied an army of enthusiasts, whose policy and devotion saved Rome from dissolution. By the decrees of the Council of Trent (1545-63), inspired by the spirit and aims of the Jesuits, the church reaffirmed its traditional teaching, conceding nothing either to renaissance or reform; and a succession of popes during the later half of the 16th century carried out with a zeal worthy of the better ages of the papacy the policy marked out for them by the Jesuits. Through the disunion of the Protestants and the strenuous efforts of the papacy, the middle of the 16th century saw the tide of revolution checked; and in certain countries, more especially in Germany, the Jesuits even gained ground which had been lost. By the close of the same century Europe was portioned between the two religions almost by the same dividing lines as exist at the present day.

It has been said that the central fact of the religious revolution of the 16th century was the severance of the Protestant nations from the Roman see; but the great schism inevitably led to issues of which the Protestant reformers never dreamed, and which they would have denounced in as unqualified terms as any theologian of the mediæval church. The reform of religion preached by Luther or Calvin implied no real change in the modes of thought that distinguished mediævalism. Their theology was but another form of scholasticism; their attitude to the classical tradition or to any departure from their own conception of the scheme of things was precisely that of the Schoolmen trained on the Decretals and Aristotle. For an infallible church they substituted the Bible as the unerring expression of God's relation to man; the interpretation of the Bible they left to the individual consciousness. This freedom was of necessity only nominal, since the members of any Protestant church were members only on condition of their accepting the church's interpretation of the contents

of the Bible, and since each different church deemed itself the special depository of the only true conception of the perfect will of God. Nevertheless, it was from this attitude of the Protestant reformers to the Bible that the developments of modern thought sprang. A reformer like John Knox would have stamped out every form of thought hostile to his own synthesis of things divine and human; but it was not in the power of the Protestant system to do what had been so effectually done by the church of the middle ages. In the mediæval conception church and state made one organism; what menaced the life of the one menaced the life of the other. Hence the state was at the church's bidding whenever its arm was needed to deal with any suggestion of heresy. But having no great central head, such an organic union was impossible for any Protestant church, and religious error could not be regarded as a crime against the existing government. So complete was the revolution wrought by this changed relation of church and state that toleration of different creeds, and not an iron uniformity, was in time seen to be the indispensable condition of civil society. But in this lies the fundamental distinction between mediævalism and the modern spirit. Mediævalism rested on the belief that society was threatened if any of its members questioned the body of truth of which the church was the custodian; it is the distinctive principle of the modern spirit that truth shall be followed wherever facts are believed to lead.

For further information see the articles in this work on the chief reformers, especially Luther, Melancthon, Calvin, Zwingli, Cranmer, and Knox, and the works named there; also the articles on Renaissance, England (Church of), Scotland (Church History), Roman Catholic Church, Pope, Charles V., Henry VIII., Elizabeth. Here we can only enumerate certain important books along the lines of the foregoing article, and dealing more or less fully with the subject or part of it. Bryce, *The Holy Roman Empire*; Renan, *Joachim de Flor et l'Évangile Éternel*, and *Averroès et l'Averroïsme*; J. A. Symonds, *The Renaissance in Italy*; Bishop Creighton, *A History of the Papacy during the Period of the Reformation*; Ranke, *Deutsche Geschichte im Zeitalter der Reformation*; Harnack's *History of Dogma* (vol. vii. transl.); Armstrong's *Charles V.*; the standard church histories from Gieseler to Moeller (of the latter especially vol. iii.); Von Bezold and Vedder on the German Reformation; for the Roman Catholic point of view Döllinger's work on the Reformation, Pastor's *History of the Popes*, and Janssen's *History of the German People at the Close of the Middle Ages*; James Gairdner's *Lollardy and the Reformation*; Pollard's *Cranmer and the English Reformation*; M'Crrie, *Reformation in Spain*; Michelet, *Histoire de France* (vols. ix.-xii.); Baird, *Rise of the Huguenots*; Burnet, *History of the Reformation* (in England); Strype, *Memorials of the Reformation*; Froude, *History of England* (first four vols.); Dixon, *History of the Church of England from the Abolition of the Roman Jurisdiction*; Worsley, *The Dawn of the Reformation*; Aubrey Moore, *Lectures on the History of the Reformation*; the relevant volumes of the *History of the Church of England*, edited by Stephen and Hunt, of the *Political History of England* by Hunt and Poole, of the *History of England*, edited by Oman; as well as Lingard and Gasquet on the Roman Catholic side; for Scotland the church histories by Lee, Cunningham, Grub, and MacEwan, Bellesheim being the standard on the Roman Catholic side; Seebohm's *Era of the Protestant Revolution*; Beard's *Reformation of the Sixteenth Century*; Smith's *Age of the Reformation*; the second volume (*The Reformation, 1504*) of Lord Acton's 'Cambridge Modern History'; and *A History of the Reformation* by T. M. Lindsay (2 vols. 1906-7).

Reformatory and Industrial Schools. or Home Office schools, are defined for England and Wales by the Children Act of 1908 as schools respectively 'for the industrial training of youthful offenders,' and 'for the industrial training of

children, juveniles of both categories being 'lodged, clothed, and fed as well as taught.' There are no state schools of the kind; the schools have been founded and are managed by bodies of private philanthropists, or by societies or religious bodies, or by local authorities. Control by the state is indirect and limited. The managers of a school desirous of receiving cases committed from the courts apply to the Secretary of State for a certificate, which is granted if on inspection the place be found suitable for the purpose. Should the subsequent conduct of the school at any time prove inefficient or unsatisfactory, the certificate may be withdrawn after six months' notice. Every certified school is inspected at least once a year by inspectors of the Children's Branch of the Home Office.

In the popular mind the distinction between reformatory and industrial schools is seldom as clear as it should be. A reformatory school can only receive a child between twelve and sixteen years of age after a recorded conviction for an offence punishable in the case of an adult with penal servitude or imprisonment, whereas a child under fourteen years of age may be sent to an industrial school without conviction. A proportion of the children have not been before a magistrate at all, but are 'voluntary cases'—troublesome children sent by friends or relatives or Poor Law Guardians, who pay a large proportion of the cost, or even the whole cost, of maintenance. Primarily industrial schools exist for the reception of children under fourteen who are found begging, wandering without proper home or guardianship, in the care of criminal or drunken parents, frequenting the company of thieves or prostitutes, living in brothels—in short, the victims of parental neglect whatever form it may take. A considerable proportion of the children, however, are committed for petty larceny, and indeed the neglect is often first brought to light when the child, as a direct result, commits a theft or other noteworthy offence. Essentially, however, industrial schools are for potential, as reformatory schools are for actual, delinquents. The single purpose of both alike is not punishment but training. Under the Children Act of 1908 managers of industrial schools may board out children under eight years of age with foster parents, but so far have availed themselves little of the power. Children are committed to reformatories for not less than three or more than five years, and must be discharged by the nineteenth birthday, though remaining under supervision up to that age however young when licensed out. Industrial school children must be licensed on or before attaining the age of sixteen, but remain under the supervision of the managers and are liable to recall up to the age of eighteen. Both classes of children commonly leave the schools some months before the completion of the full age, and some reformatory schools make a regular practice of licensing well-behaved boys after eighteen months' or two years' detention. The record of conviction often involves a life-long stigma in punishment of an offence committed by a mere child. It is hoped at an early date to get legislation to abolish this. Day industrial schools are for boys and girls whose homes, though not criminal or vicious, are so poor that the children require supervision and meals throughout the day. This type of school is, however, dying out.

The first so-called industrial school was really a junior reformatory established by the Middlesex justices in 1854, at Feltham, for convicted children between the ages of seven and fourteen years. But this was a comparatively late event in the history of the movement, a movement in which the state had taken no direct part further than the reservation

of Parkhurst Prison (1837) for boys under eighteen. The Marine Society had been founded as early as 1756 as 'an expedient to provide for poor boys who might become a nuisance.' The Philanthropic Society, now represented by the Reformatory Farm School at Redhill, was founded in 1788 'for the protection of poor children and the offspring of convicted felons, and the reformation of children who have themselves been engaged in criminal practices.' Pitt in 1793 brought in a bill to provide what would have been an industrial school, but it was rejected. In 1838 the Home Secretary was empowered to pardon boys sentenced to transportation or long periods of imprisonment on condition that their guardianship was undertaken by the managers of specially provided schools; the Treasury was authorised to contribute to their support. Here we have the beginning of the system, which still obtains, of government-supported voluntary schools. Many of them grew out of the ragged school movement, a school of industry at Dundee, and Dr Guthrie's school at Edinburgh (1846) being among the first. (See RAGGED SCHOOLS.) In 1846 a bill was brought in for the establishment of reformatory schools. This also failed to pass. But the public conscience was growing increasingly sensitive to the scandal of committing young children to the common gaols, and in 1851 a conference was held in Birmingham, of which the outcome was the foundation of several schools and the encouragement of renewed efforts in the House of Commons. The first Reformatory Act was passed in 1854, four years later than the first French Act. It enabled schools to obtain a certificate dependent on a satisfactory report from the inspector of prisons, and authorised the commitment of children under sixteen after not less than ten days' preliminary imprisonment, a condition not abolished till 1899, and not even optional up to 1893. In 1857 forty-four schools had been certified, and the first inspector was appointed. An Industrial Schools Act was passed in this year, and an act of 1866 amended and consolidated the law relating to the schools, and practically unaltered, remained in force until 1908. Day industrial schools were established by the Education Act of 1876. Several departmental committees have made important suggestions for increasing the efficiency of the work, among others that the Board of Education should assist with the inspection of the reformatory and industrial schools department. This recommendation has been adopted. The passing of the Education Act (1918), the findings of a department committee on salaries and conditions of service (1919), and a radical change in the system of Treasury grants (1920) closed an important decade in the history of the schools, and involved more progress in the treatment of the delinquent child than any legislation since the act of 1866.

The schools themselves vary considerably in character. Generally the buildings are well situated and suitable. Some were built for the purpose, but many are old residences adapted. There is now only one training ship, the *Cornwall* in the Thames. Experience has shown that for the younger boys at any rate the old training ships were unhealthy. Of nautical schools which have succeeded former ships there remain the Heswall (*Akbar*) and Farnworth (*Clarence*) reformatories, and the National Nautical (*Formidable*) and Wellesley industrial schools. For some years there has been a decrease in the number of boys leaving the schools to go to sea. As a result of their conviction ex-reformatory boys, known as such, are not accepted for the Royal Navy except in the capacity of stokers, but there is no restriction on their enlistment in the Army.

Though some of the children committed to re-

reformatory and industrial schools are of a fine type, many are mentally and physically below the normal of their class; but with improved hygiene, more generous dietaries, and the reduction of household drudgery formerly considered beneficial to character, a high standard of health has been attained. The death-rate of children in these schools is now less than that for children of the same age-periods for the country as a whole. Several special schools are certified for the reception of mentally deficient, ophthalmic, and other defective committed children, and there are schools for girls whose vicious tendencies or deplorable experiences render them unsuitable for association with others.

There are differences of opinion among managers as to the relations which should be maintained between the school and the parents. A few try to sever the connection, while others keep in close touch with their children's homes, allow frequent visits and letters, visit the homes, permit well-behaved children to spend a week or a fortnight at home once or twice a year if a sufficient standard of cleanliness and decency is maintained, and make it their aim to raise not only the child but the family, with a view to eventual reunion under respectable conditions. This latter course has been strongly advocated by the Home Office, and with marked success. When a child is committed to a school the magistrate usually makes an order for the parent to contribute a small weekly sum towards his maintenance, but such payments only amount to about 5 per cent. of the income of a school. Until recent years, in the majority of schools the children were expected by their labour to contribute largely to the cost of maintenance and also perform the whole of the domestic work of the school. Now, however, the provisions of the Education Act, 1918, are enforced, and the children under fourteen years of age receive much the same type of education as the child in the public elementary school—indeed, in some instances the children attend the local school with excellent results. In addition to this most industrial schools have well-equipped manual-instruction shops and also give valuable training in gardening, instrumental music, and in the girls' schools domestic subjects. The reformatories give, in addition, definite vocational training in farming, gardening, carpentry, and engineering, and provide educational classes of a wide scope. The training of girls has in recent years been greatly improved by the reduction in non-educational laundry-work, and the appointment of resident or visiting domestic science teachers. From a few institutions specially clever girls are sent to attend secondary schools, commercial courses, and trade schools, while shorthand and typewriting are quite commonly taught on the premises.

The value of sports and field games has long been recognised in the schools, and in boys' and girls' schools alike the facilities for indoor recreation and the pursuit of hobbies are excellent. The notion, still quite common among the public, that the schools are practically junior prisons is not justified. Bolts and bars have practically disappeared, and, as a result, absconding; and the best schools not only grant home leave, but freely allow boys or girls who have not forfeited the privilege by misconduct to go out by themselves at frequent intervals. Nearly all schools, too, provide for a summer holiday, generally at the sea.

Discipline in the majority of schools is maintained largely by systems of privileges and rewards. All forms of punishment are defined and safeguarded by strict rules, and every case has to be reported quarterly to the Home Office.

When the time approaches for a boy or girl to

leave a certified school on licence, it becomes the duty of the managers, commonly delegated to the superintendent, to find suitable occupation, and arrange for residence either with parents or friends, with employers, or in lodgings or hostels. Some schools have certified auxiliary homes in which homeless children can lodge until they become self-supporting, and to which others may return for holidays, or when changing situations. A government grant of 3s. per week, up to the age of eighteen, is made for each child when necessary, and many local authorities supplement this. A common form of disposal for boys, other than those from the nautical schools, is to farm service or army bands. An increasing number are also placed in skilled trades. For girls domestic service, until very recent years, was practically the only outlet, but now the more advanced schools are turning out a few teachers, shorthand typists, clerks, and nurses.

The managers of schools generally keep in close touch with their boys and girls for three years after they leave the school, and this 'aftercare' is now a well-established and important feature of the work. Those who are not doing well may, with certain limitation as to age and period, be recalled to the schools and given a fresh start.

The results are difficult to estimate, but the returns show that about 90 per cent. do well. The schools are seriously handicapped in their work from their inability to say too much of their successes. Obviously they cannot advertise the fact that a well-known public servant was educated in a certified school, but, on the other hand, if a boy or girl trained in a Home Office school in years to come is convicted of crime, the system is discredited by the prominence given by the press to the fact that he or she is an ex-inmate of a certified school. Probably the number who become good citizens is in the same proportion as from any other type of school.

At the present time a Departmental Committee is considering the whole question of juvenile delinquency, and will, no doubt, make many recommendations to facilitate and improve the training and disposal of these young people.

Detailed information concerning the working of these schools can be obtained from the Annual Reports of the Children's Branch of the Home Office.

The departmental committee on the schools in Scotland, which reported in 1914, urged that they should be transferred to the control of the Scottish Education Department, a recommendation vigorously supported by the Home Office Department. The transfer was effected in 1920.

Throughout the British empire, even in quite small colonies, reformatory acts have been passed, and schools for young delinquents have been provided, in many cases, by government. Training ships have been discarded. Speaking generally, the colonial administrations have viewed with disfavour the herding of children in big barrack institutions, and have adopted, whenever practicable, the principle of boarding out. In general, also, they extend the age of criminal minority.

The United States possessed a very large number of reformatory institutions for boys and girls, but many have been closed owing to the development here, too, of the boarding-out system and general recognition of the disadvantages of institutional life. Many of the older institutions have been reorganised as cottage colonies—the only system now approved by public opinion. Thus the state agricultural and industrial school of Rochester, which, since 1884, had replaced the House of Refuge founded in 1824 (the first reformatory school in the world established by law), was reopened at Industry, New York, in carefully classified colonies of twenty-

five children. The Glen Mills schools, Delaware, again, are on the cottage system. There is no Federal law concerning reformatory and industrial schools, so each state has its own laws and its own schools. But the general principle is the same in each—a recognition of the fact that the children are not in the schools for punishment, and an endeavour that life should be as free and home-like as possible.

In Belgium the schools belong to the state. The technical training is very advanced, but the régime appears too prison-like. Denmark has both state and certified voluntary institutions for delinquent children. In France no conviction can be recorded against a child under thirteen, the limit of criminal minority is eighteen, and young persons may be detained or kept under supervision up to the age of twenty-one. For sentences of less than six months a child is sent to a juvenile prison, for those of over six months up to two years to a state reformatory (*Colonie Pénitentiaire*), and for sentences of over two years to a senior reformatory or 'correctional colony.' In the state reformatories parental rights are forfeited. The institutions for girls are known as *Ecoles de Préservation*. In addition to the state reformatories there are various voluntary institutions, one of which, Mettray, is the oldest reformatory in Europe. As in most continental establishments of the kind, corporal punishment is absolutely forbidden. In Germany the system is one of voluntary management, with maintenance entirely provided out of the public funds of the state and the province. Das Rauhe Haus, founded in 1833 near Hamburg, was one of the earliest models for industrial schools; it is conducted on the cottage system. The reformatory at Nordhausen, Saxony, founded in 1910, is also on cottage lines, and in 1913 was described as the best reformatory in existence; it is splendidly equipped, and every endeavour is made to approximate to family life, and to give all possible freedom and responsibility; a house-mother as well as house-father is present in each boys' cottage. Throughout Germany supervision of ex-inmates continues up to twenty-one years of age. In Holland by law of 1901 imprisonment was abolished for children under eighteen, and only those over fourteen might be committed to a school for a first offence. In most cases detention is only for six months or a year, but it may continue up to the age of twenty-one. In Hungary, Aszód, the first of several state reformatories, was opened in 1884. This institution and Kassa (now in Czechoslovakia), opened in 1900, became distinguished by their efficiency as schools of arts and crafts, agriculture, and horticulture. Wages, amounting to one-third or one-half of the value of work done, were paid. Arpad was established in village form. In addition to these state schools, others of a voluntary character were founded by the National Child-Protection League, which had in view a system of graded homes, with promotion from one to another. The League also adopted responsibility for the after-care of children from the state reformatories, a system being devised whereby owners of industrial undertakings provided well-managed hostels for old boys from the schools. In Italy the system is one of state and voluntary schools. Technical instruction reaches a very high level, and ex-inmates, in high percentage, are placed in the trades they have learnt. Wages are paid within the institution to boys who have acquired sufficient skill to earn them. In Norway the controlling authority is the Education Department. Some of the schools, being on otherwise uninhabited islands, are able to afford almost unrestricted liberty. In Russia the first schools were voluntary, but under the control of the Minister of Justice. Many prisons had also

special sections for children who were there kept under much the same régime as in the reformatories. In 1909 the institution of government reformatories was sanctioned. In Sweden the schools for delinquents under fifteen years are under the education authority, while reformatories, public and private, are only for children of from fifteen to eighteen. In Switzerland there is no Federal system, but some cantons manage reformatories, and there are also various small private institutions corresponding to industrial schools.

In 1908 Japan passed a law concerning the establishment of industrial schools; there is no corporal punishment. A reformatory at Gezireh in Egypt is said to be second to none in the world in equipment and in efficiency of technical instruction, but is described as being unduly penal in character. See also JUVENILE OFFENDERS.

Reformed Churches, a term employed in what may be called a conventional sense, not to designate all the churches of the Reformation, but those in which the Calvinistic doctrines and still more the Calvinistic polity prevail, in contradistinction to the Lutheran (q.v.). The influence of Calvin proved more powerful than that of Zwingli, which, however, no doubt considerably modified the views prevalent in many of these churches. The Reformed Churches are very generally known on the continent of Europe as the *Calvinistic Churches*, whilst the name *Protestant Church* is in some countries almost equivalent to that of *Lutheran*. One chief distinction of all the Reformed Churches is their doctrine of the sacrament of the Lord's Supper, characterised by the utter rejection not only of transubstantiation, but of consubstantiation; and it was on this point, mainly, that the controversy between the Lutherans and the Reformed was long carried on. See LORD'S SUPPER, and SACRAMENT. They are also unanimous in their rejection of the use of crucifixes, and of many ceremonies retained by the Lutherans. Churches belonging to the Reformed group are those of England (in some respects) and Scotland, some churches of various parts of Germany, the Protestant Churches of France, the Netherlands, Switzerland, Hungary, Poland, &c., with those in America which have sprung from them.

Reformed Episcopal Church (otherwise called the Reformed Church of England) was founded by the Right Rev. Bishop C. D. Cummins, D.D. (assistant bishop of Kentucky), in the United States in 1873. Its relationship to the Church of England is derived from the possession in its holy orders of the same historical succession, through the See of Canterbury, common to both Churches. In orders, worship, and doctrine it takes outside the Established Church the position of the Evangelical party within. This Church has spread widely, and is now working in the United States, Canada, India, and England.

Reformed Presbyterians. See CAMERONIANS.

Refraction. When a beam of light, travelling in a transparent medium, impinges obliquely upon the surface of another transparent medium, what occurs in the vast majority of cases is that a part of it is reflected (see REFLECTION) and a part of it enters the second medium, but in so doing is *refracted* or bent out of its former course. If, for example, the light travel in air and impinge obliquely upon glass, the course of the refracted portion is bent so that the refracted light travels more directly or less obliquely through the glass; and, conversely, if the light travel in glass and impinge upon an air-surface, the portion which is refracted into the air will travel through the air more obliquely with respect to the refracting sur-

face than the original light had approached it. The law of refraction was discovered by Snell in 1621, and is the following: the refracted ray is in the same plane with the incident and the reflected ray, and is therefore in the *plane of incidence* (see REFLECTION); and the sine of the angle of incidence bears to the sine of the angle of refraction a ratio which remains constant, for any two media, whatever be the angle of incidence.

In fig. 1 a ray, AO, impinges on a denser medium at O; the angle of incidence is AON (ON being at right angles to the refracting surface); the refracted ray, instead of going on towards α' , is bent so as to pass through A'. Draw a circle cutting AO and OA' in c and c'; draw cd and c'd' at right angles to NN'; these lines, cd and c'd', are, for the radius Oc, the sines of the respective angles AON and A'ON'. These sines bear to one another a certain proportion, ascertained by measurement; let it be 3 : 2; then Snell's law is that any other ray, say from B, will be so refracted that the sines, similarly drawn, will bear to one another the same proportion of 3 : 2. Between air and water the ratio of these sines is almost exactly 4 : 3; between air and crown-glass it is nearly 3 : 2. Now observation shows that light passing from water into crown-glass is so refracted that the sines have the ratio $\frac{3}{2} : \frac{4}{3}$, or 9 : 8, so that the rays are less bent than when they pass from air into any of these media.

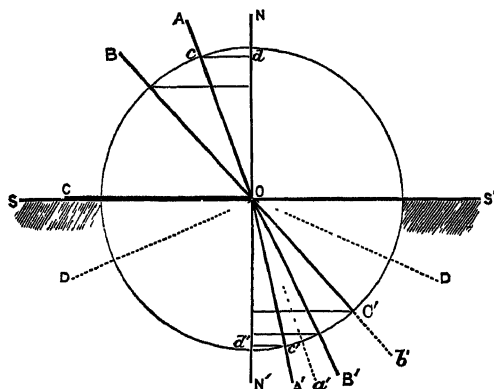


Fig. 1.

The ratio of these sines when *air* is one of the pair of media involved is called the *refractive index* of the other medium; thus, water has, for sodium monochromatic light and at 18° C., a refractive index of 1.3336, and crown-glass one of 1.5396; and the ratio of these refractive indices, ascertained with respect to air, governs the ratio of the sines, whether air be one of the pair of media experimented on or not. A direct consequence of this is that, if light pass successively, say, through air, glass, and water, the ultimate deviation will be the same as if the glass had been absent; and so for any number of intervening terms, it being always assumed that the bounding surfaces are parallel to one another; and if a parallel beam of light, passing through air, come to traverse any number of parallel refracting-surfaces, and if it regain the air, it will be found to travel parallel to, if not directly in, its original course.

The observed fact that light is differently bent in its course by different refracting media shows that there is a difference between bodies in their power of receiving light through their bounding surfaces. Newton, in accordance with his corpuscular theory (see LIGHT), interpreted this as showing that when the luminous corpuscles come very near the surface

of a denser substance they are as if they were jerked or made to swerve out of an oblique path and hurried in by the attraction of the denser substance so as to enter that substance more directly; and that when the light quits the denser substance it is retarded by a similar attraction. The consequence of this would be that light would travel in the denser medium perhaps not appreciably faster than in air, but with a mean velocity certainly not less. On the undulatory theory, however, refraction is a necessary consequence of a slower travel of ether-disturbances in the denser medium.

In fig. 2 A is a plane wave-front, advancing obliquely towards B, the surface of a denser medium. At the end of a certain time the wave-front is at A'; after an equal interval it is at A''. During the next equal interval a gradually diminishing breadth of the wave is traversing the original medium with the original velocity; but a steadily widening portion of the wave-front enters the denser medium and is there hampered. At the end of the interval the aggregate disturbance, that is to say, the wave-front, will be found to have swung round into the position and direction represented by a , just as a line of soldiers would tend to do on obliquely entering more difficult ground. During the next equal interval the wave-front advances parallel to itself, but traverses smaller distances in equal times, so that $\alpha\alpha'$ is less than AA'. To this explanation it is essential that in optically denser media light should travel more slowly: and it has been absolutely established that this is the case. Optical density, so called, does not, however, always coincide with mass-density: bisulphide of carbon, which is lighter than glass, has for sodium light a refractive index of 1.63, while crown-glass has an index about 1.5, and flint-glass one about 1.6. If the course of any ray between any two points in the two respective media be studied, it will be found that no other path between the two points could have been traversed in so short a time.

If we go back to fig. 1, and assume the rays to pass from A', B', &c. towards O, we find the rays emerging from the denser medium more nearly parallel to SS'; a ray from C', so far as it is refracted at all, emerges parallel to SS'; and for

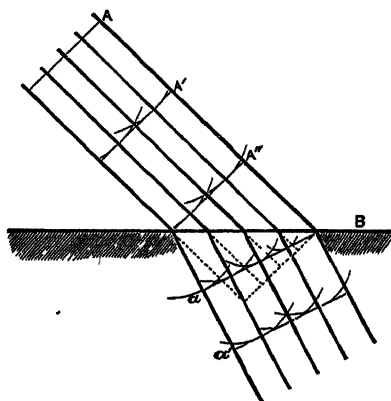


Fig. 2.

rays approaching O from points between C and S' the construction for the refracted ray becomes impossible. The angle C'ON' is the *critical angle*, beyond which there is no refraction, but total reflection (see REFLECTION). This angle is such that its sine is equal to $\frac{1}{\mu}$, where μ is the ratio between the refractive indices of the denser and

the rarer medium. For water and air it is, for sodium monochromatic light, $48^\circ 27' 40''$. Where this ratio μ (the 'relative index of refraction') is high, this critical angle is small and total reflection is well marked, as in the sparkle of the diamond.

When a spherical wave impinges on a plane surface it travels in pseudo-hyperboloids, the centre of curvature of the central portion of which is, as regards its distance from the refracting surface, farther away than or nearer than the centre of the sphere in the ratio of the refractive index of the second medium to that of the first. An eye within a rarer medium will thus see the image of a point situated within the denser medium as if it were nearer than it really is; hence a stick appears bent when partly immersed obliquely in water; and, owing to differences in the amount of refraction at different angles, the bottom of a tank looked down upon appears sunk in the middle.

In fig. 3 light starts from a point X, and impinges directly upon a spherical surface of a denser medium; the centre of curvature of the spherical surface is at C. During a certain interval of time the front of the wave advances from A' to A; during the next equal interval it would, but for the denser medium, have been at BRD. It has not, however, got so far as R in the time; the central part of the wave-front has only got as far as R', where $AR:AR'::\mu:1$. Any non-axial ray, such as XP, which would have reached Q, can only have originated a disturbance at P, which would have travelled from P in some direction to a distance not equal to PQ, but to PQ reduced in the same

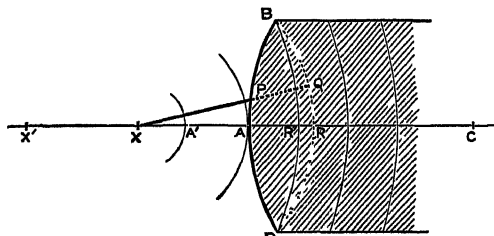


Fig. 3.

ratio of $\mu:1$. We might then, knowing μ , the relative index of refraction of the denser medium, draw, with centre P and radius $= PQ \div \mu$, an arc of a circle; the disturbance will have got to some point on that circle. Doing the same for all the P's, we have a series of circular arcs which may be connected by a line drawn so as to touch them all. This line will be a curve; and it will, for some distance from the axis, coincide very nearly with the arc of a circle whose centre is at X', so that the wave-front will travel in the denser medium approximately as if it had originally come from X'. The relation between the distance AX, AX', and AC is given by the formula $\mu_1/AX' - \mu_0/AX = (\mu_1 - \mu_0)/AC$, where μ_0 is the refractive index of the original, and μ_1 that of the refracting medium. For example, let $\mu_0 = 1$ (air) and $\mu_1 = 1.5$ (crown-glass); $AC = 2$ inches; $AX = -1$ inch (i.e. the source of light is one inch to the left of A); then $1.5/AX' + 1/1 = 1.5/2$; whence $AX' = -2$, or the light travels in the denser medium as if it had come from a point 2 inches to the left of A. If the wave-front be plane as it approaches A, that is equivalent to $AX = -\infty$ or $\mu_0/AX = 0$; whence AX' is equal to $+6$, or the light converges on a point in the denser medium 6 inches to the right of A. If, however, a plane wave-front approach A in the denser medium, that is equivalent to $AX = +\infty$; but, as the original medium is now the denser one, $\mu_0 = \frac{1}{3}$ and $\mu_1 = 1$;

whence, by the formula, $AX' = -4$, and the convergence is on a point 4 inches to the left of A. These distances of the points of convergence for plane waves, at $-4 (=f)$ and $+6 (=f')$ from A, are the Principal Focal Distances for the curved surface and the media in question; and they bear numerically the same ratio to one another as the refractive indices do; from which, together with the previous equation, we get $-f/AX + f'/AX' = 1$; which shows, still keeping to our numerical example, that when the object lies at a greater distance than 4 inches to the left or 6 inches to the right of A, the image is a real one on the opposite side of A; whereas when it is at a less distance from A, X and X' are on the same side of A, and the image is virtual. X and X', thus determinable when one of them is known, are conjugate foci; and they are interchangeable, so that an object at either will produce an image, real or virtual as the case may be, at the other.

The refracting medium may not be of indefinite extent, but may be bounded in the path of the light by another surface. If the two surfaces be both symmetrical round a common axis, we have a Lens (q.v.); and, by repeating our calculations of the refraction at the second surface as if the image produced by the first were itself an object, we arrive at the formulæ given in the article on LENSES.

If a parallel beam of light enter one plane surface and be there refracted and emerge by another which is not parallel to the first, we have the essentials of a Prism. Assume the incident light to be monochromatic; then fig. 4 shows the incident beam SP taking the course SPQR.

The elements of the problem are, μ being the relative index of refraction of the prism: (1) $\mu \sin QPn' = \sin SPn$; (2) $\mu \sin PQn' = \sin RQm$; (3) angles $QPn' + PQn' = \text{angle } A$, by the geometry of the figure; and (4) angles $SPn + RQm = \text{angle } A + mn'n$, this last being the Deviation produced by the prism. These four equations contain seven terms; and it is sufficient to measure three of these, say the angles A, SPn , and $mn'n$, in order to ascertain the rest, including μ , the relative refractive index of the prism for the particular monochromatic light employed. If, however, the light employed be not monochromatic but mixed, as ordinary daylight, we find that the prism sends each wave-length—each colour-sensation-producing component of the daylight (see COLOUR)—to a different place, and thus produces a Spectrum (q.v.). Each wave-length has its own μ and its own deviation; the more frequent and therefore shorter waves being the more refrangible by a given piece of glass and travelling the less rapidly within it.

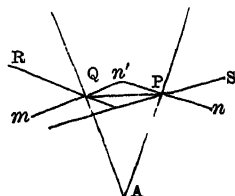


Fig. 4.

If in fig. 4 the prism be turned so that S and R lie symmetrically with reference to the angle A, the deviation is then a minimum; and in that position of minimum deviation a monochromatic beam, divergent from S, will come to focus at R. In examining the spectrum of light from a source S it is necessary to turn the prism so as to ensure sharpness by producing this minimum deviation for each part of the spectrum in succession. When the deviation is a minimum everything is symmetrical; $SPn = RQm$; $QPn' = PQn'$; whence, by equations above, $SPn = \frac{1}{2}(A + mn'n)$, and $QPn' = \frac{1}{2}A$; whence $\mu = \{\sin \frac{1}{2}(A + mn'n) \div \sin \frac{1}{2}A\}$, which determines μ , when A (the angle of the prism) and $mn'n$ (the deviation) have been measured. The refractive indices of liquids and of

gases are determined by enclosing them in hollow prisms of glass whose walls are made of truly parallel glass; the parallel glass produces no deviation. In liquids the angle of total reflection or 'critical angle' may also be readily measured; then the sine of this angle $= 1/\mu$. The refractive index varies with changes of density, $\mu - 1$ being approximately proportional to the density: and it bears certain intimate relations with the molecular constitution of the refracting matter.

As to why ether-disturbances of differing wave-lengths are differently refracted in such a medium as glass, we may adopt two main lines of inquiry. First, with v. Helmholtz, we may consider the vibrating ether as putting the atoms in a molecule out of place and expending energy in so doing; and the atoms as being so pulled, but also as being elastically returned to the molecule, with an absorption of energy by friction or damping; then these assumptions lead to the conclusion that the refractive index for a particular wave-length depends upon the relation between that wave-length and the natural period of vibration of the atoms. Second, in terms of the modern electromagnetic theory of light, we may consider the rapidly reversing electric forces in the medium as setting in motion charged electrons or groups of electrons, which themselves have positions of equilibrium with reference to the atoms to which they belong, and which therefore vibrate, with an absorption of energy by friction or damping; and also consider the electric current at each point to be partly due to the forces in the field and partly to the actual transport of charged electrons; then these assumptions lead to similar conclusions; similar, not identical in detail, but rather better in conformity with experimental observations. In all these cases we find ourselves obliged to assume that the bend of the rays is not abrupt at the reflecting or refracting surface, but involves an exceedingly thin superficial film or skin.

The general result is that, where we have an absorption-band in the spectrum, on the red side of it the refrangibility increases as the wave-length diminishes, and that more and more rapidly until at the absorption-band a high maximum is reached; but on the other side of the absorption-band the refrangibility first presents a low minimum, then rapidly increases, and then increases more and more slowly, as the wave-length continues to diminish. In so-called normal dispersion the determinant absorption-band is outside the visible spectrum; but its presence is revealed by the want of coincidence, as regards the distribution of colours, between the prism-spectrum and the diffraction-spectrum, in which latter the deviation for each wave-length depends directly upon the wave-length itself; and for different substances (e.g. flint-glass prisms and crown-glass prisms) by a want of coincidence between the spectra produced by these respectively, even though these spectra be made of equal length. Besides, in any substance not perfectly transparent, which no substance is, the local absorptions tend to complicate the distribution of colours in the spectrum. The irregularity of distribution of colour in the spectrum is called the *Irrationality of Dispersion*. If now we take two prisms, such as C (crown-glass) and F (flint-glass) in fig. 5, and pass a beam of light through;



Fig. 5.

then, if the angles of these prisms be suitable, the rays dispersed by the one will be collected by the other, and there will on the whole be deviation without dispersion; but not absolutely so, on account of the irrationality of dispersion of both prisms, the effect of which is that a calculated ratio of angles and refractive indices which will

cause deviation without dispersion for any given pair of wave-lengths will, to a very slight extent in most cases, fail to do so for the other wave-lengths present in the mixed light transmitted through the system. By the use of three prisms three wave-lengths may similarly be achromatised.

Where the absorption-band is within the visible spectrum, remarkable consequences may follow—e.g. iodine vapour refracts red light more than blue, and blue less than violet; and fuchsin in solution refracts blue and violet light less than it does red, orange, and yellow, while it absorbs the rest. These are classified as phenomena of *anomalous dispersion*; but they are direct consequences of the laws of the relation of dispersion to absorption-bands. Further, in these cases of 'anomalous dispersion,' the substance generally has, in the solid form, a surface colour different from that seen through the solution.

DOUBLE REFRACTION.—The wave-surface developed when a disturbance originates at a point in a homogeneous medium, such as glass, is spherical in form. In uniaxial crystals (see CRYSTALLOGRAPHY) the disturbance travels with two wave-fronts, one spherical, the other ellipsoidal; and the two wave-fronts are coincident along the direction of the optic axis. Of such crystals some are *positive*, such as quartz and ice, and in these the sphere encloses the ellipsoid: in *negative* crystals, such as Iceland spar and tourmaline, the ellipsoid encloses the sphere. If then a beam of light, plane-fronted,

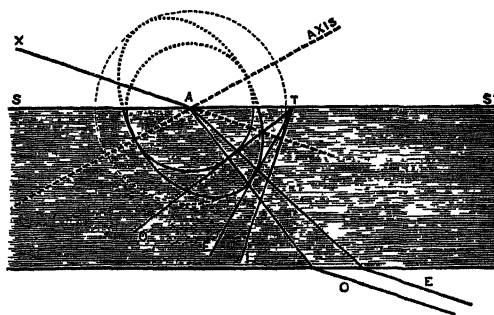


Fig. 6.

fall upon a slice of Iceland spar, the disturbance at any point such as A (fig. 6) is transmitted from that point in two portions; one portion is refracted, according to the principles of fig. 2 in article REFRACTION, as an *ordinary* refracted ray, O; the other is refracted in a way determinable by using in the construction, instead of the spheroid or arcs of a circle, the corresponding ellipsoid, or arcs of the appropriate ellipse, and it gives rise to the *extraordinary* refracted ray, E. The radius of the smaller circle is to that of the greater as $1:\mu$; the tangent to the greater circle, at right angles to XA, cuts SS' in T; tangents TO' and TE to the smaller circle and the ellipse are also drawn so as to pass through T; the ray XA is deflected so as to pass through the points at which these tangents touch these curves; and thus there are two refracted rays, and an eye towards OE will see two images of X. The light in the ordinary ray O is found to be polarised (see POLARISATION) in a plane containing both the incident ray and the crystalline axis: the extraordinary ray E is polarised in a plane at right angles to this. In biaxial crystals the three optical axes are dissimilar, and the wave-surfaces become complex: there are two refracted rays. If a doubly refracting substance be put between two crossed Nicol's prisms (see POLARISATION), light passes; and

by this means it is found that many substances ordinarily not double refracting become so when exposed to unequal stress, as by pressure, heat, or rapid cooling.

CONICAL REFRACTION.—In certain cases light, passing as a single ray through a plate of a biaxial crystallised body, emerges as a hollow cone of rays; and in others a single ray, falling on the plate, becomes a cone inside the crystal, and emerges as a hollow cylinder. These extraordinary appearances were predicted from the wave theory of light by Sir W. R. Hamilton (q.v.), and experimentally realised by Lloyd. See *Preston's Theory of Light* (4th ed. 1912).

Refrigerants 'are remedies which allay thirst and give a feeling of coolness,' although they do not in reality diminish the temperature of the body. The following are the refrigerants in most common use for internal administration: water, barley-water, dilute phosphoric or acetic acid, citric and tartaric acids taken in combination with bicarbonate of potash as effervescing draughts, ripe grapes, oranges, lemons (in the form of Lemonade, q.v.), tamarinds, chlorate of potash (ten grains dissolved in water, and sweetened with syrup, to be taken every third or fourth hour), and nitrate of potash, which may be taken in the same manner as the chlorate, or as *nitre-whey*, which is prepared by boiling two drachms of nitre in a pint of new milk; the strained milk may be given in frequent doses of two or three ounces.

Refrigeration, the artificial production and maintenance of low temperatures, is a modern art chiefly developed for the preservation of perishable foods. No doubt the observation that meat, milk, &c., keep longer in cool weather is a very ancient one, but the power to create favourable conditions at will involved a knowledge of the properties of insulating materials, availability in hot weather of ice, the only practical cooling medium, while the demand for such accommodation would only arise at a certain stage in material development. Frigorific mixtures for producing low temperatures were known in the beginning of the 17th century, and are still in use for scientific or minor purposes. In the early years of the 20th century a small ice-making machine was placed on the market, depending on the refrigerating effect of ammonium nitrate dissolved in water, and for making ice cream, the ice-and-salt method is still the principal one in this country. Fahrenheit, in working out his thermometer scale, obtained what he conceived to be the absolute zero from a mixture of ice and salt in 1762. Ice has been made in certain districts in India from a time that cannot be dated, by the atmospheric evaporation at night of water in shallow trays placed on an insulating layer of straw to cut off the earth heat. Practical refrigeration, however, for commercial purposes can hardly be said to have existed earlier than the middle of last century, although the idea of the refrigerating machine had been gradually developing in the previous hundred years.

The use of ice and of the refrigerating machine for cold storage went forward together. The first mild cured bacon in this country was produced by the aid of ice, and not so long ago many of the Danish factories used ice only, accumulating great stores in the winter time, and insulating the heaps with sawdust.

The refrigerating machine has everywhere been substituted, but ice still holds a very important place in refrigeration, and although large numbers of butchers, dairymen, fishmongers, and other small users have mechanical refrigerating plants, the greater number, especially of butchers and fishmongers, still depend on insulated chambers cooled

with ice, for fish and fresh meat, or ice and salt mixture for frozen meat. The refrigerating machine now holds the entire field for large scale work, and for the smaller purposes it is also gradually attaining the lead.

All refrigerating machines are founded on the transformation of energy involved in the latent heat of expansion or of evaporation. When a solid changes into a liquid, or a liquid into a vapour, a considerable amount of heat is absorbed, or, in the old phrase, becomes latent. In reality the heat has been transformed into the mechanical energy necessary to change the state of the material. In refrigerating machines the expansion or evaporation is usually effected or assisted, not by the application of heat, but by mechanical power, and the refrigerant is, therefore, compelled to find from its surroundings the heat necessary to the change of state, and in this way the refrigerating effect is produced.

Refrigerating machinery is divisible into several distinct classes, in accordance with the nature of the refrigerant and the refrigerating process made use of.

When air is compressed, heat is liberated in amount proportionate to the degree of compression. If this heat is removed with cooling water, and the compressed air allowed to expand, and at the same time made to do mechanical work, the heat required to maintain it in its original state is reabsorbed from the surroundings, and refrigeration is produced. This is the principle of the cold-air refrigerating machine, which, as perfected by Bell-Coleman, Lightfoot, and Haslam, brought over the first three successful cargoes of frozen meat from Australia in 1880. Owing to the fact that the air is merely compressed—not liquefied—the cold-air machine requires an excessive amount of power, and this, together with some difficulties connected with the freezing of the moisture in the air, has led to its supersession, except for some purposes where costs do not count.

The vacuum machine for ice-making was invented by Dr Cullen in 1755, but the first practical machine was Edmond Carré's, developed about a hundred years later. In the vacuum process, ice is made by the rapid evaporation at reduced pressure of a portion of the water being frozen. The pressure must be lowered sufficiently to enable the water to boil at, or under, freezing-point, and this is brought about by the action of an air-pump, aided, in Carré's machine, by an absorbent—sulphuric acid. Although vacuum plants have been made of considerable capacity, they have not come much into use, as they are expensive and troublesome to work, and the ice produced, which is opaque, or rotten, does not find favour among users. Small plants of this type are still exported in fair numbers to hot countries, and hand-driven sizes turn out a pound or two of ice in a few minutes.

The absorption system was the invention of Ferdinand Carré, a brother of Edmond, and the first machine was produced in 1858. The laboratory type consisted of two iron cylinders joined overhead by an arched iron pipe. One cylinder was about half full of strong ammonia solution. When heated, ammonia gas distilled off and was liquefied in the other cylinder, which was placed in cold water. After the distillation of gas was completed the process was reversed, the distilling cylinder going into the cold water, and that containing liquefied ammonia into the water to be frozen. The liquid ammonia under high tension rapidly distilled back, and dissolved again in the water of the distilling cylinder, while the heat, becoming latent during evaporation, was withdrawn from the water being made into ice. This simple apparatus was not very efficient, as a considerable

amount of water distilled over with the ammonia gas into the liquefying cylinder.

On a large scale reversing was got rid of by the use of pumps, and means were devised for condensing the water vapour accompanying the distilled ammonia. The plan then consisted of the following elements: the generator, in which the ammonia solution was distilled, and the analyser or desiccator, in which the vapours from the generator met a descending current of ammonia liquor, which condensed practically all the water vapour and carried it back to the generator, while the purified ammonia gas passed on to the condenser where it was liquefied by its own pressure and cooling water in pipe coils. From the condenser the liquid ammonia went to the evaporator placed where the cooling effect was required, and the evaporated anhydrous ammonia was again dissolved in water in the absorber. This water usually consisted of the spent liquor from the generator, drawn off and pumped through an exchanger, where it gave up its heat to the current of cold ammonia solution from the absorber on its way back to the analyser and generator. And so the process went on continuously in a closed cycle. At the present time the absorption machine has still a certain vogue; large and much improved units are in existence, and where exhaust steam can be used as the heating agent, the process is said to be very economical, although somewhat extravagant, in cooling water. Certain small installations avoid the use of pumps by having two cylinders, each used alternatively, as generator and absorber, and these are useful where the vibration of running machinery would be objectionable.

The compression machine, which now carries the greater part of the burden of refrigeration, is founded on the principle that volatile liquids evaporated *in vacuo*, or, at diminished pressure, develop low temperatures. This observation was made by Dr Cullen in 1755, but the first practicable compression machine was that patented in 1834 by Jacob Perkins. It contained all the elements of the present day compression system, which are illustrated in the accompanying diagram. On one side is the evaporator with one or a series of

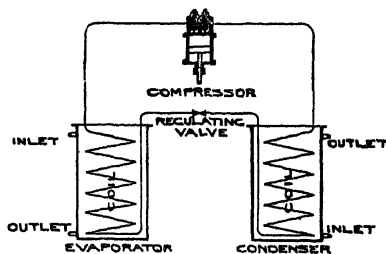


Diagram showing the compression system as applied to modern refrigerating machines.

pipe coils, in which the refrigerant is rapidly evaporated by the diminished pressure created by the compressor, which is really a pump. It is shown in a brine tank in which an unfreezeable brine—generally a 25 per cent. solution of calcium chloride in water—is cooled to a low temperature by giving up its heat to the evaporating liquid in the coil. The cold brine is then circulated by a pump to where the cooling effect is required. The compressor delivers the evaporated refrigerant to a corresponding coil, or coils, shown on the other side of the diagram, which is called the condenser. This coil is placed in a tank through which is a circulation of cold water, and as the compressor condenses the vapour the heat absorbed in evaporation reappears, and is removed by the cooling

water, and the refrigerant is again liquefied. The ends of the coils are connected by a pipe, on which is a regulating valve, adjusted to give the correct flow of liquid refrigerant back to the evaporator, in accordance with the readings of pressure gauges placed on each side of the system. The process is thus continuous, and one charge of refrigerant would be everlasting, if leakages could be prevented.

Various refrigerants have been proposed, and used, in compression machines. Jacob Perkins made use of a volatile liquid obtained by the destructive distillation of caoutchouc. Ether was the refrigerant in the earlier machines, and the ether machine is still, to some extent, in favour in hot countries. Permanent gases, liquefied under pressure, are far more powerful refrigerants, and sulphur dioxide (SO_2), carbonic anhydride (CO_2), and anhydrous ammonia (NH_3), now almost monopolise the field, although methyl chloride has a certain limited and local vogue. The machines using these various refrigerants, although alike in principle, differ considerably in detail. SO_2 has a working pressure of 35 to 50 lb. per sq. inch, CO_2 , 750–1000 lb., and NH_3 , 140–150 lb., and the quantities required to be evaporated for a given refrigerating effect differ widely. SO_2 requires large cylinder space; CO_2 a very small; and NH_3 a medium pumping capacity. The widely different working pressures necessitate corresponding differences in construction; but, with well designed machines, the refrigerating output for a given amount of power is very nearly alike for each refrigerant. There are many types of compression machines—vertical and horizontal, single or double-acting, belt-driven or direct coupled to engine, and duplex and marine types—designed to economise space. The condenser may be of the submerged type as indicated in the diagram, or it may be of the atmospheric type which economises cooling water, or the double-pipe condenser which is coming into favour.

The refrigerating effect is conveyed in different ways to the insulated cold storage rooms and other spaces or apparatus to be cooled. The brine circulation, already referred to, is very commonly through grids of pipes on the ceiling or sides of the cold room, or the brine pipes may be stacked together in a separate room, and the air of the cold rooms circulated over them by a fan, or the brine may be exposed in cascades or films in the separate room to the action of the fan. Frequently the brine is eliminated, and the expansion pipes made to replace the brine pipes in the cold room, or built into a separate expansion air-cooler with a fan. The direct expansion method avoids many losses inherent in brine circulation.

Ice-making, which is now a large industry, is conducted in insulated tanks, usually of iron or mild steel, and the freezing is effected by a circulation of cold brine from the refrigerating machine, or the expansion pipes are placed in a compartment of the ice-tank, and the brine is circulated over them by a propeller. An ice-tank may be divided into spaces by hollow partitions in which the cold brine circulates, large slabs called plate ice being thus produced. If the water-freezing spaces between the partitions are divided by lateral partitions, cell ice is the product. The larger quantity of ice, however, is now made in galvanised sheet steel moulds hung in the ice-tank, and this is described as 'can' ice.

To get the ice clear and hard, agitating gear is required to eliminate the minute bubbles of air which separate as the water freezes, and which, if left, produce opaque or rotten ice. Ice adheres tenaciously to the partitions or cans, and is separated from the former by a circulation of warm

brine, while the latter are dipped in a tank of lukewarm water, the thin film melted in either case loosening the blocks.

The overseas trade in frozen meat is now of very large dimensions, and the shipping of fresh meat carried at just above freezing-point is increasing rapidly. Success in the business is secured by maintaining a constant temperature throughout, variations not exceeding one degree either way, with assistance on the longer voyages from a circulation of antiseptic gases.

Fresh meat is more valuable than frozen meat. Refrigerated butter, cheese, and hard fruits, such as apples, come over from Australia and many other places in large quantities, and Canadian and other colonial cheese is largely ripened in cold storage. The difficulties in the way of shipping soft fruits have not yet been overcome, but progress is being made in this direction. The freezing of fish for transport has now become practicable, the use of a very low-temperature salt brine having got over the tendency of all kinds of frozen fish to 'fall down,' or become flabby when thawed. Under the conditions the salt does not penetrate, and the fish thaw out fresh. To handle these various goods, a network of public and private cold storages on an expensive scale is required at home and abroad.

Refrigeration has revolutionised the bacon trade. In the old way, curing could only be done successfully in the cold months of the year, and the bacon had to be made very salt to keep. The necessary low temperatures are now maintained continuously, and curing goes on throughout the year, so that bacon is produced only for quick consumption, and is mild cured and more palatable and nutritious than it used to be.

Brewers ripen their beer in cold storages, and they use quick chilling in conjunction with carbonating plant to 'condition' beer rapidly. Refrigeration is also an essential element in the manufacture of bakers' yeast.

In the preparation of lard and lard compound, revolving chilling drums, with an internal circulation of cold brine, are extensively used to produce a smooth waxy product without 'grain.' Oils, such as cod-liver, whale, neat's foot, &c., have their stearine separated by exposure to a low temperature, and, in a similar manner, solid paraffin wax is separated from lubricating oils. Most of the large general stores now have fur rooms, where fur garments are kept, at a temperature of 40° F. or under, in the summer. At this figure the eggs of moths, which produce destructive grubs, cannot hatch out, and damage is thus avoided.

Refrigeration has been applied on a large scale with economical results to freezing out the moisture in air supplied to blast-furnaces. Another use is the solidifying of wet or boggy ground through which it is necessary to sink pits or wells, brine circulation through a ring of double pipes sunk in the ground being the method employed.

The air in some theatres and restaurants in Germany and the United States has been cooled by mechanical refrigeration in the hot weather. One rather curious application is the separation of optical glasses from the bituminous matrix in which they are held in grinding. The old method was to chip them out with a chisel, with an average of breakages of 10 per cent. Now the mushroom head with the glasses is dipped in cold brine, and the separation takes place by differential contraction with scarcely ever a breakage.

Refugee. See CITY OF REFUGE, ÉMIGRÉS, EXTRANATY, HUGUENOTS, POLITICAL OFFENCES, SANCTUARY.

Refuse. See WASTE PRODUCTS.

Regalbuto, a town of Sicily, 25 miles WNW. of Catania; pop. 12,500.

Regalia, the ensigns of royalty, including more particularly the apparatus of a coronation. The regalia, strictly so called, of England consist of the Crown (q.v.), the Sceptre (q.v.) with the cross, the verge or rod with the dove, the so-called staff of Edward the Confessor (made in reality for Charles II.), the orbs of king and queen, the blunt sword of mercy called Curtana, the two sharp swords of justice, spiritual and temporal, the ampulla or receptacle for the coronation oil, the anointing spoon (probably the only existing relic of the old regalia), the armillæ or bracelets, the spurs of chivalry, and various royal vestments. All these, with the exception of the vestments, are now exhibited in the Jewel-room in the Tower of London. See BLOOD (THOMAS), and Sir G. Younghusband, *The Jewel House* (1920).

The proper regalia of Scotland consist of the crown, the sceptre, and the sword of state. The sceptre is of the time of James V.; the sword was a present from Pope Julius II. to James IV. in 1507. During the Civil War the regalia were removed by the Earl Marischal for safe custody from the Crown-room of Edinburgh Castle, their usual place of deposit, to his castle of Dunnottar (q.v.); and from the Restoration to the Union the regalia continued to be kept in the Crown-room as formerly. From the Union till 1818 the regalia remained locked in a chest in the Crown-room; but in 1818, an order being obtained from the Prince-regent, the chest was broken open, and the crown, sword, and sceptre are now in the charge of the officers of state for Scotland, and are exhibited in the Crown-room. See Sir Walter Scott, *The Regalia of Scotland* (1819); and Douglas Barron, *The Defence of the Regalia* (1911), and *The Castle of Dunnottar* (1926).

Regality, BURGHs OF. See BOROUGH.

Regatta. See YACHT, ROWING.

Regelation. See ICE.

Regeneration, a technical term in biology for the regrowth of lost parts—e.g. arms of starfish, legs of crab, tail of lizard. The regenerative capacity tends to occur in those organisms and in those parts of organisms which are in the natural conditions of their life particularly liable to non-fatal external injury. See T. H. Morgan, *Regeneration* (New York, 1901).

In theology, regeneration is the spiritual change which passes on all men in becoming Christians; its necessity in some shape is recognised by all branches of the Christian church. As the condition of his becoming truly Christian, a man must pass from a state of nature to a state of regeneration, from a state in which he obeys the mere impulses of the natural life to a state in which a new and higher—a divine—life has been awakened in him. The words of Christ to Nicodemus: 'Verily, verily, I say unto thee, except a man be born again, he cannot see the kingdom of God,' are accepted as the expression of this universal necessity by the Christian church. It may be further stated that every branch of the Christian church recognises, although under very different conditions, the Holy Spirit as the author of this change. The change in its real character is spiritual, and spiritually induced. According to a large portion of the Christian church, however, the change is normally involved in the rite of baptism. In the Catholic view baptism constitutes always a real point of transition from the natural to the spiritual life. The grace of baptism is the grace of regeneration; and among the direct effects of baptism are (1) the remission of all sin, original and actual; (2) the remission of the penalties due for sin both temporal

and eternal; (3) the bestowal of sanctifying grace and the infused virtues; (4) the imprinting of an indelible 'character' on the soul; besides (5) making the recipient a member of Christ and the Church, and qualifying to receive the other sacraments. The usual Protestant doctrine of baptism is explained at BAPTISM; and see also GORHAM. Protestants hold for the most part that regeneration is a special, conscious process which takes place independently of baptism or of any other outward fact or ceremony. It implies a sensible experience—an awakening whereby men come to see the evil of sin and the divine displeasure against sin, and through the Holy Spirit are born again, put away their former evil life, and begin to live a new divine life. Technically Conversion (q.v.) is the action upon man, Regeneration the agency of God.

Regenerator Furnace. See GLASS.

Regensburg. See RATISBON.

Regent, one who exercises the power without having the name of a king. In a hereditary monarchy there are various circumstances which may necessitate the delegation of the, sovereign power—as the devolution of the crown on a minor too young to be entrusted with the kingly office; the incapacity of the sovereign by illness, mental or bodily; and the case of absence from the realm. A regent under the title of Protector (q.v.) has often been appointed to exercise royal authority in the sovereign's minority, the latest instance in England being during the minority of Edward VI.; and regents and councils of regency have been sometimes named by the sovereign to provide for the probable nonage of his heir. During the frequent absences of the first two kings of the House of Hanover in their continental dominions it was the practice to appoint regents or Lords Justices to exercise the powers of sovereign. See JUSTICES (LORDS). In 1788, when George III. became incapacitated by insanity from exercising the kingly office, it became a question whether his eldest son, then of full age, had a right to be regent, or whether the nomination rested with parliament. The chief political authorities of the time were divided in their judgment, but the king's recovery ended the discussion. On the return of the malady all parties were unanimous that the regency should be conferred on the Prince of Wales, and this was done by parliament. Regency Bills were passed in 1830, 1840, and 1910. For Regent in universities, see UNIVERSITY.

Reger, MAX, German pianist and composer, was born at Brand (Bavaria), 19th March 1873, the son of a schoolmaster, to whom he owed his first musical training. Later he studied under Hugo Riemann at Sondershausen and Wiesbaden (1890-95), and taught at Wiesbaden and Munich. In 1907 he became Director of Music at Leipzig University, and 1908-13 was professor at the Conservatorium. He died at Leipzig, 11th May 1916. Reger's output, mostly in the domain of chamber-music, was enormous. His compositions, of which his organ-music and songs are the best, never depart from classical traditions; they are marked by a wealth of harmony and polyphony, but frequently tend to over-complexity and obscurity. He published a *Modulationslehre* in 1912.

Reggio di Calabria (anc. *Ῥήγιον*, or *Regium Julium*), a seaport and archiepiscopal see of South Italy, stands on the Strait of Messina, 9 miles SE. of the city of Messina in Sicily. Manufactures of silks, scented waters, gloves, stockings, and caps—the last three made from the byssus of the Pinna (q.v.)—the cultivation of fruits, wine, and olives, and fishing are carried on. Pop. (1921)

29,421 (town); 159,516 (commune). The ancient *Regium* was founded by Greeks in the 8th century. It was taken and destroyed by Dionysius of Syracuse (387 B.C.), the Romans (270), Alaric (410 A.D.), Totila (549), the Saracens (918), and captured by Robert Guiscard (1060), Pedro of Aragon (1282), and the Garibaldians (1860). In 1783 it was ruined by an earthquake, and again totally destroyed in 1908. Various ancient remains have been found from time to time.—The province of Reggio di Calabria has an area of 1221 sq. m. and a pop. of 500,000.

Reggio nell' Emilia, a city and episcopal see of Northern Italy, 38 m. NW. of Bologna. The cathedral, dating from the 12th century, was reconstructed in the 15th and 16th. The Madonna della Ghiara has fine stucco decorations of the early 17th century. There is a museum with important palæoethnological and prehistoric collections. The town is the centre of a rich agricultural district; cheese is made, and there are other manufactures. *Regium Lepidum* was probably founded by M. Aemilius Lepidus when the Via Aemilia was built in 187 B.C. In the 12th and 13th centuries it was a republic, but later passed under Modena. Pop. 83,000 (commune); 347,000 (province).

Regiam Majestatem, a collection of ancient laws bearing to have been compiled by order of David I., king of Scotland. The authenticity of the work has been controverted, a prevalent opinion being that it is a compilation from Glanville's *Tractatus*. Some authorities attribute the collecting of it to a commission of Edward I., others to an unknown author after the war of independence. Sir J. Skene edited and translated it (1609).

Regicides, the men who were appointed on the parliamentary committee to try King Charles I., but in a narrower sense the men, sixty-seven in number, who actually sat in trial upon him. Of these only fifty-nine signed the death-warrant. After the Restoration the regicides were brought to trial on a charge of high-treason. Twenty-nine were condemned to death, but only ten were executed, nineteen, together with six others who were not tried, being imprisoned, most of them for life. More than twenty who were already dead were tried and condemned all the same, and Cromwell, Ireton, and Bradshaw, three of them, were exhumed and hanged at Tyburn, and then reburied at the foot of the scaffold. For regicides in a wider use of the term, see ASSASSINATION.

Regillus, LAKE, lay in Latium, to the south-east of Rome, probably near the modern Frascati; it is celebrated in the semi-legendary history of Rome as the scene (496 B.C.) of a great battle between the Romans and the Latins, fighting on behalf of the banished Tarquin, in which the latter were entirely defeated.

Regiment, a unit consisting of a number of squadrons of Cavalry (q.v.), batteries of Artillery (q.v.), or Battalions (q.v.) of Infantry. Regiments are spoken of at the time of the Armada, 1588, and as composing the force in Ireland, 1598. Charles I. and the parliament each raised regiments, all of which were disbanded at the Restoration, with the exception of the Lord-general's Regiment of Foot and his Life Guard of Horse. These two were re-engaged (1661) and form the present Coldstream Guards and Royal Horse Guards. In the same year a Scottish corps of 1700 men, which had taken service in France in the time of James I., returned to England, and was included in the British army as the 1st Foot. See ARMY. In 1693 was raised the 1st troop of Horse Grenadier Guards, and the 2d troop in 1702. These were re-formed in 1782 as the 1st and 2d Life Guards.

Regina, since 1905 capital of the province of Saskatchewan, is 356 miles west of Winnipeg, and 1885 feet above the sea. From its position on the Canadian Pacific and Canadian National railways, it is a great distributing centre, with large grain and lumber industries, and has rapidly increasing manufactories of agricultural machinery, &c. Notable edifices are the parliament buildings, post-office and city hall, and several of the churches. The town suffered terribly from a destructive cyclone on 30th June 1912, which wrecked many churches and public buildings. Pop. (1901) 2645; (1911) 30,210; (1921) 34,432.

Regiomontanus, the name given, from his birthplace, to the mathematician and astronomer Johann Müller, born at Königsberg in Franconia, 6th June 1436. He studied at Vienna and in Italy, and was called by Matthias Corvinus to his court at Buda; but in 1471 he settled in Nürnberg, where a learned and wealthy citizen, Bernhard Walther, subsidised him so as to enable him to construct mathematical and astronomical instruments and found a famous printing-press. The two laboured together at the correction of the 'Alphonsine Tables,' and jointly published *Ephemerides 1475-1506* (1478), of which Columbus and other early navigators made much use. Regiomontanus not only worked at astronomy, but restored the study of algebra in Germany, extended the science of trigonometry, and published treatises on water-works, burning-mirrors, weights and measures, &c. He was summoned to Rome by Pope Sixtus IV. to assist in reforming the calendar, was made Bishop of Ratisbon, but died at Rome, 6th July 1476.

Among his works are *De Doctrina Triangulorum* (1463); *De Quadratura Circuli* (1463); *Calendarium* (1473); *De Reformatione Calendarium* (1484); *De Cometæ Magnitudine* (1531); *De Triangulis Omnimodis* (1533). See Ziegler, *Regiomontanus, ein geistiger Vorläufer des Kolumbus* (1874).

Register of Voice. See VOICE.

Registers, PARISH. The place which parish registers now fill was formerly, but only in very small part, supplied by monastic registers, which, however, as a rule registered only deaths of important persons, so as to be able to tell when masses became due, and were usually confined to the families of founders, benefactors, and the like. Entries were also sometimes made in the missals of parish churches, and the monastic chronicles often contain necrologies, whilst mortuary rolls were regularly sent round from monastery to monastery. These were in effect the sole early public registers, but private necrologies were sometimes kept by the chaplains of great families—e.g. Friar Brackley has left one of the Pastons and Mawtlys—and Burn (*History of Parish Registers*) mentions several entered in the flyleaves of private books of devotion. But it is mainly to the monastic cartularies and to inquisitions *post-mortem* and proofs of age that we must go for information on births and deaths of the pre-Reformation times.

It is probable that the injunction of Thomas Cromwell in 1538, ordering parish registers to be kept under the system now in vogue, was intended, like Edward VI.'s scholastic foundations, to meet one of the immediate difficulties involved in the suppression of the monasteries. Had this injunction been strictly acted on we should now be in possession of complete registers from that date onwards. But, perhaps owing to the fall, soon after, of the author of the injunction or to the general laxity of the incumbents, very little heed was taken of it, and the evil which this neglect entailed became so crying that Elizabeth in 1597 issued a stringent order that not only should

the registers be better kept, but copies of them should be yearly sent to the bishop of the diocese, an order which in 1812 was supplemented by an act enjoining the preservation, arrangement, and indexing alphabetically of the names on the registers. But nothing has been of much value against the incorrigible neglect of the incumbents and bishops. Early transcripts are practically non-existent, and even those of the 18th century are most imperfect. In the returns of the population abstracts in 1801 it was discovered that amongst 11,000 parishes in England 812 registers dating from 1538 alone existed, and later returns in 1834 showed that even that small number had decreased through the negligence of the clergy in the interval. These last returns give full details as to the date of the commencement of each register in England.

Such registers often contain much valuable information as to the history of the parish, many incumbents slightly overstepping their strict duty by putting down noticeable and curious incidents which occurred from time to time.

Registration may be described as a record of certain legal facts or transactions inserted in a book called a register and kept at a public office. Its main purposes are to preserve an authentic account of matters of public concern, to secure for them a means of publicity, and to simplify the methods of proving them. In all civilised states the registration of certain facts or transactions has been deemed necessary. In Rome public books of record existed from an early period. In later times a practice of inscribing in a public record copies of documents dealing with transactions affecting private interests came into use. The emperor Leo, recognising the existence of this practice, adopted it as a method of validating gifts; and in the later Roman empire a system of registration (*insinuatio*) for gifts was fully established and rigorously applied. Under Justinian a gift exceeding a certain amount was, if unregistered, void as to the excess. In modern systems of law a system of registration is employed in many different departments and for many various purposes. Thus in England many statutes provide for the registration of matters of public concern and make duly authenticated extracts evidence of the contents of the register. Whenever indeed it is the duty of a public official under English law, either at common law or by statute, to record certain facts in any book which is intended to be kept as a register to be referred to ever after, the book is admissible in evidence to prove not only that such official made those entries but also that the facts which he recorded are true.

Registration of judicial proceedings.—In all countries the decrees of courts of justice, civil and criminal, are registered. In England registrars are attached to the Privy Council, the several Divisions of the High Court and the County Courts. In the King's Bench Division the duties of registrars are performed, except in its bankruptcy jurisdiction, by the masters. The registrars record the proceedings of the court at each stage up to the final judgment, and with them affidavits, pleadings, &c., are filed. Probates of wills and letters of administration, both of which are really judicial proceedings, are recorded either in the principal registry of the Probate Division of the High Court or in one of the district registries. When a will is proved the original must be deposited in the registry of the Court and a copy thereof on parchment, called the probate copy, is made out under its seal and delivered to the executors, together with a certificate of its having been proved. The probate is conclusive as to what the will is. It can only be corrected on application to the Probate Division.

Registration of title to land and of deeds affecting land.—There are two main systems of public registration in respect of land—registration of title and registration of deeds. A register of title is an authentic and self-explanatory record of the state of the title to the land registered in it. A system of state registration of title to lands is in operation in many countries. Under this system the state establishes and maintains a register in which the names of the persons who own, or have proprietary interests in, particular lands are entered and in which are recorded all changes in the ownership of the land and all dealings with interests in it or burdens affecting it. The Torrens system of registration of title to land, introduced in South Australia in 1858 at the instance of Sir Robert Torrens, the first premier of the colony, was subsequently adopted in its main features in all the other Australian colonies as well as in Canada, and is the foundation of the system set up in England by the Local Transfer Acts 1875 and 1897. Where a system of state registration of title is fully operative, entry on the register constitutes the only title to land, and dealings with the land are ineffectual unless noted on the register. The principal objects of such a system of state registration are to obtain a public record of the ownership of land, to secure certainty of title in land, and to facilitate its transfer. Distinct from the system of registration of title is the system of registration of deeds affecting land. Under this system the register contains merely a statement of the deeds affecting the land, generally giving either a transcript or an epitome of each of these deeds. Such a register, while it affords a measure of protection to the persons concerned, leaves them to draw their own conclusions as to the effect of these deeds on the title to the land, and does not import any guarantee of title.

In England registration of title was first introduced as a voluntary system by the Land Registry Act, 1862. The system instituted by that act did not prove successful, and was replaced by the Land Transfer Act, 1875. Under the Act of 1875 registration continued to be optional, and the new system set up by the act did not have the effect of increasing the use of registration. The Land Transfer Act, 1897, amended the Act of 1875 in important particulars and also contained provisions under which—subject to the exercise of a power of veto given to the county council—registration on sale might, by Order in Council, be made compulsory as respects any county or part of a county. Under these provisions Orders in Council were made rendering registration compulsory in the city and county of London; but elsewhere registration under the Land Transfer Acts remained optional. These acts, together with amendments contained in the Law of Property Acts 1922 and 1924, are now consolidated by the Land Registration Act 1925 (15 Geo. V. chap. 21) which came into operation on 1st January 1926. That act—in addition to making certain changes designed to bring the system of registration of title into line with the changes effected in the law of property by the Law of Property Act, 1925, the Land Charges Act 1925, and the other property statutes which came into operation on the same date—makes a noteworthy change with respect to the extension in future of the area of compulsory registration; for it is provided that, after the expiry of ten years from the commencement of the act, i.e. on and after 1st January 1936, the system of compulsory registration may be established in any county or part of a county by Order in Council, without any resolution by the county council in favour of such extension and notwithstanding any resolution of the county council that

such extension is not desirable. After 1st January 1926 the only interests in land in respect of which a proprietor can be registered are those which under the Law of Property Act 1925 are recognised by law as 'legal estates.' All other interests in registered land take effect as equitable interests. A legal estate cannot be held by an infant. Registration confers on the registered proprietor statutory powers to deal with the land (subject to entries on the register) in any way permissible by the general law. Thus he can not only transfer and charge the land but he can also lease it and create easements and restrictive covenants. A transfer of the land, or of any part of the land, comprised in the title of a registered proprietor, is completed by the registrar entering on the register the transferee as proprietor of the land transferred. As regards deeds affecting interests in lands—a system of registering such deeds had long been in use in Middlesex and Yorkshire. By the Land Charges Registration and Searches Act, 1888, amended by the Land Charges Act, 1900, a general system for the registration of deeds of this description was brought into operation. This system is now regulated by the Land Charges Act, 1925 (15 Geo. V. chap. 22), which provides that there shall continue to be kept at the office of Land Registry (1) a register of pending actions relating to land; (2) a register of annuities or rent charges, granted otherwise than by marriage settlement or will, for a life or lives, if created prior to 1st January 1926—these charges, after that date, to be entered in the register of land charges; (3) a register of writs and orders affecting land; (4) a register of deeds of arrangement affecting land; (5) a register of land charges. The act has greatly extended the classes of 'land charges,' which must be registered in the register of land charges to render them binding on a purchaser.

Registration of Writs in Scotland.—In Scotland there exists, and has long existed, a very complete system of registration of legal writs. This system has three main purposes or applications, viz. publication, execution, and preservation. Registration for publication has been developed and applied chiefly in relation to writs dealing with proprietary and subsidiary rights in land. The existing system of land registration owes its origin to the statute 1617 chap. 16. That statute established a general register at Edinburgh and particular or local registers throughout the country, and directed that all sasines and all writs relating to the constitution, transfer and discharge of redeemable rights in land, should be registered therein within sixty days of their dates, writs relating to burghage subjects being excepted. When, by statutes passed about the middle of the 19th century, the instrument of sasine and the whole ceremony of sasine were dispensed with, the direct recording of the deed of conveyance, with warrant of registration thereon, was recognised as a sufficient completion of the disponee's real right. In place of the deed itself a notarial instrument, describing the nature of the deed and setting forth its operative parts, may be recorded. Registration may now take place at any time during the life of the person on whose behalf the writ is presented for registration. The Land Registers Act, 1868, abolished the particular feudal registers, made the general register the only competent register for all writs relating to lands not held burghage, and provided that the general register should be divided into a series of separate divisions, and that writs be entered in the division applicable to that county or registration district in which the lands affected by the writs are situated. Each royal burgh, with a few exceptions, had its register in which conveyances of land held burghage were recorded; and, notwith-

standing the abolition by the Conveyancing Act 1876 of the distinction between feudal and burghage tenure, writs of lands held burghage immediately before the commencement of that act still fall to be recorded in the burgh registers. Other registers for the publication of writs affecting land are the register of entails and the register of inhibitions and adjudications. Registration for execution, i.e. for the enforcement of an obligation, is of very ancient origin. The process, which in early times was in its essential features simply an abbreviated action in court, now retains scarcely any distinctive marks of its judicial origin. In a bond or other deed by which an obligation is constituted a short statutory clause is inserted consenting to registration for preservation and execution—a clause which imports consent to the writ being registered in the books of a competent court and to a summary warrant for execution being issued as if a judicial decree for its enforcement were pronounced. By special statute the privileges of registration in order to summary enforcement are extended to bills and promissory notes, the acceptance and subscription of which implies a consent to registration for execution. Registration for preservation provides against the loss of important writs, and has the convenience of enabling parties to obtain at any time authentic copies of the registered writ, in the form of extracts from the register. The records now available for registering deeds for preservation or execution are these: (1) The Register of the Great Seal; (2) the Books of Council and Session, for all deeds and probative writs; (3) the books of any Sheriff Court for all deeds and probative writs; (4) the books of royal burghs for instruments of protest on bills or notes; (5) the General Register of Sasines, for deeds that are recorded for preservation or for preservation and execution as well as for publication.

Registration of Electors.—It is a condition precedent to the right of any person to vote in a parliamentary election or in a local government election that his or her name should be upon the register of electors for the time being in force. The Representation of the People Act, 1918 (8 Geo. V. chap. 64), introduced new qualifications for the franchise; extended the franchise to women, subject to certain limitations; shortened the period of qualification from one year to six months; and established a system of official registration of electors. The register, which contains the names of those who are entitled to vote as parliamentary electors and of those who are entitled to vote as local government electors, is compiled by the registration officer for each registration area. In England each parliamentary county or borough is a registration area; and the registration officer is, in counties, the clerk of the county council, and, in boroughs, the town-clerk. In Scotland each burgh which was entitled under the law in force at the date of the act to appoint an assessor for the purpose of parliamentary registration, and—exclusive of such burghs—each county, or each part of a county which lies within a separate parliamentary division, is a registration area; and the assessor of the burgh or county under the Valuation Acts, or one of such assessors appointed for the purpose by the town or county council, is the registration officer. Two registers of electors are prepared in every year—one, the Spring Register, for the qualifying period of six months ending 15th December, and the other, the Autumn Register, for the qualifying period of six months ending 15th June. The registration officer is charged with the duty of ascertaining what persons in the area for which he is registration officer are entitled to be registered as parliamentary and as local government electors by reason of their having fulfilled

the conditions of the franchise during the qualifying period, and of placing the names of these persons on the register. For this purpose instructions may be issued to the overseers of parishes who make the necessary inquiries. The registration officer may require any householder or any person owning or occupying land or premises within his area, or the agent or factor of such person, to give, in the prescribed form, the information required for the purpose; and the failure of the householder, owner, occupier, or agent to give the required information renders him liable to a penalty of £20. The registration officer, having prepared lists for each registration unit within his area of all persons appearing to be entitled to be registered as electors, makes copies of these lists available for inspection by the public in his office and in the chief post-office or other convenient place in the registration unit, and at the same publishes a notice specifying the mode in which, and the time within which, claims and objections are to be made. He then, after considering claims and objections, and making the necessary corrections in the lists, forms these lists into a register, with a separate index letter and a separate series of numbers for each polling district. The register is made up in separate parts for each registration unit in the registration area, and is framed so as to distinguish the names of those who are entitled to vote as parliamentary and as local government electors. A copy of the register is open to inspection at the registration officer's office, and copies of the part of the register relating to any registration unit are kept for inspection in that unit at a convenient place. Anyone who is entitled to make and has made a claim or objection can appeal to the county court—in Scotland, the sheriff court—from the decision of the registration officer, whether such decision be on a question of fact or on a point of law. A person desiring to appeal must give notice of appeal, in the prescribed form, to the registration officer and to the opposite party, if any, within five days after the decision is given. The notice of appeal must specify the grounds of the appeal. On any point of law, but only on a point of law, an appeal lies, in England, from the decision of the county court to the Court of Appeal, and, in Scotland, from the decision of the sheriff court to a court of three judges of the Court of Session. As regards university constituencies, the governing body of every university forming, or forming part of, a university constituency must cause a register to be kept, in such form and made up to such dates as it may direct, of persons entitled to vote in respect of a qualification at that university, and must make the register available for the purpose of university elections for the constituency. This register is open to inspection by any person who makes application.

Registration of Births, Deaths, and Marriages.—In England a complete system of civil registration of births, deaths, and marriages was established by acts passed in 1836. The system instituted by these acts has been considerably altered and amended by subsequent registration acts. Before the establishment of the system of civil registration there had been long in operation a system of ecclesiastical registration of marriages, baptisms, and burials solemnised according to the rites of the Church of England, it being the duty of the officiating minister to keep such a register (see **REGISTERS, PARISH**). There were also in existence many non-parochial registers. The whole existing system is under the supervision of the Registrar-General. Every poor-law union or parish is divided into registration districts, each of which is in charge of a locally-resident registrar. The registrars of each union are supervised by a superintendent registrar. Quarterly returns of certified copies of

the entries in the local register books are sent to the superintendent registrar of the district, by whom they, if found correct, are transmitted to the general register office. There they are preserved, and may be inspected or excerpted on payment of a small fee. Entries in the registers of births, deaths, and marriages and certified copies thereof are admissible to prove facts therein stated.

As regards births—it is, in the case of every child born alive, the duty of the father and mother or, in their default, certain other specified persons to give notice of such birth to the district registrar within forty-two days after the day of the birth, and, in his presence, to sign the register. After a period of three months from the birth of the child registration may take place on a solemn declaration before the superintendent registrar being made by one of the persons on whom is imposed the duty of giving the information as to the birth. After the expiry of twelve months from the time of the birth, registration can be effected only with the written authority of the Registrar-General. The particulars to be registered are the date and place of the birth; name and sex of child; name and occupation of the father; and the name and maiden surname of the mother. The signature, description, and residence of the informant are also entered. The date of registration is stated, and the entry is signed by the registrar.

As to deaths—it is the duty of the nearest relatives of the deceased, present at the death, or in attendance during his last illness, and, in default of such relatives, of certain other specified persons to give to the registrar the required information within the five days next following the day of death. When a written notice, with a medical certificate of the cause of death, is sent to the registrar, the time of registration is extended to fourteen days next after the death. If a death is not duly registered the registrar may, after fourteen days, and within twelve months from the date of death, require, by written notice, any of the persons whose duty it is to register the death to attend at his office, and furnish him with the statutory particulars. The particulars to be registered are the date, the name, sex, age, and rank or occupation of the deceased; and the cause of death. The signature, description, and residence of the informant are also required. The entry is signed by the registrar.

As to marriages—all persons authorised to solemnise marriages (see MARRIAGE) are required to keep a register of marriages solemnised by them, and to transmit copies thereof quarterly to the superintendent registrar of their district, who sends certified copies to the Registrar-General's office. The particulars required to be registered are the date, name, age, condition, rank or occupation, and residence of each of the parties, and name, rank or occupation of the father of each of the parties.

In Scotland a general system of registering births, deaths, and marriages was introduced by the Registration Act, 1854. Prior to that act the only records were the old parochial registers, which were ecclesiastical and very incomplete. The existing Scottish system is, in its main outlines, similar to that obtaining in England. Information of a birth, with the required particulars, is to be given to the registrar of the parish or district within twenty-one days of the birth. If a period of more than three months elapse before the information is given, the parents or guardians make a declaration before the sheriff, who may then authorise the registrar to register the birth. Information of a death is to be given within eight days of the event. In the case of regular marriages the

necessary information is inserted in a statutory schedule, which must be produced to the officiating minister. The schedule, after being filled in, is signed by the contracting parties, the minister, and not fewer than two witnesses, male or female, present at the ceremony. It must then be sent, within three days, to the registrar of the parish in which the marriage was solemnised. Provision is made, when the parties desire it, for the attendance of the registrar at the ceremony. The particulars on the statutory schedule are entered by the registrar in duplicate registers. All such schedules, along with one of the duplicate registers, are in due course transmitted to the Registrar-General for preservation in the General Registry Office. (As to registration of irregular marriages—see MARRIAGE.) The office of Registrar-General was formerly held by the Deputy Clerk Register, but an act which came into operation on 23d December 1920 provided for the appointment of a Registrar-General of Births, Deaths, and Marriages in Scotland.

In England and Scotland there are various other public registers dealing with special matters.—See BILL OF SALE, COMPANY, FRIENDLY SOCIETIES, COPYRIGHT, PATENTS, TRADE MARKS, SHIP-BUILDING, WILLS. There are also registers in relation to professions, e.g. the medical register, on which are placed the names of persons possessing one or more of specified qualifications; the dentists' register; the register of money-lenders. The Registration of Business Names Act, 1916, requires registration in the manner directed in the act of, *inter alia*: (a) every firm having a place of business in the United Kingdom, and carrying on business under a business name which does not consist of the true surnames of all partners who are individuals, and the corporate names of all partners who are corporations; and (b) every individual having a place of business in the United Kingdom, and carrying on business under a business name which does not consist of his true surname.

Regium Donum (Lat. 'royal gift'), an annual grant of public money formerly received by Nonconformist ministers in England, Scotland, and Ireland. It began in 1672, when Charles II. gave £800 of secret-service money to be distributed annually among the Presbyterian clergy in Ireland, on hearing that they had suffered on his account. The grant was discontinued in the latter part of his reign and in James II.'s, but was renewed in Ireland by William III. in 1690, who increased it to £1200 a year. It was further augmented in 1723 by George I., in consequence of the Presbyterians having supported the House of Brunswick, and reached £45,000 before it was withdrawn, when the Irish Episcopal Church was disendowed. Compensation was made of life interests. The Regium Donum in England was enjoyed by Presbyterians, Independents, and Baptists, from 1723 till 1857. The Scottish Episcopalians also enjoyed for a time a small part.

Regnard, JEAN FRANÇOIS, French comic dramatist, was born at Paris in 1655. A rich shopkeeper's son, he found himself at twenty master of a considerable fortune, and at once set out on his travels. In Italy he gave himself up to gambling, but, strange to say, increased rather than diminished his means. In his autobiographical romance, *La Provençale*, we read, but somewhat dubiously, of the passion of himself as Zelmis for a young Provençal wife (Elvire), his voyaging back to France with her and her husband, their capture and sale as slaves by Algerian pirates, how he made himself pleasing to his master by skill in cookery, was carried by him to Constantinople, and, at the end

of his two years' captivity and many strange adventures, was ransomed, together with the lady, for 12,000 crowns. Her he was next about to marry when the husband reappeared, and sent the lover off again on aimless wanderings through Holland, Denmark, and Sweden, to Lapland, and back by Poland, Turkey, Hungary, and Germany. From his return to Paris (1683) he gave himself to letters, and found his true vocation in the success of *Le Divorce* at the Théâtre Italien in 1688. Eight years later his fine comedy, *Le Joueur*, achieved success at the Théâtre Français. Its successors were *Le Distrait* (1697), *Le Retour Imprévu* (1700), *Les Folies Amoureuses* (1704), *Les Ménechmes* (1705), and his masterpiece, *Le Légataire Universel* (1708). He died before his time, and so suddenly as to originate various contradictory reports, 4th September 1709. Regnard was an indifferent poet, but he was a master of dramatic situation and of comic dialogue, if not of verisimilitude or reality. To this day the reader endorses Boileau's judgment, expressed once when someone charged Regnard with mediocrity—'Il n'est pas médiocrement gai.' 'Qui ne se plaît point à Regnard,' said Voltaire, 'n'est pas digne d'admirer Molière.'

There are editions by Didot (1820), Michiels (1854), and Fourmier (1875). See the study by J. Guyot (Paris, 1907), and *Bibliographie* by Marchéville (1877).

Regnault, ALEXANDRE GEORGES HENRI, painter, was born in Paris, 30th October 1843, the son of Henri Victor Regnault (q.v.). His aptitude for drawing manifested itself very early, and he was continually sketching the animals in the Jardin des Plantes. After an excellent career in the Lycée Napoléon, he left school in 1859, and studied art under Lamothe and Cabanel; and, after two unsuccessful attempts, gained the *prix de Rome* in 1866. Reaching Rome early in the following year, he executed there a remarkable portrait of Madame Duparc, and his historical subject of 'Automedon breaking the Horses of Achilles,' and drew on wood illustrations for Way's *Rome*. He next passed to Spain with his friend Clarin; and here, as afterwards in Tangier, he found subjects of that wildly picturesque character which best suited his genius. In 1869 he painted his powerful equestrian portrait of General Prim, now in the Louvre, and his 'Judith,' and in 1870 contributed his 'Salome' to the Salon. In 1870 was also painted, at Tangier, his terrible picture, 'The Execution without Judgment under the Moorish Kings of Granada'—a work now in the Louvre. In the same year he returned to Paris on the outbreak of the Franco-Prussian war; and though, as a *prix de Rome*, he was exempt from military service, he volunteered as a private soldier, and on the 19th January 1871 was slain on the field of Buzenval, in his twenty-eighth year. As an artist he had by no means fully expressed himself; but he had produced much that was marked by great energy and power, that caught in a peculiarly vivid way the splendid and barbaric life of the East—a life, in the words of the painter himself, 'at once rich and great, terrible and voluptuous.' A monument to Regnault, sculptured by Henri Chapu, has been erected in the Ecole des Beaux Arts, Paris.

See the *Lives*, in French, by Cazalis (1872) and Marx (1887), and his *Correspondance*, ed. by Duparc (1873).

Regnault, HENRI VICTOR, chemist and physicist, was born at Aix-la-Chapelle, 21st July 1810. A shopman in a Paris bazaar, he made such good use of his scanty leisure as to qualify himself for admission (in 1830) to the Ecole Polytechnique, and, after the two years' course, entered the Ecole des Mines. He became a professor in Lyons,

whence, in 1840, he was recalled to Paris as a member of the Academy of Sciences, in consequence of some important discoveries in organic chemistry. Having filled chairs in the Ecole Polytechnique and the Collège de France, he became in 1854 director of the imperial porcelain-manufactory of Sevres. He devoted himself to the determination of important physical data, such as the laws of expansion of gases, the measurement of temperature, latent and specific heats, and especially the numerical data bearing on the working of steam-engines, for which the Royal Society of London awarded him its Rumford medal. He also received the Copley medal (1869) of the Society, and was one of its foreign members. In addition to numerous papers in the *Annales de Chimie*, &c., he published a *Cours Élémentaire de Chimie* (4 vols. 14th ed. 1871). He died 20th January 1878. See the *Éloge Historique* by Dumas (1881).

Régnier, HENRI DE, French poet and novelist, was born at Honfleur in 1864, and was educated at the Collège Stanislas, Paris. His prose works include *La Canne de Jaspe* (1897), *La Double Maîtresse* (1900), *Le Roman d'un Jeune Homme Sage* (1903), *Le Passé Vivant* (1905), *L'Amphibène* (1912), *Romaine Mirmault* (1914), *L'Illusion Héroïque de Tito Bassi* (1916), and *La Pécheresse* (1920), while among his collections of verse are *Poèmes Anciens et Romanesques* (1890), *Les Jeux Rustiques et Divins* (1897), *Les Médailles d'Argile* (1900), *La Cité des Eaux* (1902), *Le Miroir des Heures* (1911), and *Vestigia Flammæ* (1921). Régnier married a daughter of de Herédia, and in 1911 became a member of the French Academy. He has continued the symbolism of Mallarmé (whom he knew personally), writing poetry which by reason of its subject and the musical versification suggests a picture—the playing of fountains, a Grecian frieze, a palace set with precious stones—which, in turn, gives rise to the particular mood or atmosphere that the poet desires. His poems, whether in the form of sonnets or 'vers libres' or 'odelettes' (short lyrics, which he himself created), are all tinged with a gentle melancholy. Some of his novels dealing with contemporary life are, perhaps, not so successful. See the studies by de Gourmont (1908) and Berton (1910); also A. Lowell, *Six French Poets* (1915).

Régnier, MATHURIN, a great French satirist, was born at Chartres, 21st December 1573. His father was a well-to-do citizen; his maternal uncle was the Abbé Desportes the poet. The boy was tonsured at nine, but grew up dissipated and idle. In early youth he seems to have visited Italy in the suite of the Cardinal de Joyeuse, and is supposed later to have transferred his services to Philippe de Bethune, who went as ambassador to Rome in 1601. He obtained a canonry at Chartres, and enjoyed the favour of Henry IV. and his court. But his follies sapped his health, and he died an untimely death, 13th October 1613. His first collection of satires had appeared in 1608. Régnier's whole work together scarce exceeds 7000 lines—sixteen satires, three epistles, five elegies, and some odes, songs, epigrams, and miscellaneous pieces—yet it is enough to place him high in the order of merit among the poets of France. He is greatest in his satires, written in the usual Alexandrine couplet, and admirably polished, yet vigorous and original. They touch social and moral questions only, and consequently are not of merely ephemeral interest, as political satires most often are; and, what is rare in French satire, they mostly escape the fault of handling abstract types instead of actual concrete embodiments of the type. Breadth, force, and reality characterise them all, but these merits

together reach their highest point in the thirteenth, *Macette*, a satire on a hypocritical old woman who corrupts the hearts of the young around her by her cynical views of life. Régnier imitated indeed the satire of Juvenal and Horace, yet he did not copy it, and he threw his own heart into the form he borrowed. He was the last of the great poets of the 16th century: after him was to follow a period of barrenness, alike from the poverty of nature and the sterilising influences of the traditions of Malherbe and his school. It was against the attacks of Malherbe that Régnier championed Ronsard, and later he himself was defended by Boileau.

Editions are by Brossette (1729), Lenglet Dufresnoy (1733), Prosper Poitevin (1860), M. de Barthélemy (1862), and E. Courbet (1875). See Chénier's *Bibliographie de Régnier* (1889), and Gosse's *French Profiles* (1905).

Regrating. See ENGROSSING.

Regular Canons. See CANON.

Regulars. See CLERGY.

Regulus, a term in Metallurgy, which is now used in a generic sense for metals in different stages of purity, but still retaining, to a greater or less extent, the impurities they contained in the state of ore. When, for example, the ore known as the sulphide of copper is smelted, the product of the different furnaces through which it passes is called regulus until it is nearly pure copper. The name, which signifies 'little king,' was first given by the alchemists to the metal antimony, on account of its power to render gold brittle.

Regulus. See GOLDEN-CRESTED WREN.

Regulus, MARCUS ATILIUS, a favourite hero with the Roman writers, was consul for the first time in 267 B.C., and for his military successes obtained the honour of a triumph. Chosen consul a second time (256), he was sent along with his colleague Manlius at the head of a navy of 330 ships against the Carthaginians, and encountering the enemy's fleet off Heraclea Minor he totally defeated it. The Romans then landed near Clypea, where for some time Regulus was victorious in every encounter, but at last (255) suffered a total defeat and was taken prisoner. He remained in captivity for five years, but when fresh reverses induced the Carthaginians to solicit peace Regulus was released on parole and sent to Rome in company with the Punic envoys. It is related by the Roman poets and historians, as an instance and a model of the most supreme heroism, how Regulus at first refused to enter Rome since he was no longer a citizen; how, after this conscientious scruple was overcome, he declined to give his opinion in the Senate till that illustrious body laid upon him its commands to do so; how he then earnestly dissuaded them from agreeing to any of the Carthaginian proposals, even to an exchange of prisoners; and how, after he had succeeded by his earnest appeals in obtaining the rejection of the Carthaginian offers, he resisted all persuasions to break his parole, though conscious of the fate that awaited him, and, refusing even to see his family, returned with the ambassadors to Carthage, where the rulers, maddened by the failure of their schemes through his instrumentality, put him to death by the most horrible tortures. The common story is that he was placed in a cask or chest stuck full of nails, also that, with his eyelids cut off, he was exposed to the glare of the African sun. Unfortunately this noble tale of heroic patriotism and unflinching fortitude is unhistorical, or at least unsupported by any good authority.

Regulus, or **RULE**, ST, according to legend, a monk of Constantinople or bishop of Patras who in 347 A.D. came to Muckross or Kilrimont (after-

wards St Andrews), bringing relics of St Andrew to Scotland from the East. The adoption of St Andrew as the national patron saint appears to belong to the first half of the 8th century; and for the possible identification of St Regulus with an Irish St Riagal of the 6th century, see Skene's *Celtic Scotland* (vol. ii. 1877).

Regur, the rich, black cotton soil of India. It is the result of the long-continued growth and decay of vegetation—the organic residue being commingled with the disintegrated and decomposed débris of the subjacent rocks.

Reichenbach, a manufacturing town of Saxony, 11 miles SW. of Zwickau, produces woollen fabrics—merinoes, flannel, shawls—and has dyeing and calico-printing works; pop. 30,000.

Reichenbach, a cotton and woollen manufacturing town of Prussia, in Lower Silesia, 32 miles SW. of Breslau; pop. 16,000.

Reichenbach, HEINRICH GOTTLIEB LUDWIG (1793–1879), botanist and zoologist, was from 1820 a professor at Dresden.—His son, HEINRICH GUSTAV (1824–89), was also a botanist, a professor at Hamburg from 1862. He was famous in connection with orchids.

Reichenbach, KARL, BARON VON, naturalist and technologist, was born at Stuttgart, 12th February 1788, and educated at Tübingen. After a short political imprisonment at the instigation of the French authorities, he studied the industrial arts, and in 1821, in connection with the Count of Salm, he started a number of factories of different kinds at Blansko in Moravia, which he managed with great success, retiring with a fortune. He devoted much study to the compound products of the distillation of organic substances, and he succeeded in bringing to light a number of compounds of carbon and hydrogen not previously known; among these were creasote (1833) and paraffin. Studying with enthusiasm the subject of 'animal magnetism,' he discovered, as he thought, a new force in nature, which he called Od (q.v.), and conceived to be intermediate between electricity, magnetism, heat, and light, and recognisable only by the nerves of sensitive persons. His chief works are *Geologische Mittheilungen aus Mähren* (1834), *Untersuchungen über die Dynamide des Magnetismus* (1847–49), several works on 'odic force' (1852–58), *Aphorismen* (1866), *Die Odische Lohe* (1867). His *Letters on Od* (1926) and some other works have been translated. He died at Leipzig, 19th January 1869. See biographical works by Schrötter (1869) and Fechner (1876).

Reichenberg (Czech, *Liberec*), the chief seat of the cloth manufacture in North Bohemia, stands on the Neisse, 86 miles by rail NE. of Prague. Apart from the principal industry, machinery and leather are manufactured. The cloth industry was established in the 16th century. In 1920 an annual fair on the Leipzig model was started, to represent Czechoslovak industry. There is an important industrial school. Pop. 35,000.

Reichenhall, an Alpine spa in the extreme south-east of Bavaria, 10 miles SW. of Salzburg. It was almost wholly consumed by fire in 1834, and handsomely rebuilt. It is the chief centre of the Bavarian salt-works. The salt-springs are fifteen in number, two yielding 25 per cent. of salt.

Reichstadt, DUKE OF. See NAPOLEON II.

Reichstag, **Reichsrat**. See GERMANY and AUSTRIA.

Reid, CAPTAIN MAYNE, writer of boys' stories (originally Thomas Mayne Reid), was born at Ballyroney, County Down, in 1818, the son of a

Scoto-Irish Presbyterian minister, and studied four years for the ministry, but, disliking his intended profession, he at twenty emigrated to America, where he led a roving and adventurous life, in turn storekeeper, negro-overseer, schoolmaster, actor, and journalist. He served in the United States army during the Mexican war of 1847, and distinguished himself especially in the storm of Chapultepec. The Hungarian struggle, in which he had meant to take part, was at an end before he reached Europe, whereupon he settled down to a literary life, first at London, next in Buckinghamshire. He died 22d October 1883. His vigorous style and the profusion of hairbreadth 'scapes he provided delighted his breathless readers, who did not stop to notice the truthfulness of his scenery and the occasional excellence of the narrative style. Among his best books were the *Boy Hunters* (1853), the *Bush Boys* (1856), and the *Boy Tar* (1859), the *Scalp Hunters* (1851), the *Rifle Rangers* (1850), the *War Trail* (1857), and the *Headless Horseman* (1866). See his *Life and Adventures* by his widow (1900; expanded from an 1890 memoir).

Reid, Sir George (1841-1913), was born at Aberdeen. Trained as a lithographer, he studied art in the Trustees' Academy, Edinburgh, under Mollinger at Utrecht, under Yvon in Paris, and with Israels at the Hague. He was elected A.R.S.A. in 1870, and R.S.A. in 1877, and from 1891, when he was knighted, till 1902 (when he resigned) was P.R.S.A. He is most widely known by his portraits, which are distinguished by unflinching verisimilitude, vigorous handling, and thorough modelling. His half- and full-lengths are remarkable for their individuality of attitude, for the insight with which, in each case, the characteristics of the sitter are expressed by the entire figure, as well as by the face. Among his more important portraits are 'Lord President Inglis,' in the Scottish Parliament House; 'H. Wellwood Maxwell of Munches,' and 'John Mackenzie.' He also produced many rich, freely painted flower-pieces, as well as landscape work of a delicate and quiet charm; and his book illustrations prove him one of the most accomplished draughtsmen of his time.

Reid, Thomas, head of the Scottish school of Philosophy, was born on the 26th April 1710, at Strachan, a country parish in Kincardineshire, where his father was minister. His mother belonged to the well-known family of the Gregorys (q.v.). Reid began his education at the parish school of Kincardine, and at the age of twelve he became a student of Marischal College in Aberdeen. He took his degree of M.A. in 1726, and continued to reside in Aberdeen as college librarian, his chief studies being mathematics and the natural philosophy of Newton. In 1736 he left Aberdeen, and went to England, where he was introduced to the most distinguished men in Oxford, Cambridge, and London. In the following year he was presented by the senatus of King's College to the parish church of New Machar in Aberdeenshire. The parishioners were bitterly opposed to his appointment, but his conduct and manner gradually won them over. It is said that, from distrust of his powers, instead of composing for the pulpit himself, he preached the sermons of Tillotson and other English divines. In 1739 Hume's *Treatise on Human Nature* appeared, the perusal of which gave the impulse that determined Reid's future philosophical career. He had fully adopted the idealism of Berkeley, but was now revolted by the conclusions drawn from it by Hume, and in consequence was led to seek a new foundation for the common notions as to a material world. In 1748 he contributed to the Royal Society of London a short essay on *Quantity*. In 1752 he was appointed one of the

professors of Philosophy in King's College, Aberdeen, the senatus being the patrons of the chair. Here he followed the established course of teaching in three successive years to the same students mathematics, natural philosophy, and moral philosophy. He was the founder of a Literary Society in Aberdeen, which enrolled among its members Campbell, Beattie, and other men of ability; to this society he submitted his first draft of the *Inquiry into the Human Mind*. In 1763 he was chosen to succeed Adam Smith as professor of Moral Philosophy in the university of Glasgow. In 1764 he published his *Inquiry*. His thirst for general science never left him; at the age of fifty-five he attended Black's lectures on Heat. He continued in the duties of his chair till 1780, when he retired to devote his remaining strength to the publication of his works on the mind. In 1785 the *Philosophy of the Intellectual Powers* appeared, and in 1788 the *Active Powers*—together forming a systematic work on the science of the human mind. In 1774 he had contributed his account of Aristotle's logic to Lord Kames's *Sketches*. The publication of the *Active Powers* was the close of his career as an author, although to the end of his life he kept up his bodily and mental vigour and his interest in science. He was taken ill suddenly in the autumn of 1796, and died on the 7th October.

Like Kant, Reid was roused to metaphysical research by Hume, and became the chief of a school whose aim was to deliver philosophy from scepticism, and to do so by resting finally on principles of intuitive or *a priori* origin. The Scottish philosophy, dominant till Sir W. Hamilton's time in Scotland, and influential in France (see ROYER-COLLARD), found a zealous defender in McCosh (q.v.).

See COMMON SENSE, SCOTTISH PHILOSOPHY; the *Life* by Dugald Stewart prefixed to Reid's works (4 vols. 1803); the edition by Sir W. Hamilton (1853); McCosh's *Scottish Philosophy*; and Campbell Fraser's monograph (1898).

Reigate, a town of Surrey, pleasantly situated at the southern base of the North Downs, 21 miles S. of London. Of the castle of the Earls of Warrene little remains save a grassy mound, with large vaults or caverns beneath it. The church, with a nave dating back to 1180 and Transition Norman piers, is mainly Perpendicular, and contains the grave of Lord Howard of Effingham, and a library (1701) with some curious MSS. and many of Evelyn's books. Other buildings are Reigate Priory, the grammar-school (1675), the old town-hall (1708), and the municipal buildings (1901). Foxe the martyrologist is claimed for a resident; and Archbishop Usher died here. The town has spacious public parks, commons, and open spaces. Till 1832 Reigate returned two members to parliament, and then one till 1867. It was incorporated as a municipal borough in 1863. Redhill, two miles east, is within the borough and is the centre of business. Pop (1851) 4927; (1881) 18,662; (1921) 28,914.

Reign of Terror. See DANTON, ROBESPIERRE.

Reikiavik. See REYKJAVÍK.

Reimar's, Hermann Samuel (1694-1768), was born at Hamburg. He studied at Jena and Wittenberg, travelled in Holland and England, and was rector of the school at Wismar, and later professor of Oriental Languages at the gymnasium of Hamburg. He is the author of the so-called 'Wolfenbüttelsche Fragmente,' published by Lessing in 1774-78 (further portions by others in 1787 and 1850-52). These 'Fragments,' up to that time only known in MS. by a few Reimar's most intimate friends, produced the profoundest sensation throughout Germany: since in them the author, in the boldest and most trenchant manner,

denied the supernatural origin of Christianity. Another work in the same direction is his *Vornehmste Wahrheiten der natürlichen Religion*; of a miscellaneous character are his *Primitia Wislariensis*, *De Vita Fabricii*, and his edition of *Dio Cassius*. See the monograph by D. F. Strauss (1860; 2d ed. 1878; trans. by Voysay, 1879).

Reims, or RHEIMS, a city in the French department of Marne, situated on the Vesle (a tributary of the Aisne), 100 miles ENE. of Paris by rail. Strongly fortified with detached forts since the Franco-German war, when it was for a time the German headquarters, it is well built, and from the material employed in building, which is the chalk-stone of the district, and from the prevalence of the older style of domestic architecture, has a picturesque appearance. It is built on the site of *Durocor-torum*, which is mentioned by Cæsar as the capital of the Remi, from which people it subsequently took its present name. Christianity may have found an entrance into Reims at an earlier period, but it was not till about 360 that it became a bishop's see. Under the Frank rule it was a place of much importance, and it acquired a deeply religious interest from its having been the scene in 496 of the baptism of Clovis and his chief officers by the bishop, St Remy (c. 433-533). In the 8th century it became an archbishopric, and from 1179, when Philip Augustus was solemnly crowned there, it became the place for the coronation of the kings of France, who were anointed from a vessel of sacred oil, called the *Sainte Ampoule*, which a dove was said to have carried to St Remy from heaven. Joan of Arc brought the dauphin hither, and the only sovereigns in the long series, down to 1825, not crowned at Reims were Henry IV., Napoleon I., and Louis XVIII. In 1793 the cathedral was attacked by the populace, and the sainte ampoule smashed by a sans-culotte; and in 1830 the ceremony of coronation at Reims was abolished. Reims was in German hands for a week in September 1914, and thereafter suffered bombardment to the end of the war. The town was wrecked, but the cathedral was not beyond repair. The cathedral is one of the finest extant specimens of Gothic architecture. It was built between 1212 and 1430. Its nave is 466 feet long by 99 in breadth, with a transept of 160 feet, and the height is 144 feet. Its grandest features are the west façade, which is almost unrivalled, with its magnificent doorway (figured at DOOR). The stained glass is remarkable for its beauty; and there are two magnificent tapestries. The Romanesque church of St Remy (mainly 1160-80), with the saint's shrine, is nearly of equal size, but of less architectural pretension. Its nave was ruined in the war. The hôtel-de-ville (1627-1830) was reduced to a shell; and little was left of the 'Maison des Musiciens' or of the archbishop's palace. The Lycée (also ruined) represents a former university (1547-1793). Reims is one of the principal entrepôts for the wines of Champagne (q.v.), and the hills which surround the town are planted with vineyards. It is one of the great centres of the woollen manufacture in France, and its manufactures, embracing woollen goods (especially merinoes), mixed fabrics in silk and wool, &c., are called *Articles de Reims*. Pop. (1872) 71,397; (1891) 101,699; (1911) 115,78; (1921) 76,645. See DOUAL.

Rein. See BRIDLE, RIDING.

Reincarnation, Transmigration, Metempsychosis. 'Mair has at all stages of human development endeavoured to picture to himself the future of those whose life on earth has come to an end. Two of the possibilities that have presented themselves are reincarnation, a rebirth in another

body of the same species; and transmigration, the reappearance on earth in a form which differs from the previous one. Side by side with this exists the view, in practice distinguishable only with difficulty, that the soul itself is in the form of an animal. Another form of belief that tends to be confused with the foregoing is that which attributes, usually only to certain persons, successive transformations without intervening death or rebirth; this is in substance allied to the powers of transformation attributed to magicians, just as transmigration proper is, logically, bound up with the creed that living men may, for safety, deposit their souls in some place of safety; but it must not be supposed that the presence of one element implies that of the other.

2. A belief in metempsychosis of one or other kind is found sporadically as an element of popular belief among various tribes in the lower stages of culture, but it is in such cases rarely possible to discover how it originated; the theory was also held, or suggested, by various Greek philosophers without, however, necessarily forming an important element in popular religion. In India and West Africa, on the other hand, there is no doubt as to the hold which it has on people's minds, and in both cases it seems to be the outcome of a seeking for the origins of patent facts—in India for the meaning of the different lot of rich and poor, which in time developed into an ethical creed, the doctrine of the survival of merit and demerit after the death of the individual; while among the Ibo the biological interest is in the foreground, and reincarnation is at the bottom the native explanation of the resemblances between persons of different generations. By somewhat similar reasoning the Australian native at times explains why strangers become fast friends almost at first sight, alleging that the parties must have been comrades in a previous existence, and this theory has also been put forward, doubtless as an original idea, by an Hegelian philosopher of our own time. On the other hand, no clear origin can be assigned to such beliefs as those of the Malagasy, Zulu, &c., to which reference is made below, nor yet to the creed of some totemic peoples that their dead pass into the body of the totem animal.

Certain exceptions, such as the reincarnation creed of the Druids, apart, there seems to be little or no reason for assuming the spread of a belief in metempsychosis outside its own culture area as an explanation of the distribution of the various forms of the creed.

3. Transmigration is the accepted doctrine not only of Hinduism, Jainism, and Buddhism, but is also part of the philosophy of Brahmanism; but in Buddhism it is a popular creed which conflicts with orthodox psychology, and is essentially a misunderstanding of the doctrine of *samsāra*. According to the Upanishads, the 'fine body' and 'moral substratum' (*karma-ācraṇya*) survive even the absorption of the world into Brahman, and condition the resumption of personal existence, till by the acquisition of knowledge (soul = Brahman) unity with Brahman is attained, and the illusion of plurality of existences overcome. Until the 'seed of works' is thus consumed, the cycle of existence must roll on, and even the gods, their tale of merit exhausted, must descend to lower forms of life; conversely, the soul in non-human form (plant or animal), its demerit worked off, rises in the scale of existence. As, among primitive peoples, ethical considerations are not the deciding element when a soul passes from this world, it is not probable that this doctrine of transmigration was at the outset of moral import. It comes in view from an unknown source between the age of the Vedas and that of the Upanishads, and may well have

been developed from a popular belief either of aboriginal tribes or, of the Aryan-speaking peoples themselves.

4. In Madagascar there appear to have been many tribes of whom their neighbours asserted that they were transformed at death into animals, or that their souls were in the form of animals; but of only one, the Betsileo, can it be said that they believed this of their own dead; and their creed seems to be without any precise parallel even in Malaysia. Certain serpents, called *fanany*, were said to be formed in a pot beneath the corpse, which is tied to the central pillar of the hut and allowed to putrefy; at first the *fanany* was very small; then it was transported to the family tomb after the human remains had been buried; then, after some months, the python came out and was treated with the utmost respect; the family whose offerings of food it accepted were its kin. This lot was reserved for the nobles; crocodiles and eels were the abode of the souls of others, but the chief who became a *fanany* could accord hospitality to the souls of his descendants. At the death of the soul-animal, the soul passed to the common abode of the dead.

5. The Zulu, like many other peoples, believe that their dead pass, according to their rank, into various kinds of serpents or lizards; but other Bantu-speaking peoples hold that their chiefs, or even the common herd, pass into lions and other animals; some Zambesi tribes say that a man can choose his own soul-animal by swallowing the maggots from the putrefying flesh of his chosen species.

6. How far these beliefs are connected with Totemism (q.v.) is a very open question; but it is certain that some kinds of West African totemism belong to the same complex as the reincarnation creed; for the Siena or Senfo hold that a man's soul passes into the body of his totem-animal, and conversely the spirit of the dead animal enters a new-born child of the clan. The Efik beliefs as to the 'bush-soul' are also akin to totemism; but in this case it is the soul of the living man that is lodged in the beast; a link with the reincarnation creed is made by the fact that the bush-soul of the reincarnated is the same species of animal as that of the original person.

7. It must, however, be recognised that the beliefs of primitive peoples are even more fluid than our own, and pass one into another with such facility that the true origin and relationships of the various elements are obscured. In another aspect, the reincarnation creed of West Africa is related to the belief in a genius or tutelary spirit; but it is also a theory of human psychology, and the double is confused with the ghost; in yet another aspect the double is a personified promise to return to the other world.

It is therefore clear that no brief synopsis of the facts can be anything but misleading; the account of Ewe beliefs which follows, itself only a sample of West African creeds, makes no pretence of being more than a survey of some features of the reincarnation complex. The Ewe say that man has two souls, one of which goes into the grave, and thence to the land of the dead, which is a duplicate of this world; a man who has been a great king there will die soon after birth here, so that he may return to the scene of his former glories; and an aged man in this world may fall ill because his associates in Amedzowe, impatient at his long absence, are preparing to break down his hut there; his relatives in Amedzowe send him to this world. Side by side with this belief is another which says that Mawu, the supreme god, decides the lot of a soul that is going from Amedzowe, and also fixes the length of his life. A third account says that a man has one

or more *kla* or *aklama* (tutelary geniuses), which are often confused with the *luwo* (soul); Mawu sends the *kla* into a man, and it determines his character; if a man does not fulfil his obligations, e.g. food tabus, his *kla* will not protect him. When a man dies, the figurines which represent the *kla* are broken, and it becomes a ghost which goes to a place under the earth; both *luwo* (soul) and *aklama* are termed *noli* after a man's death.

The deep-rooted confusion disclosed by this summary is paralleled among the Edo of Benin, though the aspect of the creed differs widely; among them the genius is double, and some say that the one in *elimu* (heaven) comes to earth when the one on earth leaves the corpse of a dead man.

8. There are certain tribes of Central Australia which hold a reincarnation creed according to some authors; but the facts as to the Arunta beliefs are not clear; the Clingali, however, declare that ancestors are repeatedly reincarnated, with change of sex each time.

Some authors have traced the origin of totemism in Indonesia and Oceania to the belief that the soul at death passes into an animal which thus becomes sacrosanct; the same belief is found sporadically in New Guinea, North and South America; the exact significance of the facts is, however, not quite clear.

9. Among the ancient inhabitants of Europe belief in reincarnation was an important element in the creed of the Druids; but it is not clear how far it was confined to them, or common to the whole people, and taught especially by the Druids. They seem to have held that there was a life in another world before reincarnation in this.

10. Among the Greeks belief in reincarnation was a feature of the worship of Dionysus and the Orphic cults in the 6th century B.C., but it was taught and known at an earlier date; for Herodotus declares, without good grounds, that it came from Egypt. References to the 'Weary Wheel' suggest that Oriental influences played some part; but the Asiatic 'Wheel of Life' may well have no causal connection with the Wheel of Fortune; at a period when pictorial representations were hardly likely, even if in existence, to pass from east to west, independent origin is the more probable. The name of Pythagoras is specially associated with the doctrine of reincarnation. He taught that all living things are akin; hence man should abstain from a flesh diet. Other names associated with the doctrine are Empedocles, Plato, and Plotinus, but it is not clear how far these teachers made any impression on the mass of the people.

11. There is nothing to show that metempsychosis played any part in Roman beliefs; such mentions of it as are found are clearly derived from Greek sources. Of uncertain origin and very minor importance is the doctrine of metempsychosis among the Jews, with whom it forms part of a system of esoteric mysticism, first recorded in mediæval times. There is some evidence for the existence of a belief in metempsychosis among early Teutonic peoples; but, as among the Celts, the evidence is mainly literary, and does not necessarily imply a living belief contemporary with the record.

12. Somewhat akin to the doctrine of reincarnation is a theory propounded in modern times to explain the nature of personality. It has been suggested that the real Self is something far more extensive than personality as we know it; the Self is, as it were, confined in a chamber, and manifests itself in the world only dimly and partially, through, as it might be, an aperture small in proportion to the whole; in successive existences, different facets of the Self come in contact with existence.

The more important sources are collected by the writers in Hastings, *E.R.E.*, s.v. Transmigration. See also Rivers, *Melanesian Society*, ii. 361-372; De la Vallée Poussin, *The Way of Nirvana*; B. H. Streeter, *Immortality*.

Reindeer, or CARIBOU (*Rangifer tarandus*), a species of deer, the only representative of the genus. It is a native of the northern parts of Europe, Asia, and America, and was introduced into Iceland in 1770. In Caithness it existed till the middle of the 13th century (Harting's *Extinct British Animals*, 1880). It is by far the most valuable of the deer, for not only are the flesh and skin of much use, but the animal has long been domesticated in Scandinavia, especially among the Laplanders. The wild reindeer of Lapland is almost equal in size to the stag, but there are great differences of size in different districts, the largest size being generally attained in the polar regions. The domesticated animal is never so large as the wild one; but that of Siberia is, like the wild one, much larger than that of Lapland. The reindeer is strong, somewhat heavily built, but yet very swift. The hair is longer in winter, and is gray or brownish in colour. The legs are short and thick, and the broad main hoofs spread out as the animal speeds over the snow. Besides the main hoofs, there are two accessory lateral hoofs. The head is carried horizontally, not erect as in other deer. The muffle of the nose is hairy. The antlers are large and are unique in being possessed by both sexes. Moreover, they begin to appear at an early stage in life, within a few weeks after birth, and at the same time in both sexes, whereas in the other deer, in which only the males have antlers, they do not appear before nine months or more after birth. In the female the antlers are somewhat smaller, thinner, and less branched than in the male, and are retained through the winter until the breeding season in spring, after which they are cast. 'The male, on the other hand,' Darwin notes, 'casts his horns much earlier, towards the end of November.' There is great variability in the antlers; 'there is a "bez tine" as well as a "brow tine," which are peculiar in being either branched or palmate.' In summer the Lapland reindeer feeds chiefly on the shoots of willow and birch, while in winter it depends mainly on lichens such as the so-called reindeer



Reindeer (*Rangifer tarandus*).

moss. It seems that they use both their antlers and their hoofs in removing the snow which hides their food. The animals run swiftly, but not gracefully, taking long sliding strides, and their hoofs snap together as they run. In their natural life the reindeer are gregarious. They migrate from the mountains to the lowlands in winter, and return again in spring, a change in part dependent

on the food-supply. Moreover, by leaving the lowlands in spring they free themselves from the gnats and gad-flies, which trouble them very seriously. Domesticated reindeer have been introduced with great advantage and success into Alaska, Newfoundland, Labrador, and some parts of North-west Canada. It is said that the Lapps have to move their herds near the coast in the summer if the health of their stock is to be preserved, and sometimes an immense herd will rush in a headlong race to the sea.

In North America and elsewhere the reindeer is hunted for the sake of its flesh, fat, and hide. It is shot or trapped in snow-pits. The flesh and fat are used in a fresh state or made into pemmican. The skin is used in many ways—for clothing, bedding, and the like. To the Laplanders 'the reindeer serves as a substitute for horse, cow, sheep, and goat,' but its domestication is not very complete. It constitutes the chief part of the Lapp's wealth, and some possess tame herds of two thousand or more, which feed chiefly in the mountainous regions in summer and in the lower grounds in winter. The animal can maintain a speed of nine or ten miles an hour for a long time, and can easily draw a weight of two hundred pounds besides the sledge. Almost every part of the dead animal is used in some way. The reindeer also yields excellent milk.

Reindeer Moss (*Cladonia rangiferina*), a lichen of great importance to the Laplanders and other inhabitants of the northernmost regions of Europe and Asia, as forming the chief winter food of the reindeer. It is found in almost all parts of the world, but is most abundant and luxuriant in the Arctic regions. It is a very variable plant, but always consists of a much-branched erect cylindrical tubular thallus, with small perforations in the axils. It attains a height of two inches and upwards. Its nutritious qualities depend on Lichenin (q.v.), and though acrid it may be used as human food.

Reineke Fuchs. See REYNARD THE FOX.

Reinhardt, MAX, born in 1873 at Baden bei Wien, appeared as an actor at Berlin in 1894, and as director of the Deutsches Theater, the Grosses Schauspielhaus, and Die Komödie there has been associated with a great movement to organise the art of the theatre—declamation, music, scenery, lighting—with a single eye to dramatic effect, classical, symbolical, or realistic, as each play may require. One of his novelties is to extend the stage right into the centre of the auditorium, and another to mingle spectators and actors in 'crowd' scenes, his chief aim being to restore the intimacy that existed in Greek and Elizabethan theatres. See monographs by Jacobssohn (1911) and by Stern and Herald (1919).

Reinkens, JOSEPH HUBERT (1821-96), was born near Aix-la-Chapelle, where he worked in a factory before he studied for the priesthood. In 1853 he became professor at Breslau, and in 1873, a strenuous opponent of the infallibility decrees, was chosen bishop by the Old Catholics (q.v.).

Réjane, GABRIELLE (1857-1920), French actress, daughter of an actor, made her *début* in 1875 at the Vaudeville. Endowed with a marked personality she had a successful career at the Vaudeville, Odéon, Variétés, and Ambigu, but her greatest triumphs were achieved in Richépin's *La Glu*, and Sardou's *Madame Sans-Gêne*. She made several foreign tours, visiting England for the first time in 1894.

Relapsing Fever (also known as *famine-fever* and *seven-day fever*), is one of the three great

species of continued fever, the two others being typhus and typhoid. It was first definitely discriminated from these diseases by Dr Henderson of Edinburgh and other Scottish physicians about 1842, but it can be traced back with certainty in the records of disease a century farther, when it was prevalent in Ireland and Scotland. During the 19th century it was met with in those countries, in England, in central and eastern Europe, the countries surrounding the Levant, North Africa, India, China, and, though never extensively, in North America. Relapsing fever usually begins suddenly with rigors, a sense of chilliness, and frontal headache. Febrile reaction soon sets in, with a temperature of 104° or more, and pulse usually over 100 per minute; the tongue is coated with a thick moist whitish fur; and the skin is often jaundiced (a symptom that seldom occurs in typhus or typhoid fever). There is severe aching pain in the joints and muscles, and great sleeplessness; but delirium, if present at all, usually comes on only towards the end of the first week. After the above-described symptoms have lasted for a period varying from five to eight days, generally on the seventh day, a sudden change takes place. This *crisis* commences with a copious perspiration, which is followed by a rapid falling of the pulse and temperature to or below the normal, and the patient appears nearly well. But from the fifth to the eighth day of this seeming convalescence a sudden relapse occurs, and all the primary symptoms return; these often run a rather shorter course than before, and again terminate in sweating and in a second convalescence, which is in most cases permanent. The relapse sometimes, however, occurs three or even four times. Death is a rare termination of relapsing fever; and when it does occur, it is usually before the seventh day of the disease. No important anatomical lesion is constantly observed in the bodies of those who succumb to this disease, except enlargement of the spleen. One form of the disease, however, is much more severe, and very often fatal. It was originally described as a distinct disease under the name of *bilious typhoid*, and is characterised by more marked implication of the digestive organs, by the constant presence of jaundice, and by absence or incomplete development of the crisis and intermission. It has now been shown to be really identical with relapsing fever proper. Relapsing fever is generally met with among those living under unfavourable hygienic conditions; it is specially apt to attack a population suffering from insufficient nourishment (hence the name famine-fever), and is seldom met with among the upper classes, or among Europeans residing in the tropics, unless they are brought closely in contact with the sick. At the same time it is very infectious, spreading either directly from the patient to doctors, nurses, &c., or from clothes and bedding to washerwomen, who have suffered severely in some epidemics. It was shown by Obermeier of Berlin in 1873 that an organism (*Spirillum*) is constantly present in the blood of those suffering from the disease, and his results have been confirmed by numerous other observers. Moreover, a similar disease has been produced in monkeys by inoculation with the organism, which has also been found in their bodies after death. There can be no doubt, therefore, that this spirillum is the cause of the disease (see GERM THEORY OF DISEASE). Though relapsing fever has been abundantly proved to be distinct from typhus, they are often associated in a curious way; epidemics of the two diseases have frequently been observed to occur in the same place either simultaneously or successively.

Treatment.—The patient, as in other febrile

diseases, must be kept in bed, and soporifics and aperients are frequently necessary. Salvarsan or other preparation of arseno-benzol has the same destructive effect upon the spirillum causing this disease that it has in syphilis, and a single injection into the veins is often sufficient to cut short the fever and prevent relapses.

Relations, MAINTENANCE OF. In England it is the duty of the husband to maintain his wife, according to his estate or condition in life; if he refuses or neglects to do so, or makes it impossible for her to live with him, she has an 'authority of necessity' to pledge his credit for the necessities of life. Under the statutes relating to the poor a husband may be punished for deserting his wife, and compelled to provide for her maintenance; the husband of a lunatic wife may be compelled to contribute to her maintenance in an asylum. The obligation of a husband to maintain his wife ceases if she leaves him without his consent in circumstances which do not justify her in living apart, and in any case if she commits adultery, though he may have been guilty of cruelty or other misconduct. Under the Married Women's Property Act, 1882, a woman who has property may be compelled to contribute to the maintenance of her husband. At the common law a parent is not legally bound to maintain a child; but he may be indicted for not supplying an infant child with necessities. In like manner a child is not bound at common law to maintain his parents. But the poor-law of 1603 imposes a direct liability on the father, grandfather, mother, grandmother, or children of any person not able to work; and by a subsequent act a man who marries a woman having children (legitimate or illegitimate) must maintain such children. The Married Women's Property Act, 1908, provides that married women having separate estate shall be liable for the maintenance of their parents. Bastard children are to be maintained by the mother; but the father may be summoned before justices and ordered to pay a weekly sum to the mother, or to a person appointed by the justices. A grandchild is not liable to maintain a grandparent, nor can a man be required to maintain persons related to him only by affinity (as e.g. a son's wife), or a collateral relation (as e.g. a brother or nephew). In Scotland the father, and failing him the mother, is bound to maintain children until they are able to earn a livelihood; similarly a child is bound to maintain his father. The same applies between descendants and ascendants in all degrees, but not to collaterals. A husband is bound to maintain the indigent parents of his wife during the subsistence of the marriage, but only up to the value of any property he may have received through his wife on marriage. The father and the mother of an illegitimate child are equally and jointly bound to support it, and if the child is unable to earn a livelihood the obligation may last throughout its life. A husband is, of course, bound to support his wife; and he is liable to her creditors for alimentary debts. In the United States the laws of the states vary; but the duty to support wife, children, and parents is generally recognised, and it is usually made a penal offence to abandon wife or children.

Relative Keys. See SCALE.

Relative Rank. See RANK.

Relativity. 1. *The Physical Universe.*—As judged by the information furnished to us by the evidence of the senses, the physical universe seems to us to have an objective existence independent of the observing mind. But in some cases the processes of scientific investigation lead us to conclude that certain of the phenomena of the universe, e.g. the mirage, are unreal, and have a quite different

constitution from those of the phenomena which they seem to resemble. The question naturally arises, May not the apparent realities be themselves unreal? And by one school of philosophers it is asserted that there is no real objective universe at all; that it is non-existent outside the thinking mind; that, in fact, its properties are only attributes and properties of the mind. And it is really impossible to prove or disprove either view. To these philosophers the physicist replies that if their view be correct, so that he is only investigating the properties of mind, he is nevertheless taking the best method of carrying out the investigation. He therefore asserts as a postulate the external objective existence of the universe, and proceeds to investigate its properties as such in accordance with scientific method.

2. *Space and Time: their Relativity and Dimensions.*—The ideas of space in which our universe exists, and of position within it, are impressed upon us through observations which lead us to use such terms as right and left, up and down, far and near; or north and south latitude, east and west longitude, height above or depth beneath mean sea-level, and so on. Three independent and definite statements of these or similar types, e.g. distance north, distance east, and distance up, completely specify position in space. Therefore we say that space is possessed of three independent dimensions, or that it is tridimensional.

Similarly, the idea of time in which existence occurs arises through observations which lead us to employ terms such as before and after, earlier and later, or such prefixes as pre- and post-. One definite statement of such a type, e.g. 5 o'clock P.M., completely specifies the instant of an occurrence. Therefore we say that time has one dimension, or is unidimensional. It may change while position remains fixed, and so we regard it as an entity quite independent of space.

But we cannot specify an instant in time without specifying an instant, or epoch, or origin, from which we measure time forwards or backwards. And we cannot specify position in space without specifying a point or origin from which we measure distances forwards or backwards, in three independent directions—that is, measurements in time and space are essentially *relative*: we may speak of absolute time and absolute space, but we know nothing of them in actual experience.

3. *The Scientific Method.*—In the development of science from a mere body of disconnected data the attempt is first made to co-ordinate the facts or phenomena into connected groups, and then to frame, by postulation, determining conditions, or rules, or *laws*, which bind them together. The aim is always to get the *most inclusive*, the *most simple*, and the *most accurate* law attainable. At first it is regarded as a mere working hypothesis. But gradually, as its applicability widens, and in particular when it is found to be capable of predicting previously unknown phenomena, it attains to the rank of an accepted *theory*, though it can never attain to absolute proof.

The simplest law of all is that of constancy, conservation, or *invariance*. The next simplest is that of direct proportionality. A law may be purely empirical, that is, purely descriptive in itself, but it is not then regarded as an ultimate law exhibiting fully the interrelations of phenomena. It does not fulfil the above test of inclusiveness.

4. *Newtonian Relativity.*—Newton's laws of motion, which apply to all mechanical actions in the universe of ordinary matter, were stated without explicit reference to any system of axes, or any origin of position or of time (sect. 2), but the essential relativity of measurements in space is implicitly involved in them. If they hold with

reference to any set of axes supposed to be at rest, they hold also with reference to any set which are in uniform rectilinear motion relatively to these. Time is supposed to be essentially the same for both systems of reference.

5. *Action at a Distance. The Aether.*—One of the postulates or laws laid down in the Newtonian philosophy is that no action can take place between distant bodies except by the intervention of a connecting medium. Light comes to us from the most distant stars, and it takes time to traverse the intervening space. Its rate of propagation is known from experimental measurements. It has some location in the interval between its departure and its arrival. The medium in which its energy is located is termed the *aether*. Newton considered that, even in a case in which there was no finite rate of propagation of action, there could be no action between distant bodies except through a medium (as in the case of gravitation, for example). His view indeed was that no one competent in matters of philosophic thought could come to the contrary conclusion.

Maxwell investigated the properties of the aether which would enable it to account for electric and magnetic actions occurring apparently at a distance, and he showed that these would be propagated at a finite speed by wave motion in the medium. His idea that these waves were waves of light, and that their speed would therefore coincide with that of light, has been fully verified. He investigated the stresses in the aether which accompany their propagation.

6. *Aberration. Fixed Aether.*—In consequence of the motion of the earth round the sun, which is shared by any observer on the earth's surface, a star is not in general seen in the direction in which it is actually situated. The phenomena is exactly analogous to that observed when one moves through still air in which raindrops are falling vertically. The drops do not appear to be falling vertically, but to move in a direction inclined to that of the observer's motion. The displacement of the star is exactly that which would occur if light moved with its known constant speed through the aether *at rest*, while the earth moved freely through that aether without disturbing it in any way. This is the doctrine of a *fixed aether* serving for the propagation of light, and, according to Maxwell, of all electro-magnetic action.

But in order to explain the observed slower speed of propagation in a more refractive medium than aether in free space, it is necessary to assume that the aether is denser in a more refractive medium (e.g. water or glass) than it is in free space. To explain the facts Fresnel assumed that the excess of the density in matter over that in free space is carried completely by the matter in its motion through the aether, while the proportion of the aether having the same density as in free space moves freely through the matter, or, rather, lets the matter move freely through it. It is in this sense that the term *fixed aether*, above introduced, is used. Fresnel's assumption is found to agree entirely with experiments regarding refraction.

7. *Michelson's Experiment. Moving Aether.*—Now, if a boat is rowed at a constant rate relative to the surface of a stream, it can easily be shown that the time to row it first down and then up stream through a given distance relative to the banks is greater than the time taken to row it across the stream and then back through the same distance. In the same way light, moving with constant speed through the aether, would be expected to take a longer time to pass forwards and backwards between two points at a fixed distance apart on the earth's surface when the line joining them is parallel to the direction of the earth's motion, i.e.

to the direction of the æther-stream, than it would when the line is perpendicular thereto.

When the test was made (by an optical interference method) by Michelson, and later with more delicate apparatus, which could indicate one two-hundredth part of the effect to be expected, by Michelson and Morley, no trace of the effect was observed. This leads directly to the conclusion that the æther is at rest *relatively to the earth*, and is directly opposed to the conclusion drawn from aberration.

8. *The Fitzgerald-Lorentz Contraction.*—Fitzgerald pointed out that the only way of reconciling these discordant experimental results in accordance with recognised physical ideas was to assume that the length of a body was different according as it lay parallel or perpendicular to the direction of its motion through the æther. The length has to be shorter in the former case so as to reduce the time of transit of light to and fro along it to the time in the latter case. The change cannot be shown through measurement by a material scale, for the length of the latter is variable in the same way.

Lorentz independently made the same assumption in consequence of theoretical reasoning which led to an extension of the Newtonian principle of relativity. The interaction of æther and matter might produce the contraction.

9. *Lorentzian Relativity.*—Lord Rayleigh pointed out that the contraction deduced by Lorentz from his theory of the propagation of light (electromagnetic waves) through the æther, a theory framed to account for the Michelson-Morley result, would lead us to expect the existence of slight double refraction in matter so strained. Rayleigh made the experiment, and found no such effect. Brace verified his result with still more delicate apparatus.

In the Newtonian relativity the duration of a given event was assumed to be the same for all observers in all conditions of motion—that is to say, time was regarded as an absolutely independent variable (sect. 2). Lorentz showed that, by using a certain set of space and time co-ordinates, differing from the Newtonian set mainly in that the time co-ordinates depended on relative motion, the equations for electro-magnetic (optical) conditions in the free æther were of the same form *to whatever set of axes they were referred* so long as these were in uniform relative motion only. This implies the absence of all observable effects, such as those sought for by Michelson and Morley, and by Rayleigh and Brace. The new idea involved is that of time dependent on position and motion. This relativity reduces to the Newtonian form for motion sufficiently slow in regard to the speed of light. It therefore fits ordinary mechanical as well as electro-optical facts.

10. *Einsteinian Relativity. First Form.*—The motion of a Lorentzian set of axes was supposed to be given with reference to a set regarded as fixed relatively to the æther. And Lorentz's investigation was designed to determine conditions under which the above-mentioned optical effects would necessarily be as found. Einstein asserted that physical laws, found true relative to one set of axes, were unaltered in form if referred to another set which was in uniform rectilinear motion with respect to the former. This states the conditions of invariance (sect. 3) of physical laws. Einstein postulated also the invariance of magnitude of the speed of light relative to any system of co-ordinate axes whatever be its state of uniform rectilinear motion. From these postulates he deduced (sect. 12) the Lorentzian conditions of relativity. The difference introduced now is that *these conditions follow as consequences of an asserted universal law*, whereas they were formerly introduced to account for certain particular phenomena. All physical

phenomena—at least apart from gravitation—are now postulated to be subject to it. Thus no measurements designed to exhibit motion relative to the æther can succeed. This is in accordance with hitherto observed facts.

11. *Second Form. Gravitation.*—In Newtonian (or, rather, Galilean) relativity, in Lorentzian relativity, and in the first Einsteinian relativity, invariance of laws was asserted with reference to any set of axes in *uniform* rectilinear motion with respect to a set for which the laws were found to be true. In his second form of relativity Einstein generalised this condition so as to include invariance of all physical laws relatively to all sets of axes whatever be their state of relative motion. The state need not be steady whether with regard to translation or rotation.

Newton proved that weight was proportional to mass (or inertia), and essentially defined force as the product of mass and acceleration. But it does not follow that weight bears the same proportion to inertial mass as other forces of equal magnitude do. A comparatively recent experiment (1891) by Eötvös gave strong support to the view that the proportion is the same. Einstein made the postulate that it is the same, and thus succeeded in including gravitational laws within the scope of the theory of relativity. This postulate is the basis of the second form of his theory, just as the postulate of the constancy of the speed of light under all conditions was the basis of its first form, or as inertial invariance was the basis of Newtonian relativity.

No quite satisfactory theory of gravitation has ever been proposed, nor does Einstein's re-foundation of the principle of relativity furnish one. But it does enable gravitational phenomena to be described formally as if they were merely motional effects stated relatively to a suitably moving set of axes. In illustration of this statement, consider a person weighing 10 stones standing on a lift at rest. If he is suddenly loaded with 1 stone weight more, he may, judging by the pressure of his feet on the floor, decide that his weight has been increased by one-tenth. If the lift be now suddenly set in upward motion with an acceleration of rather less than 3 feet per second, he would, if the motion were outside his cognisance, consider that his gravitational tendency had again increased by one-tenth. The two effects would be indistinguishable to him, for he refers everything to axes fixed relatively to the lift. But in the latter case his axes are actually moving with vertical acceleration relatively to the earth, and the apparent gravitational effect can be accounted for by reference to a parallel set of axes fixed relative to the earth without any allusion to gravitation. Another example appears in the case of an equatorial observer, to whom, were the earth rotating at about seventeen times its present rate, gravitation would seem to be non-existent because of the action of the so-called centrifugal force.

12. *Second Form. Velocity of Light.*—In this generalised system of relativity it follows that, just as in the first system the invariance of the speed of light compelled departure from the simple inertial invariance of the Newtonian system, so here the new postulate compels departure from the constancy of the speed of light except in a uniform gravitational field. The theory shows that the speed of light is less in a region of strong gravitation than it is at a great distance from any gravitative body. Hence light is in general refracted in passing through a non-uniform gravitational field, being deflected towards the region of stronger gravitation. This predicted effect has been verified within observational errors, in the case of starlight passing near the limb of the totally

eclipsed sun, both as to its direction and magnitude. Another successfully undergone test of the theory is that of the direction and magnitude of the motion of the perihelion of Mercury, which does not seem to be explainable on the unmodified Newtonian theory of gravitation. One more successful test lies in a predicted change of wavelength of light emitted in a very strong gravitational field. The experimental proof is difficult because of the smallness of the effect even in the strong field of the sun. But the verification has recently been made still more stringent by observation of light coming from the intensely dense small component of the double star Sirius.

13. *Euclidean Space. Curvature of Space. Space-Time Co-ordinates.*—If, in a limited plane space of two dimensions, we draw a right-angled triangle, Euclid's proposition that the square on the hypotenuse is equal to the sum of the squares on the two other sides holds true. Such space is called *Euclidean or Homaloidal*. The proposition does not hold in *curved space* of two dimensions, e.g. on the surface of a sphere, the sides of the triangle being portions of great circles.

If, in our tridimensional space, we draw from the right-angled corner of the plane triangle a line perpendicular to the triangle, and complete the rectangular block with the three coterminous sides as edges, we find that the square on the line joining that corner of the block to the opposite corner is equal to the sum of the squares on the three consecutive edges which together join these corners. So our space is called tridimensional, Euclidean, or homaloidal space. Similarly we can treat of four and higher dimensional spaces, though, from our limitations in nature, we cannot picture them to ourselves.

In Newtonian relativity the distance between two points not in relative motion in our space is quite independent of time, and the Euclidean relationship holds. In Lorentzian, and in Einsteinian relativity of the first kind, a relation subsists between the three space co-ordinates and the time. The distance between the points is not regarded as independent of the observer's motion relative to the points. The relation which was found to suit the results of the Michelson-Morley experiment and others, together with the assumed independence of the speed of light of all uniform relative motion, is that, in the propagation of light between two near points in free space, the sum of the squares of their component rectangular distances is equal to the square of the speed of light multiplied by the square of the interval of time taken by light to pass between the two points. We may express this by saying that the square of their optical distance is equal to the sum of the squares of their co-ordinate distances. This is the law which compels the physical invariance referred to in section 10. It may be represented geometrically by means of a space-time rectangular complex of four dimensions in which the product of the speed of light into the interval of time, multiplied by the ordinary imaginary factor—the square root of negative unity—is measured in the fourth rectangular direction. That four dimensional complex forms a *Euclidean space*. The statement that it is Euclidean expresses the first form of Einsteinian relativity. But it must be remembered that it is not a *real* four dimensional space: it is purely pictorial. A scheme of its representative points would indicate the past, present, and future of our material universe, apart from gravitational effects except in a region so small that the gravitational force is practically uniform throughout it.

For a field of varying gravitation we cannot find a set of rectangular space-time axes so moving as to simulate the field throughout its whole extent

by means of the accelerations: witness the various values of the planetary years. In other words, the above law regarding sums of squares does not hold. We must regard the space as non-Euclidean except in so far as it may be practically so throughout any sufficiently small region. It must be curved slightly in a fifth dimension. The above law regarding sums of squares therefore requires slight modification, and products of co-ordinate distances are brought in.

It is easy to see how curvature of space may give rise to the idea of a gravitative force. Consider two dimensional plane (therefore Euclidean) space. An observer limited to it learns by experience that if he moves with given speed in a circle of radius R , he is subject to an apparent centrifugal force which is inversely proportional to R . Suppose that, unknowable to him of course, his plane space becomes uniformly curved into a spherical surface of great radius. If he now repeats his experiment, measuring the same length R along the curved surface, as he must, he will find that the centrifugal force measured parallel to the surface, which is all that he can judge of, is less than the value which he would expect from his previous experience by an amount proportional to R . He would ascribe this naturally to a central gravitative force directly proportional to the distance.

14. *Existence of the Æther.*—Extreme relativists, seeing that in their scheme light moves in free space, apart at least from gravitative action, with the same speed between two fixed points *whatever be their condition of uniform motion*, assert that the æther has no real existence. The extreme form of the theory approaches more nearly to the standpoint of the idealistic philosophy (sect. 1). For the physicist Newton's view still holds (sect. 4). He cannot disprove the assertion, but neither can the extreme relativist deny the opposite assertion (sect. 1). The physicist feels compelled to seek 'the reason of the cause and the wherefore of the why' expressed in terms of ideas consonant with an understood mechanism if that be possible, or at least a mechanism presenting analogies to others whose mode of action is understood. But the condition of equal speed of propagation of light upstream or down-stream is, if there be no other way of describing conditions, a fundamental difficulty.

Stokes long ago showed that aberration (sect. 6) could be explained in consistence with an æther dragged along with the earth in its motion in such a way as to be at rest, relatively to the earth, at the earth's surface. His postulates were not quite consistent with all necessary conditions, but can be made so. It follows that, in measurements made at the earth's surface, no effect of æther drift should be observable. Recent observations at high altitudes have given a positive Michelson-Morley effect increasing with the altitude. If the æther motion thus evidenced be found to be non-rotational, a definite proof of the existence of the æther is furnished.

15. *Conclusions.*—The chief phenomena of the physical universe remain, as before, accountable for on established principles. It is only in connection with effects involving extreme delicacy of measurement that the necessity for addition or modification arises. The new theory states a relationship, hitherto unused, amongst the measurements of space and time in connection with physical actions. It is purely a mathematically descriptive formula that is used. It tells nothing of itself apart from its use in connection with principles already recognised, such as the Maxwellian principles of electro-magnetic action, or that of the Newtonian gravitational potential, except in so far as it may necessitate very slight modification thereof. Never-

theless it has introduced great descriptive unification throughout the whole field of physical science, and has already been extended by further generalisation. It links up the phenomena of gravitation, hitherto isolated, with the whole range of mechanical phenomena, and is in touch with the recent development of ideas concerning these. It satisfies the test of a scientific theory (sects. 3, 12).

It must be regarded as the most wide-reaching and searching development in *dynamics*, if not since Newton's time, at least since the introduction of the Hamiltonian principles of action; as it also is, in physics generally, the greatest since Maxwell's unification of optical, electric, and magnetic phenomena.

Relativity of Knowledge. The doctrine of the relativity of knowledge is almost a commonplace in some philosophical schools, and is as strenuously denied by others. It is connected primarily with the contrast between the absolute and the relative, or the noumenon and phenomenon, and is one phase of the great discussion as to the relation of knowledge to reality. In its modern form the doctrine has obtained currency chiefly through the speculations of Kant, of Hamilton, and of Herbert Spencer. Knowledge evidently implies a knower and a relation between the knower and the object known. Hence it is argued that the object is conditioned by the relation into which it is brought; merely by becoming an object the thing as it is in itself undergoes a change or accommodation. Our knowledge therefore can never yield us the reality of things—the noumenon or thing-in-itself—but only the phenomenon, the thing as it appears to us. Or, as it is otherwise expressed, in being known the object must conform to the nature of the knowing faculty, the mental constitution or organisation of the knower; we cannot, therefore, conclude, says Hamilton, that the properties of existence are known 'in their native purity and without addition or modification from our organs of sense, or our capacities of intelligence.' Hamilton's general conclusion is: 'Of things absolutely or in themselves, be they external or be they internal, we know nothing, or know them only as incognisable; and we become aware of their incomprehensible existence only as this is indirectly or accidentally revealed to us, through certain qualities related to our faculties of knowledge. All that we know is therefore phenomenal, phenomenal of the unknown.' This is adopted by Herbert Spencer, and made the basis of his theory of knowledge, or rather of what Ferrier would have called his agnology, his doctrine of our necessary ignorance: 'The reality existing behind all appearances is, and must ever be, unknown.' In Kant a similar doctrine is associated with the asserted subjectivity of the forms of space and time; but it is also based upon the broader consideration that perception can give us 'only the relation of an object to the subject, not the inward essence which belongs to the object in itself.' The empirical schools, which resolve our knowledge into impressions of sense manipulated according to the laws of association, likewise accept in its widest sense, as J. S. Mill points out, the doctrine of 'the entire inaccessibility to our faculties of any other knowledge of things than that of the impressions which they produce in our mental consciousness.' But, inasmuch as they in many cases profess a sceptical idealism which denies, or leaves doubtful, the existence of any reality beyond the states of consciousness, their views are less usually associated with the term.

The starting-point of the above argument must be conceded by all. Knowledge obviously implies relation; it exists only through the duality of knower and known, this duality being as necessarily

present in the case of what is called self-knowledge as in the case of knowledge by self of independent objects. But the upholders of the doctrine of relativity proceed to convert this essential feature of intelligence into a proof of the 'impotence' of our faculties. For the term is used in such a way as to imply a taint or defect in our knowledge. Our knowledge is condemned because it fails to realise a certain ideal. The question arises, however, whether the ideal proposed is in any sense legitimate or possible. What is this 'reality existing behind all appearances,' this thing in itself that so persistently evades our grasp? The answer of a sound philosophy would seem to be that this unknown essence or noumenal reality is a fictitious entity of our own creation. The essence or nature of a thing is expressed in its qualities or action; the noumenon reveals itself in the phenomenon. The relativists are in the habit of saying that 'we know only phenomena,' thus making our knowledge of phenomena the ground of our ignorance of the corresponding noumena. But, strictly speaking, it is a misuse of language to say that we know phenomena; the phenomenon is our knowledge of the noumenon. To say that we know phenomena is therefore only a roundabout way of saying that we know, and what we know is the noumenon or thing-in-itself. Of course the contrast between knowing and being is not abolished according to this view; in human knowledge, at all events, the existence of objects is independent of our knowledge of them. It is this contrast between the thing as existent and the thing as known that lends plausibility to the doctrine of relativity. But the contrast only justifies us in saying that knowing a thing is not the same as being that thing; whereas the relativistic doctrine says that, *ipso facto*, to know a thing is not to know the reality of the thing. Knowledge, in this view, infallibly cuts us off from knowing.

Apart from this general line of thought, the doctrine is frequently based upon the large extent to which sensation enters into all our knowledge. In the structure of their sense-organs different living creatures differ appreciably, and there will be a corresponding difference in the image of the world which they make to themselves. The knowledge of every being, it is argued, is thus inevitably conditioned by its organisation, and there is no possibility of arriving at an objective criterion. Man, in the Protagorean formula, is the measure of all things; but he measures them only as they seem to him. Such a formula may be interpreted either in a sensationalistic and individualistic fashion, as seems to have been done by Protagoras, or in a rationalistic and humanistic fashion, as is seen in Kant. The former interpretation leads to a sceptical dissolution of knowledge, for it leaves no common ground on which individuals might meet. Kant, by making space and time, if not the categories also, forms peculiar to the human intelligence, but common to all men, provides for objective truth between man and man, but insists on the merely human and relative character of such truth. Apart from the assertion of the merely subjective character of space and time, which Kant can hardly be said to have proved, it is evident that the relativist argument applies with most force to what are called the secondary qualities, such as tastes, smells, sounds, and colours. But when we consider the elevated pleasures of which the last two, at all events, are the source, we may well hesitate about pressing the relativistic argument too far. Things do not exist on their own account as bald brute facts, on which intelligence afterwards supervenes, to make what use of them it can. It seems truer to believe that to be known and enjoyed by spiritual beings is the

purpose of their existence. The relativity of the world to the human senses and intellect would then form no ground for believing that the image of the world thus obtained was in any sense distorted or untrue. We may rise to higher insight and more perfect æsthetic appreciation, but that our knowledge is finite and subject to revision does not deprive it of validity or objective truth in its own time and place. The case for the relativity of knowledge will be found strongly put in Sir W. Hamilton's *Discussions* and *Lectures on Metaphysics*, Mill's *Examination*, Mansel's *Bampton Lectures*, and Herbert Spencer's *First Principles*.

Relics (Gr. *leipsana*, Lat. *reliquiæ*, 'remains'), personal memorials of those among the dead who have been distinguished during life by eminent qualities: especially, in the history of the church, objects which derive their value from their connection with our Lord and with the saints; as, for example, fragments of our Lord's cross or crown of thorns, portions of the dust, the bones, the blood, the instruments of torture, the chains, &c. of the martyrs, the mortal remains, the clothes, the books, and other objects of personal use of the other saints. With them may be grouped objects to which a certain indirect sacred interest is given by their being brought into contact with the direct memorials of the distinguished dead, as by their being placed on the tombs of the martyrs, touched with the relics, or blessed at the shrine or sanctuary of the saints, &c. Reverence for relics developed with the increasing honour paid to Martyrs (q.v.).

The earliest monuments of Christian history contain evidences of the deep and reverential affection with which martyrs of the faith, their mortal remains, and everything connected with their martyrdom were regarded by their fellow-Christians, and for which Catholics profess to find warrant in many passages of the Old and of the New Testament, as Ex. xiii. 19; 2 Kings, xiii. 21, and xxiii. 16-18; Matt. ix. 20-22; Acts, v. 12-16, and xix. 11, 12. The letter of the Church of Smyrna attests this plainly as to the martyrdom of Polycarp; Pontian's *Life of Cyprian* tells of their stealing the martyr's body, and carrying it away by night in holy triumph. The Apostolical Constitutions bear witness to the honours paid. Miracles, too, are described as connected with relics. Thus, Ambrose tells of a blind man's sight restored by his touching the bodies of the martyrs Gervasius and Protasius; and similar wonders are detailed by Gregory Nazianzen, Chrysostom, and Leo the Great; so that the possession of relics of the martyrs, and even the occasional touching of them, was regarded as a special happiness. According to Theodoret, even cities were content to share with each other portions of the sacred treasure. Connected with this feeling, too, is found a belief of a certain sacred efficacy in the presence or the touch of the relics; and especially there is ascribed by Chrysostom, Basil, Theodoret, and other Fathers, to prayers offered before the relics, a virtue in dispelling or warding off sickness, diabolical machinations, and other evils. Hence we find that altars were erected over the tombs of the martyrs, or at least that relics were invariably placed on the altars, wherever erected; inasmuch that the Trullan Council ordered the demolition of all altars in which no relics had been deposited. Far more sacred than the relics of martyrs was the cross of our Lord, which was believed to have been discovered at Jerusalem by Helena (q.v.), mother of the Emperor Constantine. Minute portions of the wood were distributed to the principal churches; and Cyril of Jerusalem, within less than a century after the discovery of the cross, describes the precious wood as dispersed throughout the world. According to Rohault de Fleury's *Mémoire sur les*

Instruments de la Passion, 'the total cubic volume of all the known relics of the True Cross is about 5,000,000 cubic millimetres, whereas a cross large enough for the execution of a man must have contained at least 180,000,000 or thereby.' The practice of relic-worship, and the feeling on which it was founded, were not suffered to pass without a protest. At quite an early period many abuses and superstitions had crept in, which even the Fathers who admit the worship do not fail to condemn; and Vigilantius, in a treatise now lost, reprobated in the strongest terms the excesses to which it was carried, and indeed the essential principles on which the practice rests. He had so few followers, however, that were it not for the refutation by Jerome of his work against relics we should have no record of his opposition to the popular view; and it is urged by Catholics, as a proof of the universal acquiescence of the church of the 4th century in the practice of relic-worship, that it was not even found necessary to call a single council to condemn Vigilantius.

The writings of Augustine, of Paulinus of Nola, of Ephraem the Syrian, of Gregory the Great, and others are full of examples of the miraculous virtue ascribed to relics, and of the variety and the extensive multiplication of sacred memorials of all kinds. Nor was this confined to the orthodox alone; all the different parties in the controversy on the Incarnation agreed with Catholics and with one another on this subject, and even the Iconoclasts, at the very time that they most fiercely repudiated the use of images, admitted without difficulty the veneration of relics.

In the age of the Crusades a fresh impulse was given to the worship of relics in the West by the novelty and variety of the sacred objects brought home from the churches of Syria, Asia Minor, and Constantinople by crusaders, by palmerers returning from Palestine, and by the Latin conquerors of Constantinople; and it is admitted by the most zealous Catholics that at this period many false, and perhaps even absurd and ridiculous relics were introduced, and were successfully commended to the veneration of individuals or individual churches in the West; nor do they venture to doubt that abuse and superstition found their way side by side with what they regard as the genuine and authorised worship of the church. Nevertheless, with the exception of the Waldenses, Wyclif, and a few isolated individuals, the practice remained unchallenged till the 16th century, when, in common with many other doctrines and practices of the Church of Rome, it was utterly repudiated by the Reformers. Catholics, however, allege that the practice, as sanctioned by the church, has nothing in common with the abuses which form the main ground of the objections alleged by Protestants. The Roman Catholic use of relics, as authorised by the church, is to serve as incentives to faith and piety, by recalling vividly to men's minds the lives, and, as it were, the corporeal presence and the earthly converse of the saints, and thus placing before them, in a more touching manner, the virtues which, in the examples, are held up for men's imitation. The decree of the Council of Trent connects the subject of relic-worship with the general question of saint-worship, and regards the relics of the saints not as possessing intrinsic virtue, but only as instruments 'through which God bestows benefits on men.' The Fourth Lateran Council (1215) forbade the sale or veneration of relics until their authenticity had been approved by the authorities; the Council of Trent renewed the prohibition. In the pastoral of the Bishop of Treves, inviting pilgrims to the exhibition of the Holy Coat (1891), it is expressly stated that 'the authenticity of no relic, be it the most eminent of the oldest church of Christendom,

falls under any precept of Catholic faith.' Relics are usually venerated in costly cases or 'reliquaries' set on the altar; they are also carried in procession, and the faithful are blessed with them.

The Greek and other Oriental churches, and most of the Oriental sects, agree with Roman Catholics in the practice of relic-worship. On the contrary, the Reformed churches, without exception, have rejected the usage; though non-religious relic-worship is rife enough, in the form of swords of Wallace and Bruce, locks of Prince Charlie's hair, &c. The practice of relic-worship forms a notable feature of the Mohammedan usage of pilgrimages, and is an even more important feature of Buddhism.

Relief, as distinguished from 'sculpture in the round,' is one of the oldest forms of mural decoration, and in many cases is a subordinate department of architectural art rather than a branch of sculpture proper. It is low relief (*bas-relief*, *bassorilievo*), middle (*mezzo-rilievo*), and high relief (*alto-rilievo*) according as the carved figures project very little, in a moderate degree, or in a very considerable degree from the background. The ancient Egyptians practised a peculiar kind of low relief and *intaglio* combined (see *EGYPT*). The wall-sculptures of Assyria (q.v.) and Babylonia (q.v.) are mostly in very low relief. The Elgin Marbles (q.v.), from the Parthenon of Athens, are the most notable example of high relief. See **SCULPTURE**.

Relief Church. See **UNITED PRESBYTERIAN CHURCH**.

Relieving Officer. See **POOR-LAWS**.

Religion.—A word of Latin origin now found in most of the European languages, in some cases replacing the earlier term. As regards its etymology the derivations from *relinquere*, to leave, or *re-eligare*, to choose anew (i.e. to return to the Deity) have found no favour. The choice has usually lain between (1) *religare*, to bind (Lactantius, *Div. Inst.*, iv. 28, cf. Lucretius, i. 931), explained with reference to the restrictions imposed by religion, or the collection of duties incumbent upon man, or the bond with or dependence upon the Deity; and (2) *relegere*, to gather together, reconsider (Cicero, *Nat. Deorum*, ii. 28, 72), with reference to the carefulness and attention to all that concerns the gods. The latter of these is to be preferred. The term *religio* itself has had an interesting history, and two senses can be distinguished: (1) a feeling of awe, anxiety, doubt, &c., one, however, so indefinite that *religiosus* and *superstitiosus* overlapped; and (2) the cult, worship, or system which arose in consequence of, and was founded upon, that feeling. Already in the second century A.D. *religio* could be explained by the word *pietas*, and it could be applied by Christians to Christian feeling and the Christian cult (Minucius Felix).

Although general terms equivalent in meaning to religion can hardly be said to occur elsewhere, both the feeling of awe and a consequent system of behaviour are characteristic of all religions; and modern inquiries into the widespread feeling of the 'numinous' (R. Otto, &c.), and the innumerable tabus and other regulative, restrictive, and disciplinary features of religion, have shown that what is throughout fundamental is the consciousness or awareness of something outside ordinary normal existence which imposes itself upon men and forces them to take a special and considered attitude to it. On the other hand, this primary feeling is by no means necessarily 'religious' in the accepted use of the adjective, and no entirely adequate definition of the term 'religion' has as yet been found. It would be generally agreed that a defini-

tion of religion should certainly cover other than those religions which are for one reason or another considered higher than the rest; moreover, it should, properly speaking, apply to religion alone and differentiate it from morality, art, philosophy, and all that is now regarded as lying outside the term. But a serious difficulty at once arises because often among the world's religions such differentiation hardly, if at all, exists, and there are various types of cult, important for the history of religion, which, to some authorities, do not merit the name of religion. Again, whereas early writers (the Fathers and Schoolmen) were especially concerned with the definition of *true* religion—Christianity as distinct from other religions, or orthodoxy as distinct from heterodox forms—modern writers find it necessary to distinguish between religion and the magic which, though closely resembling it, is to be regarded as its opponent. Accordingly, besides the broad distinction between religion and what is non-religious—one which often can scarcely be drawn—there is a further crucial distinction, no longer between religion true and false, but between religion and magic—again one which can hardly be maintained consistently and rigorously.

Many definitions of religion have been suggested, all beset by the difficulty of gathering together under one head the many sides of 'religious' life and thought. A careful study of them—Leuba (*Psychological Study of Religion*) discusses forty-eight—is a valuable introduction to the nature of religion. The religion of the individual is, typically, something extremely intimate and of the deepest personal worth, often quite incommunicable; it penetrates to a greater or less degree the non-religious aspects of his life and thought; it is an ultimate authority to which he is subject, and which absolutely conditions his ideas of God and the Universe, so that 'spiritual' truths far transcend those that are based on scientific and other knowledge. On the other hand, the environment of the individual varies from the more simple and homogeneous to the more heterogeneous and specialised; and such is the varying extent of specialisation and differentiation in communities that the religion of the individual is far from being necessarily that of the group to which he belongs. Again, quite apart from the question of the significance for religion of art, science, political and other philosophies, &c. it often happens that art, philosophy, or political idealism will so be the 'religion' of a man or of men that some distinction must be drawn between whatever subjectively functions as a religion and a more objective estimate. How to form such an estimate would, however, be disputed, and by objective religion could be meant, either religion which has obtained historical realisation, or it may be better to recognise that, as opposed to religion as a subjective spiritual state, with all its manifold forms of expression in history, it is precisely objective religion which it is the goal of the modern Science of Religion to determine. The following may be cited as a recent definition: Religion is a collection of beliefs and practices (or practical attitudes) concerning a reality, personal or impersonal, unique, multiple, or collective, but in some way supreme, upon which man feels himself somehow or other dependent, and with which he desires to enter into relation (Pinard de la Boullaye).

Various attempts have been made to classify religions. The criteria have been *dogmatic*: religions true and false, natural and revealed, or natural and positive; or *cultural*: the religions of savage and civilised races (some would interpolate the semi-civilised), or of nomads, hunters, agriculturists, &c., or book religions and those without

sacred writings. Distinctions have been drawn also between national or race religions and those founded by great individual teachers, between redemptive religions and those in which the idea of an individual saviour is wanting or germinal, and, again, between universal religions and those too closely bound up with social, national, or dogmatic restrictions to be universal. Much more stimulating have been the classifications influenced by evolutionary ideas of some progressive development in the character of religion itself. Especially striking and influential was Hegel's scheme of religions of nature, spirituality, and the absolute or Christian religion. In general all evolutionary schemes are based on the recognition of (1) some extremely rude types of social-religious life among rudimentary peoples, (2) various evident developments from lower to higher types of religion, and (3) certain convictions as to the lines along which development has run and must continue to run. Although different conflicting classifications prevail, each has brought out facts of importance; and although the questions to which investigators have applied themselves can scarcely be said to have been answered, much more is known of religion than even a generation ago, and the modern study of the world's religions is one of the most impressive features of the day.

Four methods of inquiry in what is now a vast field of research may be noticed. (1) The *Comparative* is exemplified in Sir James Frazer's *Golden Bough*, with its collection of material illustrating many different forms of magic, tabu, sacrifice, ideas of the soul, regard for the dead, &c. As in the world of organisms some particular resemblance is perceived and forms the basis of the classification; though whether the resemblances are as significant as the differences, and whether the conclusions based on them are valid, are vital questions that sooner or later arise. The method has brought to light great masses of illuminative material: one passes from the comparison of data to that of different methods of handling the data, from the comparison of religions to that of theologies and philosophies, and the last word may be said to be, not the formulation of some final body of truth but the comparative study of such bodies of truth, religious and other, as are regarded as final. (2) The *Historical* method is concerned with the changes in the religion of a land, people, group, or individual, with the history of particular beliefs or practices, with that of a religion irrespective of land (Judaism) or people (Buddhism), and with the history of religion in the human race. Thus attention is paid to the rise of new religions, their ebb and flow, the decline of a religion and its death or revival. Thereby it is seen that the religious conditions of any one age are simply one stage in a profound process some fuller knowledge of which can be determined by a survey over as large a field as possible. It also becomes obvious that, as the changes which have made religious history turn upon all the individuals concerned, the religion of the individual is psychologically not less important than that of his environment. (3) The *Sociological* method investigates the part played by religion in the great events of family, tribal, and national life, the inter-relation of the constituent social divisions, the preservation of the social group, and its main interests. The relation between social conditions and the contemporary religion is not fortuitous; and besides the rôle of religion in social institutions (on which cf. Frazer, *Psyche*), the relation between the religious and non-religious spheres of life and thought always proves significant. Physical and economic conditions are also of the first importance, whether the scene is laid in the desert or in

mountains; climate is a factor (contrast Persia and India), also the risks attending the food-supply, and even the nature of the staple diet. These and other factors combine to shape the mentality of a people, so that an effective religion becomes the natural and inevitable expression of a people's whole temperament and life. Finally (4), of ever-increasing prominence is the *Psychological* method concerned primarily with the instincts, emotions, and mental processes. Viewing religion from within it illuminates the inner lives of men, ourselves included. Everywhere it tends to find similar fundamental processes, and it relates together in a new way the highest and lowest types of man. It elucidates the natural psychological efficacy of religious beliefs and practices—the tabus, belief in magic, the efficacy of convictions in the efficacy of both amulets and angels. It associates the idea of divine kingship and hero-worship, the sacred dance and the secular, and the religious and non-religious forms of initiation and other ceremonies, and of conversion, mysticism, and other impressive subjective states. Though still in its infancy and apt to be marred by extravagances, this powerful method is a most drastic dissection and analysis of the individual. It has demonstrated the naturalness of all religion when viewed from the psychological standpoint. But while every man's religion is seen to be explicable, if not self-evident, by reason of his conscious or unconscious presuppositions, psychology is unable to pronounce upon its objective value, or resolve the conflict between opposing or rival religious convictions. Further, what is expressed in terms of Space and Time (e.g. 'another' world, an 'external' power, a 'heavenly' origin or goal) is found to rest upon psychical experiences of a prevailingly uniform type. The religious and non-religious phases of personal experience, whatever they involve and wherever they may lead, cannot be isolated in separate spheres—as is already evident from the usual keen intellectual and rational criticism of all religious data. Hence, although the 'spiritual' truths of God and the Universe stand quite apart from the scientific and other non-religious convictions of Reality, both have their normal place in the individual; and the religious and non-religious ways of feeling and experiencing, of thinking and acting, are so inter-connected that a new stage has been reached in the scientific study of religion.

Of the many theories of the origin and development of religion none has won general acceptance, though all have cleared the air and brought valuable facts to light. The theories postulate an initial event (e.g. a primeval revelation), or a peculiar primitive mental state (fear, belief in ghosts, illusions), or some very rudimentary form of cult (fetishism, totemism, ancestor-worship). Religion, in some way or another thus introduced, is supposed to 'survive,' or stages of development are worked out more or less along genetic lines, beginning, e.g. with some primitive animatism or Animism (q.v.). Such crude views as that religion was invented by priests, or was the tool of a class, and that it was spread, in either case, to further selfish or ambitious aims, wholly ignore psychological facts, the characteristic vicissitudes of religion and its persistence. All theories that imply a survival of religion from past ages evade the problem of its actual origin and the reason of its survival; for the data of religious experience combine with the history of religion to indicate that religion persists and undergoes its innumerable modifications because of the innumerable individuals who accept and adjust current religious ideas, beliefs, and practices which are found to afford a natural interpretation and expression of

certain private and unique types of experience. A theory of the origin of religion must satisfy individuals whose personal experience forbids them to regard their religion as a survival from pre-historic ages. Further, the dominant and practical part played by religion in individual and social life tells against any theory of its *origin* from such an emotion as fear or from such illusions as ghosts; and it is necessary to distinguish between (1) what can evoke a distinctively religious feeling (as can fear and distress) or ideas of another realm (as can dreams and trances, &c.); (2) what might seem to be the most rudimentary religion conceivable; and (3)—what is quite another thing—the actual dawn of religion in the history, whether of the individual or the race.

The most characteristic feature of every effective religion is its function as an indispensable complement. Thus it serves to explain, relieve, and supplement phenomena, experiences, and situations which lie far outside the normal. Man's life and thought are found to be incomplete without it. Unseen powers are an explanation of otherwise inexplicable or abnormal phenomena, and religion offers a present help in time of trouble and an all-sufficing promise for the future. So natural is the psychological function of religion that the dawn of religion may be considered to have begun with the experience of certain typical needs (outside the range of the ordinary experience and knowledge of the time) and their satisfaction. The vividness and intensity of religious feeling at the beginning of a new religion or at periods of its revival, like similar periods in the history of individuals, show how religion will inaugurate some new series of developments. But since the content of every new mystical or religious experience is found to be conditioned by the stage of development already reached, such experiences, whether in the individual or the race, are landmarks, they are turning-points and not starting-points. On ordinary psychological grounds one cannot deny the existence of some sort of religious or spiritual experience among very primitive peoples; but the further back we go the more rudimentary must be the stage of development reached, until it becomes impossible to conjecture what the content of religious experience could have been. Experiences which can only be described as religious have been so normal, powerful, and pervasive that the theory of the origin of religion from some 'primitive revelation' might seem to be psychologically attractive. Now although the term 'revelation' is commonly restricted to particular occasions, which are felt to be so impressive and of such objective force as to require a distinctive term not to be applied elsewhere, revelation of some quality must, on psychological grounds, be regarded as a constant factor in the history of religion, though some of the known types of religion (in totemism and theriomorphism) are already so extremely rudimentary that one can scarcely determine the meaning of 'revelation' in prehistoric ages.

Effective religion (as distinct from mythological and other speculation) is typically concerned with the elemental problems of life. The problem of the food-supply bulks so largely among rudimentary peoples that religious (better 'magico-religious') beliefs and practices to this end presumably predominated from the earliest times. At all events such rites recur among the most rudimentary totemic societies known, and may probably lie behind the remarkable cave-paintings of animals in prehistoric Western Europe. The view that whole peoples are devoid of religion has not been proved, nor, if true, would it affect the problem of the dawn of religion. Similarly the widespread recognition of a Supreme Being, even among very rudimentary peoples (e.g. pygmies), as urged by Andrew

Lang, and confirmed especially by Wilhelm Schmidt, has hardly the significance commonly attached to it, for these great gods usually stand outside the working social system, even as among more advanced peoples a Supreme Being, however freely recognised, is often not so effective as the beings felt to be nearer at hand and more directly interested in men.

The study of mystical, religious, or spiritual experiences has so unmistakably emphasised the remarkably varied results from social, ethical, intellectual, and other points of view that the detrimental, unlovely, and clearly unprogressive aspects of religion are not less significant than those which are recognised as wholly beneficial and as factors in progress. The progressive history of religion is a fact, and some great landmarks are well known, the most notable being the birth of Christianity and the widespread movements five or six centuries earlier. But although Confucius and Lao-tse (vol. iii. pp. 410, 187), Buddha (vol. ii. p. 525) and Mahavira, the founder of the Jains (q.v.), Zoroaster (or a new stage in an earlier Zoroastrianism; q.v.), stand at the head of profound developments continuing to the present day, in Palestine the Deutero-Isaiah (vol. vi. p. 234) and the reorganisation of Judaism (see EZRA) proved an indispensable prelude to Christianity, and a line can be clearly traced from modern Christianity back to the earlier history of religion in Palestine. Not only is this continuity impressive, but the growth of knowledge of Man and the Universe in the Christian world may be contrasted with the relative stagnation of religious and other thought elsewhere, not to mention the fact that some religions, so far from tolerating or acquiescing in scientific and critical research, would essentially preclude or exclude it. Such facts as these need explanation, and a natural history of religion has to recognise (1) the differing inter-relations everywhere between religious activities and the non-religious (science, philosophy, &c.); (2) the admitted qualitative differences in the social and other value of religious experiences and convictions throughout history; and (3) the evidently supreme importance of those factors which have been everywhere operative and account for the stagnation, the death, or the progressive development of religions, and account for the differences everywhere between the religious and non-religious tendencies.

Finally, typical of religion are its striking demands. The history of religion means that man's life and thought are found to be below the best of which he is conscious, and his apprehension of spiritual truths an imperfect approximation. Religion stands for something greater than man's considered account of it; and the religion of the day has constantly been found to be so inadequate as to be regarded as harmful, and a restatement has been necessary. Religion states or implies what are felt to be the ultimate realities of God, Man, and the Universe; and the incomprehensibly profound ideas of the individual's potential place in the Universe and his destiny are latent in many different forms, lower and higher. Religion offers itself as an entirely sufficient explanation and foundation, and it is accepted and approved as such by an act of faith, and some appropriate inter-relation is formed between the religious and the non-religious spheres of the individual's whole life. Thus the data of religion and its history present a vast field for manifold inquiries, and these invariably issue, partly in significant conclusions regarding religion itself, partly in a profounder knowledge of human nature. Throughout, new light is thrown upon the mind, its development, and the manner in which it treats its experiences; and the fact that these inquiries are now con-

cerned equally with theologies and philosophies, and the problems of the relation between religious and non-religious experience, makes the modern Science of Religion itself a landmark in the history of religion.

BIBLIOGRAPHY.—Admirable readable books on comparative religion by Clodd, Frazer, Hartland, Lang, &c.; general introductory books by J. Estlin Carpenter, Jevons, Marett, &c.; an invaluable handbook by C. H. Toy (1913)*; *The History of Religions*, G. F. Moore (2 vols., 1914, 1920)*; *The psychology of religion*, I. King (1910), J. H. Leuba (1912), Thouless (1923), &c.; psychology and philosophy, Galloway (1914)*; special studies by W. Robertson Smith, Durkheim, Flint, and the Cairds; an important critical essay on the comparative study of religions, by H. Pinard de la Boulaye, S.J. (i. History, 1922; ii. Methods, 1925)*; *Encyclopædia of Religion and Ethics**; the 'Gifford Lectures,' the 'Hibbert Lectures,' *Revue de l'histoire des Religions*,* *Archiv für Religionswissenschaft*.* Fuller references to the bibliography, which is considerable, will be found in the preceding, especially those marked with an asterisk. Besides the paragraphs on religion in the articles in this work on Assyria, Babylonia, Egypt, Etruria, Greece, India, Japan, Rome, &c., see separate articles on the various religions of the world, sects Christian and other, and religious doctrines, including those on

Agnosticism.

Ancestors (worship of).

Animals (worship of).

Animism.

Anthropomorphism.

Apologetics.

Angines.

Buddhism.

Confucius.

Copts.

Divination.

Fetichism.

Fire.

Images.

Inspiration.

Magic.

Mandæans.

Manichæus.

Materialism.

Mohammedanism.

Mormons.

Mythology.

Pantheism.

Parsees.

Plants (*Plant-love*).

Positivism.

Rationalism.

Reincarnation.

Sacrifice.

Secularism.

Serpent-worship.

Spiritualism.

Theism.

Theology.

Theosophy.

Totemism.

Witchcraft.

Zend-Avesta.

Zoroaster.

Remainder in the law of England was an estate in expectancy. Thus, if the owner of the fee-simple, or freehold of lands, gave them by will or deed to A for life, and after his decease to B and his heirs, the interest of B was called the remainder, because, after deducting A's life estate, all that remained belongs to B. A remainder was distinguished from a reversion in this, that in the latter case the land returned or reverted to the owner himself. Remainders were used in settlements for the purpose of fixing the succession and tying up the property, so far as the law would permit. A legal remainder cannot be created after 1926. But all kinds of future interests which could before 1926 be created either at law or in equity may be created by way of equitable interests, e.g. bond may be granted to B in trust for A for life with remainder in trust for A's first son who shall reach twenty-one. See PERPETUITY.

Remak, ROBERT (1815-65), physician and physiologist, became a professor in Berlin, and distinguished himself by microscopic work in pathology and embryology, and by the medical application of electric currents. He wrote works on the development of the vertebrates and on the medical uses of electricity.

Rembang, a town and port on the north coast of Java; pop. 22,000.

Rembrandt. The name 'Rembrandt' was a baptismal name only, which occurs in various forms. Rembrandt's initials were R.H.—i.e. Rembrandt Harmenszoon, or son of Harmen, and his father's full name was Harmen Gerritszoon van Rijn, or Harmen the son of Gerrit, living on Rhineland. The local indication, van Rijn, is used in deeds after 1600 A.D. Rembrandt is now often called Van Rijn, but never Harmenszoon. At the time of the artist's birth his family was of the lower middle class, and in prosperous circumstances, living at Leyden, and holding property there. From the register of marriages and from a date on

an etching, Vosmaer accepts 15th July 1607 as the true birth date. Rembrandt's father was a miller, and his mother, Neeltjen van Suytbroeck, a baker's daughter. They had seven or eight children, of whom two died young, Rembrandt being the youngest but one. All the boys were brought up to trade except Rembrandt, whose father wished to give him a classical education; but he had no taste for Latin, so he went to learn painting in the studio of Van Swanenburch, probably in his twelfth or thirteenth year. Orlers says that he worked with Van Swanenburch three years. This master came of a good family, and had visited Italy. Rembrandt's next master was Pieter Lastman, but he stayed with Lastman only six months. He probably returned to his father's house about 1623, and stayed there till 1630. Already he had begun to paint old age; there are several pictures of that date representing old people, as well as careful studies. He began his career as an etcher very early, and etched beggars and picturesque heads, including his own, also a first biblical subject, 'Jesus presented in the Temple.' There are no less than thirty etchings for the year 1630, when the artist was only twenty-three. In the same year he migrated from Leyden to Amsterdam, then a picturesque city of 100,000 inhabitants, and there he set up a studio and took pupils. Already one of the most industrious and productive artists that ever lived, Rembrandt found time to paint several biblical subjects, besides a number of portraits, and to etch forty plates in the year 1631, whilst his progress in art was so rapid that he painted one of his most important masterpieces, 'The Anatomical Lesson,' in 1632, at the early age of twenty-five. He married Saskia van Ulenburgh in June 1634. She was of a good family, twenty-one years old, and the youngest of nine children. The pair settled in a large house in the Breedstraet in Amsterdam. There is good evidence that the marriage was happy, and we know Saskia by the portraits her husband made of her. After marriage he continued to be very industrious, even the year of marriage having a harvest of several religious pictures and many portraits, as well as fifteen etchings. The artist was also in the habit of producing many sketches and drawings. Vosmaer observes that these are either studies from nature or notes taken rapidly, or else embryos of ideas caught as they formed themselves, with a rude pen and a wash, or a few strokes of black stone.

Rembrandt had a daughter, Cornelia, born in July 1638, but she died the month following. A second Cornelia was born in 1640, who also died young, and a son, Titus, in 1641. His father died about 1632, and his mother about 1640, after having been frequently portrayed by her son both in painting and etching. Saskia died prematurely in 1642, after only eight years of marriage. Between the death of his mother and that of his wife, Rembrandt's activity developed itself in three branches, portrait, small biblical or genre pictures, and large canvases with figures the size of life. The year of Saskia's death is also that of the famous picture known as the 'Night Watch.' An important branch of Rembrandt's artistic production from 1643 to 1650 was landscape, which he continued to practise more or less till 1659, both in etching and painting. After the death of Saskia the domestic life of the artist becomes obscure. In 1654 his servant Hendrickje Jaghers had a child by him baptised as Cornelia, and after his death one Catherina van Wijck is mentioned in the register as his widow, but it is unknown whether she was a second or a third wife, and at what date her marriage took place. It is not precisely known what were the causes of Rembrandt's bankruptcy in

1656. He was an ardent collector, willing to give high prices, and as his family fell into embarrassed circumstances, it is likely that he helped them. His art, too, became unfashionable; but he did not relax his diligence. His collection fetched only 5000 florins at the sale. Vosmaer believed, however, that he had found evidence of a return to partial prosperity, and that Rembrandt was able at least to rent a commodious and handsome house near the Rozengracht. After continuing to work with constant energy and undiminished power, he died 8th October 1669, following his son Titus, who died a year earlier. Titus left a posthumous daughter, Titia, and Rembrandt was present at the baptism. He was spared the pain of losing this grandchild, whose death occurred thirteen days after his own. Rembrandt left two children, names unknown.

The genius of Rembrandt has been the subject of much controversy, but his fame has increased, notwithstanding unintelligent censure and praise often equally unintelligent. Rembrandt was not blind to the merits of Italian art, as we know by his collection, but his own practice was founded on the direct study of the nature he saw around him both in human life and landscape. It is a mistake, however, to suppose that he copied nature slavishly, that he was a sort of photographer. Far from that, he was so imaginative that he transmuted everything. He had an equal power of expressing mass and rendering detail both in painting and etching. His technical force in both arts has only been rivalled in other styles, and it has never been surpassed. The common admiration for his *chiaroscuro* is, however, misplaced. The *chiaro-oscuro* of Rembrandt is often false and inconsistent, and, in fact, he relied largely on public ignorance. But though arbitrary it is always conducive to his purpose. In etching the effect of it was often heightened by an intentionally unequal distribution of finish. No artist ever combined more delicate skill with more energy and power. His treatment of mankind is full of human sympathy for all ages and conditions, but his especial study was old age. In his interpretation of the Scriptures he did not seek to give dignity by a factitious magnificence, or by elevating personages above their social rank, but by inspiring respect for them, and interest in them, as they were. At the same time his artist-faculty of idealisation acted in its own way by giving sublimity. Of the great artists Rembrandt is not the most perfect, but he is the most interesting, and his work is full of variety, both in subject and in technical methods. He was a great draughtsman, in his own way, and often a fine colourist as well as a great executive virtuoso both in painting and etching. Rembrandt had much personal influence as a teacher, and many of his pupils became known. His life seems to have been absorbed in work, and he avoided fashionable society, keeping to the burghers and artists.

See the elaborate French Life by his countryman Vosmaer (1877), the study by Émile Michel (trans. 1893), the monograph on the etchings by P. G. Hamerton (1894), and Lives by Knackfuss (1900), Bréal, Baldwin Brown (1908), and several works by Dr W. Bode. (1897-1908). The first catalogue of the etchings of Rembrandt is that by Gersaint (1751), supplemented by Peter Yver, and translated by Dauby of Liverpool (1796). Adam Bartsch followed at Vienna in 1797. De Clausin published in 1824 an edition of preceding catalogues. Wilson (Lond. 1836) issued a new catalogue with original observations. That by Charles Blanc, in two vols. (Paris, n.d.), includes both pictures and etchings, that by Middleton (Lond. 1878) gives the etchings only, and a catalogue privately printed for the Burlington Club in 1877 gave the etchings in chronological order. Vosmaer gave catalogues at the end of his biography, both chronological and classified. A. M. Hind's catalogue

of the etchings (1912) was revised in 1924. F. S. Haden's monograph on the etchings (Lond. 1879) proves that some of the plates attributed to Rembrandt were executed by other hands, probably by pupils. According to a critical study by Professor J. C. Van Dyke, *Rembrandt and his School* (1923), only about 50 pictures are to be assigned to Rembrandt himself, the others being the work of pupils and followers, though they may have been done under his eye, and touched or even signed by him. The catalogues of Rembrandt's works give about 500 pictures, 600 drawings and studies, and 353 etchings. The bent of his mind may be judged of by the choice of subject. Out of the general total of about 1450 works 136 are from the Old Testament, 255 from the New, 22 from classical mythology, and only 12 from history. There are about 440 portraits and 100 landscapes, besides some sketches of animals and many studies not classed. With the single exception of the Bible, Rembrandt got little from books, and his house, so rich in works of graphic art, contained barely twenty volumes.

Remembrancer, KING'S or QUEEN'S, an officer of the old Exchequer of England, whose duty it was to remind the judges of that court at the proper times that such and such things had to be attended to, and also to keep certain records and make out processes. Since the constitution of the Supreme Court (q.v.) the king's remembrancer has been at the head of a department of the central office of that court. The King's and Lord Treasurer's remembrancer is now the general administrator of the crown revenues of Scotland.

Remijia, a genus of Rubiaceæ (see CINCHONA), valuable as a source of Quinine (q.v.). There are over twenty species known, many in Brazil. The name comes from that of the Brazilian physician Remijo.

Remington, PHILLO, inventor, was born at Litchfield in New York on 31st October 1816. He entered the small-arms factory of his father, and for twenty-five years superintended the mechanical department. The perfecting of the Remington breech-loading rifles and of the Remington typewriter was largely due to his inventive skill. He retired in 1886, and died on 4th April 1889.

Remiremont, a town of France (dept. Vosges), stands on the Moselle, 17 miles by rail S.E. of Epinal. The remains of an abbey, founded in 620, are the finest building in the town. The abbess was a princess of the empire down to 1566; the nunnery was suppressed at the Revolution. Textiles, leather, and cheese are made. Pop. 10,000.

Remittent Fever is a name applied to severe types of malarial fever, in which the temperature falls slightly or remits from time to time, but in which there is no complete fall to normal temperature between the paroxysms. See article MALARIA.

Remizov, ALEXEI, born 1877, Russian novelist and exponent of a realism that is tempered with symbolism. He does not aim at exact reproduction, but uses his discrimination in selecting, so that what he describes may be real enough, but the juxtaposition of unrelated elements is apt to be grotesque. *The Story of Stratilatov* (1909), however, is a striking book, the scene being laid in a provincial Russian town. Remizov's style is considered extremely pure.

Remonstrance, THE, a detailed statement of all the king's illegal and oppressive acts, and a vindication of the rights of parliament, laid before the House of Commons by Pym, and carried by 159 votes to 148, after a stormy debate lasting from noon till after midnight, November 22 and 23, 1641. On the question of its being printed the debate began anew with such extraordinary exasperation that an actual conflict on the floor of the House was saved only by the calmness and tact of Hampden. On a division a majority of 23 left the publication free and restrained the printing only until

further order. The adoption of the Remonstrance was felt on both sides to be a crisis in the struggle between Charles I. and the parliament. It kindled afresh the enthusiasm of the country, and hurried the king into more violent and fatal measures. 'The turning-point of freedom or despotism,' says Forster, 'for two more centuries in England was probably passed that night.'

Remonstrants. See ARMINIUS.

Remora, or SUCKING-FISH (*Echeneis*), a genus of fishes sometimes classed not far from mackerels among the Acanthopterus Teleosteans, or referred to a special sub-order Discocephali. The great peculiarity is the suckorial disc on the dorsal surface of the head. It is formed from a modification of the first dorsal fin, whose spines have become cleft. The sucking-fishes fix themselves very firmly to sharks, sword-fish, turtles, and even to ships. So firmly do they adhere that they are sometimes used in fishing. A line is fixed to the tail; the fish is set free; it discovers a turtle or fish and fastens itself. The fishermen dive after the line if the remora has fastened on to a turtle, or may in other cases simply haul it up. Columbus, or one of his companions, described how the 'Guaican' shoots 'like an Arrow out of a Bowe towards the other fish, and then, gathering the bag on his head like a



Remora (*Echeneis remora*).

purse-net, hold them so fast that he lets not loose till ha'd up out of the water.' More precise details have been furnished by other travellers. Several species of *Echeneis* or remora are known from Zanzibar, Cuba, New Guinea, &c. The remora of the Mediterranean was well known to the ancients, and was credited with many feats, such as that of detaining Antony's ship from the battle of Actium. The fish is palatable, and is sometimes eaten after its day's work of fishing.

Removal of Goods. See LANDLORD AND TENANT.

Remscheid, a town of Rheinland, 6 miles S. of Elberfeld-Barmen, carries on extensive manufactures of ironwares, cutlery, &c. The population, only 22,000 in 1871, is now 77,000.

Rémusat, (JEAN PIERRE) ABEL (1788-1832), Chinese scholar, was born at Paris, and studied medicine, but as early as 1811 he published an essay on Chinese literature. In 1813 he was compelled to serve as hospital surgeon, but in 1814 he was made professor of Chinese in the Collège de France. Of the numerous works that he wrote subsequent to this period we may mention *Recherches sur les Langues Tartares* (1820), a work in some sort preparatory to his great *Éléments de la Grammaire Chinoise* (1822). He wrote also on the origin of Chinese writing (1827), on Chinese medicine, on the topography and history of the Chinese empire, and *Mélanges* (published in 1843).

Rémusat was the first to make known in Europe the life and opinions of Lao-Tsze. In 1818 he became one of the editors of the *Journal des Savants*; in 1822 he founded the Société Asiatique of Paris; and in 1824 he was appointed curator of the Oriental Department in the Bibliothèque Royale.

Rémusat, CHARLES (FRANÇOIS MARIE), COMTE DE, a French politician and *littérateur*, born at Paris, 14th March 1797, the son of Augustin Laurent, Comte de Rémusat (1762-1823), who was successively chamberlain to Napoleon and a prefect under the Restoration. His mother (*née* Claire Elizabeth Jeanne Gravier de Vergennes) was born in 1780, married in 1796, became *dame du palais* to Josephine, and died in 1821. Young Rémusat early developed Liberal ideas, and took eagerly to journalism. He signed the journalists' famous protest against the Ordinances of Polignac which brought about the July revolution, and was in October elected deputy for Toulouse. He now allied himself with the Doctrinaire party, and in 1836 became under-secretary of state for the interior. In 1840, when the government passed into the hands of Thiers, Rémusat was made minister of the Interior, but soon resigned the office. He was exiled after the *coup d'état* of Louis Napoleon, and thenceforward devoted himself to literary and philosophical studies, till, in August 1871, Thiers called him to hold the portfolio of Foreign Affairs, which he retained until 1873. He died 6th June 1875. Rémusat was long a well-known contributor to the *Revue des Deux Mondes*.

Among his writings are his *Essais de Philosophie* (1842); *Abélard* (1845); *L'Angleterre au XVIII^e Siècle* (1856); studies on *St Anselm* (1853), *Bacon* (1857), *Channing* (1857), *John Wesley* (1870), *Lord Herbert of Cherbury* (1874); *Histoire de la Philosophie en Angleterre de Bacon à Locke* (1875); two posthumous philosophical dramas, *Abélard* and *La Saint Barthélemy* (1878), and *Correspondance pendant les premières années de la Restauration* (6 vols. 1883-87).

His mother's *Mémoires* (3 vols. 1879-80) and *Lettres* (2 vols. 1881), both of which have been translated into English, proved to be of the greatest interest, and threw a flood of light on the strange society of the First Empire and the character of Napoleon.

Remy, ST (Lat. *Remigius*). See REIMS.

Renaissance is a comprehensive name for the great intellectual movement which marks the transition from the middle ages to the modern world; a movement including a very marked change in attitude of mind and ideal of life, as well as in philosophy, art, literary criticism, political and religious thought. Substantially a revolt against the barrenness and dogmatism of Mediævalism, the new spirit claimed the entire liberation of reason, and, passionately recognising and studying the rich humanity of Greece and Rome, aimed at a complete rehabilitation of the human spirit with all the free activities and arts and graces which invested the classical age. It was an escape—at first hesitating, then triumphant—from a life regulated and confined on all sides by ecclesiastical tradition and intellectual tyranny into joyous freedom and unfettered spontaneity. Zeal for the *Litteræ Humaniores* brought forth a new ideal of culture, and the new view of life for which the name of Humanism is used. Renaissance, re-birth, was originally used as synonymous with the Revival of Letters, the revived study in a new spirit of the classical languages and classical literatures of Greece and Rome in all their depth and breadth, interpreted in their own spirit, and divested of the narrow traditional limitations. Greek in especial was practically a new discovery, and a vastly important one; but the knowledge of the

classics was only one side of the movement which permeated and transformed philosophy, science, art, and religion. The new spirit powerfully aided in weakening the power of the papacy, in the establishment of Protestantism and the right of free inquiry. Under its impulse astronomy was eventually reformed by Copernicus and Galileo, and science started on its modern unfettered career; by it, too, feudalism was abolished, and the demand for political liberty began to be raised. Reverence for the Holy Roman Empire and for its ancient rival the papacy was alike decaying; a new sense of nationality was springing up, and national languages began to flourish. To the same general impulse, as causes or effects, belonged also the invention of printing and multiplication of books, new methods of paper-making, the use of the mariner's compass, the discovery of America, and the exploration of the Indian Sea. The fall of the Eastern Empire in 1453 sent swarms of Greek scholars to promote the revival of scholarship already in progress in western Europe. From the nature of the case, it is impossible to fix a definite date for the beginning of the Renaissance; long before the close of the dark ages there were isolated scholars and thinkers who anticipated the new light. In its main elements, however, the movement originated in Italy towards the end of the 14th century, and, attaining its full development there in the earlier half of the 16th, the Renaissance communicated itself throughout the whole of the rest of Europe; France, Germany, England, and other countries participating later in the movement, which in each of them took a somewhat different shape. But Italy was specially the nursing-mother of the Renaissance.

For the first herald of the Renaissance we may go as far back as Dante (1265-1321), who, with all his mediævalism of conception, yet by the pristine energy and fullness of his poetry was no unworthy follower of his chosen master, Virgil. The first positive impulse, however, in that direction was imparted by Petrarch (1304-74). Besides suggesting in his Italian *Rime* the old Roman grace, he awoke enthusiasm for the classics by his Latin epic *Africa* and numerous epistles and dissertations. In his old age he tried to imbibe a little Greek at the extremely sorry sources within his reach, and on receiving Homer from Constantinople urged Boccaccio to translate the supreme poet into Latin. Boccaccio did not rest till he had piously, though very imperfectly, rendered into Latin both the *Iliad* and *Odyssey*. A secretary of Petrarch, Giovanni Malpaghino, commonly called da Ravenna, was the most accomplished Latinist of his day, and, wandering as he did all over Italy, communicated the new impulse to distinguished pupils, Barbaro, Strozzi, Poggio, Bruni, who in their turn propagated it anew from Venice, Rome, Mantua, and elsewhere. Luigi Marsigli's house became a private academy of the new doctrine, a resort of all the promising neophytes of Florence. Caluccio de Salutato, who translated Dante into Latin, having been made chancellor of Florence in 1375, introduced into public documents the stately sonorous periods of the classic style, and so rendered it imperative on all princes and popes of the next age to have trained stylists as their secretaries. A like classic transformation was effected in epistolary correspondence by Gasparino da Barzizza, who made a special study of Cicero's letters. The glory of having been the first Florentine to visit Byzantium for the sake of learning the sacred Greek belongs to Giacomo da Scaparia. To Salutato and Palla degli Strozzi is due the foundation of a Greek chair at Florence; and in 1396 Manuel Chrysoloras, a genuine Greek in the flesh, began his instructions from the Greek

chair. Chrysoloras planted schools also at Rome, Padua, Milan, and Venice. In the earlier period of the Renaissance Florence leads the van. The president of the republic, Cosimo de' Medici, himself a scholar, theologian, philosopher, musician, financier, a connoisseur in painting, sculpture, and architecture, figures as the magnificent Mæcenæ of the new learning, founding the Platonic academy, and opening his hospitable house to all the wits at home and all the distinguished visitors attracted thither. The son of his physician, Marsilio Ficino (q.v.), Cosimo educated for the express purpose of interpreting Plato. Strozzi, perhaps the richest after Cosimo of the merchant-princes of Florence, sent to Greece for countless volumes of MSS., and constantly kept copyists employed. Niccolò de' Niccoli spent his whole fortune in buying MSS. or procuring copies. Poggio Bracciolini, one of the most eminent of the scholars of his time, rescued Quintilian from a 'foul prison' and transcribed him, and copied with his own hand MSS. of Lucretius and Columella, while he also unearthed Italicus, Manilius, and Vitruvius. Though for fifty years chancellor in the Roman Curia, he directed the most poignant satires against the church. Vespasino da Bisticci (1421-98) was perhaps the last of the mediæval scribes, and the first of modern booksellers; he was agent of Cosimo, Nicholas V., and Frederick of Urbino, supplier of MSS. to Hungary, Portugal, Germany, and England, and the largest employer of copyists in Europe, whom, too, he personally superintended.

The second period in the history of the Renaissance is distinguished by indiscriminate avidity for everything classic. As its most representative scholar may be cited Francesco Filelpho (1398-1481). Having studied rhetoric and Latin at Padua, he learned Greek at Constantinople, became professor at Venice, Bologna, and Florence, and gained the admiration of all Italy for erudition. In the third period of the Renaissance the leading figures are Lorenzo de' Medici and Politian at Florence, Boiardo at Ferrara, and Sannazaro at Naples. President of Florence from 1469, and himself of the most versatile talent, Lorenzo de' Medici was, like his grandfather Cosimo, his son Giovanni (Leo X.), and his nephew Giulio (Clement VII.), a munificent patron of learning. By the consent of all, the most consummate of the humanists is Politian, whose *Manto*, *Ambra*, and *Nutritia* display almost as spontaneous a command of the classic languages as do his *Orfeo*, *Stanzae*, and *Rime* of his native Italian. Towards the end of the 15th century mere erudition began to sink in credit, and the accomplished personages who adorn the fourth period are of a somewhat more independent type—the historians, Guicciardini and Machiavelli, the handsome Bembo, the splendid Alberti, Castiglione, the author of *Il Cortegiano*, and Ariosto, author of *Orlando Furioso*, the *Cinque Canti*, and the polished cynical *Satires*.

Some of the faults of the Renaissance clung to it in all its periods. At one time pedantry threatened to check originality and spontaneity; the worst ancient works were prized more than the best written in any new European tongue. Petrarch valued himself mainly for his Latin works, and thought lightly of his Italian poems. The tendency was established to regard the classics as the one standard of learning and the one instrument of education. A worse fault was it that the revolt against mediæval religious tradition was accompanied to a very large extent by absolute and anti-Christian immorality and license. Literary and artistic refinement placed no check on brutal lusts and savage passions; though in a few men

of high character, Michelangelo, Raphael, Pico della Mirandola, Ficino, and others, in whom Humanism did not extinguish the principles of Christianity and morals, a singularly noble and complete humanity was displayed. The culmination of the Renaissance in Italy may be regarded as having fallen within the half century 1456-1500; and its close for the land of its birth may be fixed at the sack of Rome in 1527 by the Constable de Bourbon, followed by the transference of Humanism in its later developments to France, England, and the rest of Europe.

In Germany the change was as marked as in Italy, but the Humanism of Germany and the Low Countries was very different in spirit from that of Italy. Not less tinged by a revived love for ancient learning, it was never divorced from morality nor hostile to Christianity; and its most important direct outcome was the Reformation. Biblical and Oriental studies were strenuously cultivated. Amongst the noted leaders were Erasmus, Melancthon, Reuchlin, and Von Hutten. In the Netherlands and Flanders the new school of painting was a notable development. In France the movement had rich results in art and letters. Villon, Marot, Ronsard, but above all Rabelais are types of the French Renaissance in pure literature; while within the sphere of scholarship and religious reform we have here the names of the Scaligers, Dolet, Muretus, Cujacius, Salmasius, Casaubon, Beza, Calvin.

In England Wyclif and Chaucer may be regarded as the forerunners of the Reformation and the Renaissance; but the main streams of both these movements reached England contemporaneously. In scholarship the great names are Grocyn, Linacre, Colet, Ascham, and More; but the fullest English outcome of the Renaissance was the glorious Elizabethan literature, with Spenser and Shakespeare, and in philosophy Bacon, as its most noted representatives.

RENAISSANCE, in Architecture, the style which succeeded the Gothic, and preceded the rigid copyism of the classic revival in the first half of the 19th century. Under the heading ITALIAN ARCHITECTURE we have traced the rise and progress of the Renaissance in the country of its birth. The spread of classical literature during the 15th and 16th centuries created a taste for classic architecture in every country in Europe. France, from her proximity and constant intercourse with Italy, was the first to introduce the new style north of the Alps. Francis I. invited Italian artists to his court during the first half of the 16th century. The most distinguished of these were Leonardo da Vinci, Benvenuto Cellini, Primaticcio, and Serlio. These artists introduced Italian details, and native architects applied them to the old forms to which they were accustomed, and which suited the purposes of their buildings, and thus originated a style similar to, though diverse from, that of Italy.

The Italian buildings, besides many palaces and domestic structures, comprised a large number of churches, St Peter's being the great model. In France (as in the other countries north of the Alps) the stock of churches was greater than was required. The grand domestic buildings of Florence and Rome were constructed for defence externally, and were founded in design on the old mediæval castles, which the nobles occupied within the cities. The domestic architecture of France is rather taken from the luxurious residences of the monks, and the pleasant open villas in the country; so that, although very graceful in outline and in detail, its buildings want the force and grandeur of the Italian palaces.

In the French Renaissance so much are the old

Gothic forms and outline preserved that the buildings of Francis I. might at a short distance be mistaken for Gothic designs, although on nearer approach all the details are found to be imitated from the classic. Such are the palaces of Chambord (q.v.)

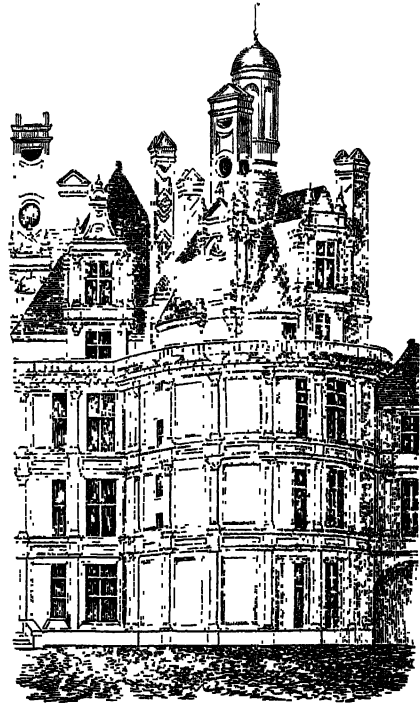


Fig. 1.—Château of Chambord.

and Chenonceaux (q.v.) on the Loire, Fontainebleau, and many others. The churches of this period are the same in their principles of design. Gothic forms and construction are everywhere preserved, while the details are as nearly classic as the designers could make them. St Eustache, in Paris, is one of the finest examples of this transitional style.

From the middle of the 16th to the middle of the 17th century a style prevailed which may be said to exhibit all the varieties of the Renaissance. This style, usually known as that of the time of Henry IV., may be distinguished by the constant use of pilasters, broken entablatures, curved and contorted cornices, architraves, &c., all applied so as to conceal rather than to mark and dignify the real uses of the features of the buildings. The Tuileries, wrecked by the Commune, showed all these defects. Many of the features of this period are imitated in the so-called 'Queen Anne style' of the present time (see below). From this debased style architecture gradually recovered, and during the 18th century a style more becoming the dignity and importance of the *Grand Monarque* was introduced. The classic element now began to prevail, to the entire exclusion of all trace of the old Gothic forms. Many very large palaces are built in this style; but, although grand from their size, and striking from their richness and luxuriance, they are frequently tame and uninteresting as works of art. The palace of Versailles (q.v.) is the most prominent example. The two Mansards, one of whom designed Versailles, had great opportunities during this extravagant epoch. Their invention of giving a row of separate houses the appearance of one palace, which has ever since saved architects a world of trouble, was one of the most fatal blows

which true street-architecture could have received. The east front of the Louvre, designed by Perrault, is one of the best examples of the style of the age. Many elegant private hotels and houses in Paris were erected at this period. A peculiarity of the style of Louis XIV. is the ornament then introduced, called *Rococo* (q.v.).

The classic Renaissance was completed in the beginning of the 19th century by the literal copying of ancient buildings. Hitherto, architects had attempted to apply classic architecture to the requirements of modern times; now they tried to make modern wants conform to ancient architecture. In the church of the Madeleine, Paris, for

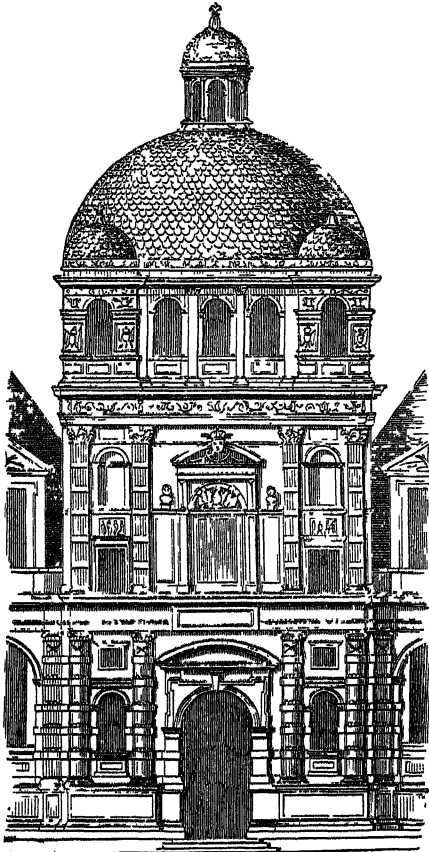


Fig. 2.—Central Pavilion of the Tuileries: as designed by De Lorme.

instance, a pure peripteral temple is taken as the object to be reproduced, and the architect has then to see how he can arrange a Christian church inside it! Many buildings erected during the time of the Empire are no doubt very impressive, with noble porticoes, and broad blank walls; but they are in many respects mere shams, attempts to make the religious buildings of the Greeks and Romans serve for the conveniences and requirements of the 19th century. This was found an impossibility—people came to rebel against houses where the window-light had to be sacrificed to the reproduction of an ancient portico, and in which the height of the stories, the arrangement of the doors, windows, and, in fact, all the features were cramped, and many destroyed, in order to carry out an ancient design. The result has been that this cold and servile copyism is now entirely abandoned. The French proceeded to work out

a free kind of Renaissance of their own, which proved itself, as the streets of Paris testify, the liveliest and most appropriate style for the street architecture of the French capital in the late 19th century.

In Spain the Renaissance style early took root, and, from the richness of that country at the time, many fine buildings were erected; but it soon yielded to the cold and heavy 'Greco-Romano' style, and that was followed by extravagances of style and ornament more absurd than any of the reign of Louis XIV. The later Renaissance of Spain was much influenced by the remnants of Saracenic art which abound in that country.

In England, as in the other countries of Europe, classic art accompanied the classic literature of the period; but, the fountain-head being at a distance, it was long before the native Gothic style gave place to the classic Renaissance. It was more than a century after the foundation of St Peter's that Henry VIII. brought over two foreign artists—John of Padua and Havenius of Cleves—to introduce the new style. Of their works we have many early examples at Cambridge and Oxford, in the later half of the 16th century. Longleat, Holmby, Wallaton, and many other country mansions, built towards the end of the 16th century, are fine examples of how the new style was gradually adopted. The course of the Renaissance in England was similar to its progress in France; it was even slower. Little classical feeling prevailed till about 1620. The general expression of all the buildings before that date is almost entirely Gothic, although an attempt is made to engraft upon them classical details. The pointed gables, mullioned windows, oriels and dormers, and the picturesque outlines of the old style are all retained long after the introduction of quasi-classical profiles to the mouldings. This style, which prevailed during the later half of the 16th century, is called Elizabethan (q.v.), and corresponds to the somewhat earlier style in France of the time of Francis I. This was followed in the reign of James I. by a similar but more extravagant style called Jacobean, of which Heriot's Hospital at Edinburgh is a good example; the fantastic ornaments, broken entablatures, &c., over the windows, being characteristic of this style, as they were of that of Henry IV. in France.

The first architect who introduced real Italian feeling into the Renaissance of England was Inigo Jones. After studying abroad he was appointed superintendent of royal buildings under James I., for whom he designed a magnificent palace at Whitehall. Of this only one small portion was executed (1619-21), which still exists under the name of the Banqueting House, and is a good example of the Italian style. Jones also erected several elegant mansions in this style, which then became more generally adopted. In the later half of the 17th century a splendid opportunity occurred for the employment of the Renaissance style after the great fire of London. Sir Christopher Wren rebuilt an immense number of churches in that style, of which St Paul's (see LONDON) was the most important. The spire of Bow Church and the interior of St Stephen's, Walbrook, are also much admired.

During the 18th century classic feeling predominated, and gradually extended to all classes of buildings. In the early part of the century Vanbrugh built the grand but ponderous palaces of Blenheim and Castle Howard, which have a character and originality of their own. To these succeeded a vast number of noblemen's mansions, designed by Campbell, Kent, the Adames, and others. Many of these, like the contemporaneous buildings of France, are of great size and magnifi-

cence; but they are usually tame and cold in design, and a sameness pervades them all. They generally consist of a rustic basement-story, with a portico over the centre, and an equal number of windows on either side. The portico is considered essential,

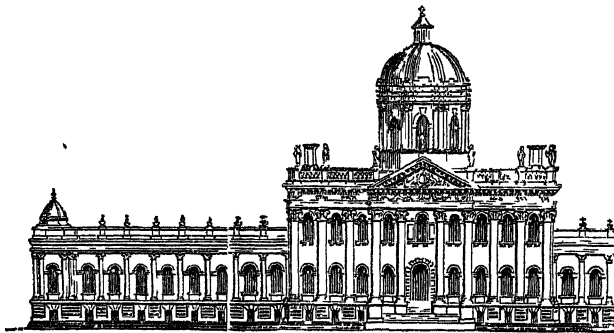


Fig. 3.—Park Front of Castle Howard.

and, although it is perfectly useless, the light and convenience of the house are invariably sacrificed for it.

The further study of the buildings of Greece and Rome led, in the beginning of the 19th century, to the fashion of reproducing them more literally. All important public buildings were now required to be absolute copies of ancient buildings, or parts of them, or to look like such, and then the architect had to work out the accommodation as best he might. St Pancras' Church in London is a good example. It is made up of portions from nearly

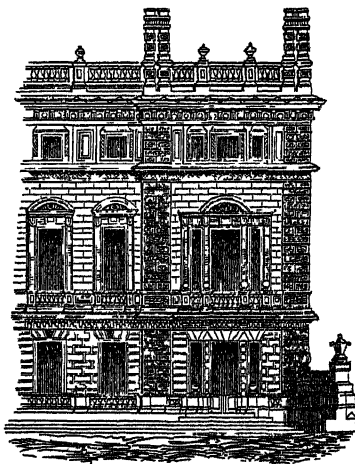


Fig. 4.—Portion of Façade of Bridgewater House.

every temple in Greece. Many really successful buildings, such as St George's Hall, Liverpool, the High School and Royal Institution (Royal Scottish Academy) in Edinburgh, have been erected in this style; but they owe their effect not to their being designs well adapted to their requirements, but to the fact that they are copies from the finest buildings of antiquity. We have thus two different styles included under the head of Renaissance—viz. one in which the classic elements are subordinated to the Gothic dispositions, as is now generally understood by the expression 'Renaissance;' and the other in which the classic elements distinctly predominate, commonly known as 'Classic.'

Sir Charles Barry was the first to break away from this thralldom, and to return to the true

system of designing buildings—namely, by so arranging their general features as not only to express the purposes they are intended to serve, but in so doing to form the decorative as well as the useful elements of the edifice.

The Travellers' Clubhouse and Bridgewater House in London are admirable specimens of his design. There are no superfluous porticoes or obstructive pediments, but a pleasing and reasonable design is produced by simply grouping the windows, and crowning the building with an appropriate cornice.

As already noticed, a similar style of domestic architecture has been worked out in France; but both there and in England there was a reaction against everything classic, and a revival of mediæval architecture superseded that of classic, especially in ecclesiastical buildings. The most magnificent examples of this style are the Palace or Houses of Parliament at Westminster, and the Law Courts.

The so-called Queen Anne style, common in recent years, is supposed to be founded on the class of design prevalent at the beginning of the 18th century. The buildings erected at that period were of a very plain and simple order, with classic cornices and details, and frequently with large windows, sometimes divided by mullions. There is occasionally a certain picturesqueness in the arrangements which has been made the most of in the modern revived style. The latter, although taking the name of Queen Anne, is far from adhering to the style of her reign, but is rather a free use of the elements of the early Renaissance or Elizabethan style. It thus combines much of the freedom of the late Gothic with classic detail, to which is added a copious use of features borrowed from the Renaissance of France and Germany. Many large structures have been erected in this style, such as the Royal Colonial Institute in London, and the new Law Courts at Birmingham. In these buildings the peculiar features of the style are visible—viz. large windows, divided by plain mullions, and a mixture of classic details and Gothic forms. The style adapts itself well to villas and smaller structures, in which the curved gables of the dormers form prominent features.

In Germany, Russia, and every country of Europe the Renaissance came to prevail in a manner similar to that above described in other countries. The picturesque castle of Heidelberg is an early example, and the Zwinger and Japanese palace at Dresden are edifices of the beginning of the 18th century. In the domestic buildings of Nürnberg, Dresden, and other towns of the north of Germany many instances occur of the picturesque application of classic detail to the old Gothic outlines. One of the most striking examples of the revival of classic art occurred in Bavaria during the first half of the 19th century, under the auspices of King Louis. He caused all the buildings he had seen and admired in his travels to be reproduced in Bavaria. Thus, the royal palace at Munich is the Pitti Palace of Florence on a small scale; St Mark's at Venice is imitated in the Byzantine Chapel Royal; and the Walhalla, on the banks of the Danube, is an exact copy (externally) of the Parthenon. The finest buildings of Munich are the Picture-gallery and Sculpture-gallery by Klenze, both well adapted to their purpose, and good adaptations of Italian and Grecian architecture. In Vienna and Berlin there are many examples of the revived Classic and Gothic styles, but the Germans have always understood the former better than the latter. The

museums at Berlin, and many of the theatres of Germany, are good examples of classic buildings. The domestic architecture of Berlin is well worthy of notice, many of the dwelling-houses being quite equal in design to those of Paris. Of the other countries of Europe the only one which deserves remark for its Renaissance buildings is Russia. St Petersburg is of all the cities of Europe the one which best merits the title of a city of palaces. From the date at which the city was founded, these are necessarily all Renaissance in character. They are nearly all the works of German or Italian architects, and are unfortunately, for the most part, in the coldest and worst style. The ornaments of the palaces are chiefly pilasters running through two stories, with broken entablatures, &c., and ornaments of the flimsiest rococo. The New Museum, by Klenze, is, however, a marked exception. In America nearly all the new buildings of importance are carried out in the Renaissance style. Many of these are of great size and striking design. The town-hall of Boston may be referred to as one of the most imposing and effective. Another conspicuous example is the town-hall of Philadelphia (q.v.).

Along with architecture, during the period of the Renaissance Painting and Sculpture and all the other arts took their models from the classic remains which were so carefully sought for and studied. All ornamental work, such as carving, jewellery, and metal-work of every kind, followed in the same track. Mediæval niches and pinnacles gave place to the columns and entablatures of the classic styles, and the saints of the middle ages yielded to the gods and goddesses of ancient Rome.

See the general historical works of Gregorovius, Guizot, Hallam, Lacroix, Lecky, Villari, &c., the relevant chapters in the standard histories of the different countries, especially in that of Italy, and in the *Cambridge Mediæval History* and *Camb. Modern Hist.*; also Voigt, *Die Wiederbelebung des klassischen Altertums* (1859; 3d ed. 1873); Burckhardt, *Kultur der Renaissance in Italien* (1360; 8th ed. 1901); Pater, *The Renaissance* (1873); Palustro, *La Renaissance en France* (1870-95); Gebhart, *Les origines de la Renaissance en Italie* (1879); J. Owen, *Skeptics of the Renaissance* (1881, 1892); various works by Müntz, including *Histoire de l'art pendant la Renaissance* (1889-91); two books on the *Renaissance in England* by Gotoh (1894, 1901); W. J. Anderson, *Architecture of Renaissance in Italy* (1896); works by Hannay on the *Later Renaissance* (1898) and by G. E. B. Sainsbury on the *Earlier Renaissance* (1901); various books by Monier, including *Le Quattrocento* (1901), by Wölfflin, including *Art of Italian Renaissance* (1903), and by Sandys, including *Harvard Lectures* (1905); Sir Sidney Lee, *The French Renaissance in England* (1910); Fiorentino, *Studi e ritratti della Renaissance* (1911); works on the *French Renaissance* by Blomfield (1911), W. H. Ward (1911; rev. ed. 1927), and A. Tilley (1918, 1922); B. Willey, *Tendencies in Renaissance Literary Theory* (1922); F. J. C. Hearnshaw, *Social and Political Ideas of the Renaissance* (1925). See the articles on the various painters and writers of the Renaissance, and those on PAINTING, REFORMATION, SCULPTURE, with the works there cited; also those on BRUNO, CAMPANELLA, ERASMUS, HUMANISTS, HUTTEN, ITALIAN ARCHITECTURE, MACHIAVELLI, MEDICI, PICO DELLA MIRANDOLA, POLITIAN, SAVONAROLA, &c.

Renaix, a town in the Belgian province of East Flanders, 25 miles by rail S. by W. of Ghent, carries on dyeing, and manufactures cotton and woollen fabrics; pop. 22,000.

Renan, ERNEST, was born at Tréguier, in the department of Côtes-du-Nord (Brittany), on the 27th February 1823, a Breton by his father's ancestry, a Gascon by his mother's. The centre of the life of Tréguier (originally a monastic village) is its minster, and to the atmosphere of the place Renan attributed in large measure his early bent to those studies which he unceasingly

pursued for more than half a century. His father, who was a sailor, died while he was still a child, leaving his widow in straitened circumstances, with the care of one daughter and two sons. To his mother and sister Renan owed a special debt, which he expressly acknowledged in his *Souvenirs d'Enfance*. The young Renan gave early promise of distinction, and in 1836 he was one of the lads chosen by the Abbé Dupanloup for a place in the Catholic seminary of St Nicolas du Chardonnet, in Paris, conducted by himself on methods entirely his own, his one aim to turn out priests with the accomplishments and temper of mind that would render them effective men of the world. After three years at St Nicolas he had two years of philosophy at Issy, a branch of the great seminary of St Sulpice. Descartes adapted to Catholic orthodoxy, and the Scottish philosophy as taught by Reid, were the main subjects of study. At the conclusion of his course at Issy he was in all things, personal habits and temper of thought, a docile son of the church; though one of his teachers had already divined the essential tendency of his mind, and had plainly told him 'that he was not a Christian.' At St Sulpice, however, his attention was mainly turned to the study of Hebrew, and to this study, of his own accord, he added that of German. As the result of these combined studies the traditional construction of Christianity became impossible for him. Quitting St Sulpice in 1845, he abandoned all thoughts of the church as a profession. At this crisis his sister Henrietta proved his invaluable friend and consoler. In 1848 he became *agrégé de philosophie*, and two years later was appointed to a post in the department of manuscripts in the Bibliothèque Nationale in Paris. Successive *mémoires* made his name known in connection with Oriental studies, and in 1860 he was made one of a commission sent by the French government to study the remains of Phœnician civilisation. In 1861 he was chosen professor of Hebrew in the Collège de France. The emperor, inspired by the clerical party, refused to ratify his appointment, and it was not till after the fall of the imperial government (November 1870) that he was actually established in the chair. He travelled considerably in Italy, in Scandinavia, and the East in connection with special departments of research, and in 1878 was chosen member of the French Academy. Renan married a niece of the painter Ary Scheffer.

Of the long series of Renan's works, which by their combined learning and literary power made him the first man of letters in Europe, we can here note only those which call for special mention in a summary account of his career. His work as an author began with a paper *Sur les Langues Sémitiques* (1847), afterwards developed into his *Histoire Générale des Langues Sémitiques* (1854). In his *Averroès et l'Averroïsme* (1852) he gave one proof among many others of his familiarity with the life and thought of the middle ages. He wrote frequent essays, afterwards collected in his *Études d'Histoire Religieuse* (1856) and *Essais de Morale et de Critique* (1859), which arrested wide attention by their grace of style and originality of suggestion. His European reputation, however, dates only from the publication of the *Vie de Jésus* (1863), 'one of the events of the century.' With the *Vie de Jésus* also began what its author regarded as the special work of his life, the *Histoire des Origines du Christianisme*. In Renan's conception the history of Christianity, in the true sense of the term, is possible only from the close of the 2d century after Christ. Previous to that period materials do not exist for an adequate narrative based on data that justify a dogmatic construction of the development of Christianity. The tracing

of Christian origins, therefore, must be a work essentially tentative, and one that, justifying conjecture, calls for the finest critical faculty in him who attempts it. It was with this conception of his task that Renan wrote the series, the labour of nearly thirty years, in which he embodied his construction of the evolution of the Christian religion and theology. Of all the volumes none excited the extraordinary interest of the first. In the *Vie de Jésus* the combined weakness and strength of Renan's method were exaggerated to caricature on a subject of supreme and universal interest, and one, moreover, which even from the boldest critics had hitherto exacted the tacit admission of its special place in the heart of humanity. Few readers, even in France, received it without large reserves on the score of good taste and right feeling, while in Britain its preciosity of sentiment and effeminate exquisiteness of manner jarred even on those who were at one with the writer in his general point of view. Of the volumes that followed the *Vie de Jésus*, that on St Paul and that entitled *Marc-Aurèle et la Fin du Monde Antique* are specially noteworthy, the one as assigning to the apostle a much inferior place in the history of the Christian church to that which Protestants at least have assigned him, the other for its brilliant delineation of the last stages in the life of paganism. In completion of the task he had set before him, Renan undertook what, as he himself said, should have been the natural beginning of his work, the history of the people of Israel.

Besides this main product of his genius and industry, Renan from time to time published other volumes, some, such as *Questions Contemporaines* and *La Réforme Intellectuelle et Morale*, on the current questions of the day, and others, such as the *Dialogues Philosophiques* and *Drames Philosophiques*, on the profounder questions of human life and destiny. In 1883 appeared *Souvenirs d'Enfance*, in which he traced in his most delicate vein the influences that worked in him during his childhood and early youth. As a supplement, Renan published *L'Avenir de la Science* (1890), conceived and written in 1848. Taken with the preface of 1890, this book throws a vivid light at once on the history of its author's opinions and on that double nature he inherited from his Celtic and Gascon ancestry. In his earlier work sentiment is often strained beyond the limit of virile feeling; his later writings often reveal the Gascon by unseasonable *persiflage* and epicurean suggestion. He died 2d October 1892, and was buried in the Panthéon.

Renan's *Histoire des Origines du Christianisme* consists of the following volumes: *Vie de Jésus* (1863), *Les Apôtres* (1866), *Saint Paul* (1867), *L'Antéchrist* (1873), *Les Évangiles et la Seconde Génération Chrétienne* (1877), *L'Eglise Chrétienne* (1878), *Marc-Aurèle et la Fin du Monde Antique* (1880), *Index général* (1883); its great complement, *Histoire du Peuple d'Israël* (5 vols. 1887-1894). Other writings are: *Le Livre de Job* (1859); *Le Cantique des Cantiques* (1860); *L'Ecclesiaste* (1862); *Histoire Générale des Langues Sémitiques* (1854); *Mission de Phénicie* (1865-74); *Études d'Histoire Religieuse* (1856); *Nouvelles Études d'Histoire Religieuse* (1884); *Averroès et l'Averroïsme* (1852); *Essais de Morale et de Critique* (1859); *Mélange d'Histoire et de Voyages* (1878); *Questions Contemporaines* (1868); *La Réforme Intellectuelle et Morale* (1871); *De l'Origine du Langage* (1863); *Dialogues Philosophiques* (1876); *Drames Philosophiques*, including *Caliban*, *L'Eau de Jouvence*, *Le Prêtre de Némis*, *L'Abbesse de Jouarre* (1888); *Souvenirs d'Enfance et de Jeunesse* (1883); *Discours et Conférences* (1887); *L'Avenir de la Science* (1890); the Hibbert Lectures (1890), delivered in London, on *The Influence of the Institutions, Thought, and Culture of Rome on Christianity*; with Victor Leclercq, *Histoire Littéraire de France au XIV^e Siècle*; *Ma Sœur Henriette* 1895; trans. as *Brother*

and Sister, 1896); *Ernest Renan-Henriette Renan: Nouvelles Lettres intimes* (1923).

For critical estimates, see Sainte-Beuve, *Nouveaux Lundis* (tome ii.); Schérer, *Études sur la Littérature Contemporaine* (tome viii.); G. Monod, *Les Maîtres de l'Histoire* (1895). See also Grant Duff's *In Memoriam* (1893); Lives by Séailles (1895), Mary Duclaux (1897), W. Barry (1905); R. Allier, *La Philosophie d'E. Renan* (1906); Lockroy's *Au Hasard de la Vie* (1913); Guérard's *French Prophets of Yesterday* (1913); L. F. Mott's Study (1921), and Pommier's (1923); also Girard and Moncel, *Bibliographie* (1923).

Rendsburg, a town of Sleswick-Holstein, stands on the Kiel Canal, 19 miles W. of Kiel, and has manufactures of cotton, machinery, and chemicals; pop. 16,000.

René I., surnamed 'the Good,' titular king of Naples and Sicily, the son of Louis II., Duke of Anjou and Count of Provence, was born in 1409 at Angers. He failed in his efforts to make good his claim to the crown of Naples, gave his daughter in marriage to Henry VI. of England (1445), and ultimately devoted himself to Provençal poetry and agriculture at Aix in Provence, where he died regretted in 1480. See ANJOU, and a monograph by Edgecumbe Staley (1913).

Renfrew, an ancient royal burgh, the county town of Renfrewshire, stands on the south bank of the Clyde, 6 miles below Glasgow. Its first charter dates from 1313, and Robert III. made it a royal burgh in 1397, but it was a burgh at least as early as the reign of David I. (1124-53). A knoll called Castlehill commemorates the site of Renfrew castle, the original seat of the royal house of Stewart. Anciently the chief port on the Clyde, it has still a small harbour. The principal industries are shipbuilding, water-tube boiler-making, and engineering. For parliamentary purposes up to 1918, it formed one of the Kilmarnock group of burghs. Pop. (1841) 2013; (1891) 6777; (1921) 14,161.

Renfrewshire, a county in the south-west of Scotland, bounded on the N. by the river and firth of Clyde, on the E. by Lanarkshire, and on the S. and W. by Ayrshire. Though only twenty-eighth of the Scottish counties in size, it stands fifth in population. It is 31 miles long by 13 broad, and contains about 240 sq. m. or 151,431 acres, including water and foreshore. Pop. (1801) 78,056; (1851) 161,091; (1881) 263,374; (1911) 314,574; (1921) 298,904. The surface is irregular: besides the low lands fringing the Clyde, there are three principal valleys, those of the Gryfe, the Black Cart, and the White Cart, with upland pastures and ranges of hills, the highest point being the Hill of Stake (1711 feet) on the borders of Ayrshire.

Agriculture and the breeding of horses and cattle are carried on with success; dairy-farming is largely practised, owing to the proximity of large towns. Rather less than two-thirds of the whole extent is arable, mainly in pasture or grass crops. The minerals are coal, iron-stone, shale, and lime. Besides mining and agriculture, numerous industries flourish in various parts of the county, the principal being the manufacture of thread, cotton, and chemicals, print and bleach works, shipbuilding, engineering, distilling, and sugar-refining. Renfrewshire is well supplied with roads and railways, and has two considerable ports—Greenock and Port-Glasgow. It is divided for administrative purposes into two wards, Upper and Lower, with sheriffs-substitute at Paisley and Greenock. There are two parliamentary divisions, eastern and western, each returning one member. From time to time parts of Renfrewshire have been detached and added to Glasgow. The chief towns, besides those mentioned, are Renfrew, the county town

and only royal burgh, Johnstone, and Barrhead. Renfrewshire, or at least the western portion, was anciently called Strathgryfe, and it was the chief patrimony of the house of Stewart. In 1404, not long after the accession of that family to the crown, the title of Baron of Renfrew (still borne by the Prince of Wales) was conferred by Robert III. on his son James; and about the same time Renfrew was disjoined from the sheriffdom of Lanark and made a separate county.

See county histories by Crawford (1716), and Metcalfe (1905).

Reni, GUIDO. See GUIDO.

Renner, KARL (b. 1870), Austrian politician, studied law at Vienna, and from 1907 to 1918 sat in the imperial parliament as a social democrat. He became the first chancellor of the Austrian republic, remaining in office 1918-20. He headed the Austrian Peace Delegation at St Germain in 1919, and in 1920 worked for a *rapprochement* with Czechoslovakia. He has published various works on political and international questions, as well as the national song of the republic, 'Deutschösterreich du herrliches Land.'

Rennes (the *Condate* of the Redones), the capital formerly of the province of Brittany, and now of the department of Ille-et-Vilaine, is situated at the confluence of those two rivers, 234 miles WSW. of Paris and 51 SSE. of St. Malo. A seven days' fire in 1720 destroyed nearly 4000 houses, and the ancient walls have been superseded by pleasant promenades, so that the place wears a modern aspect. Four bridges connect the upper or new town and the lower or old town, and the most noteworthy of the public buildings are the cathedral, finished in 1844, and Italian in style; Notre Dame, with its dome surmounted by a huge image of the Virgin; the archbishop's palace (1672); the stately Palais de Justice (1618-54); the university buildings (1855), with a picture-gallery; the theatre (1835); the Hôtel de Ville, with a public library; and the Lycée. As the focus of main and branch lines of railway between Paris and the north-west of France, and commanding good river and canal navigation, Rennes is favourably situated for commerce; and, in addition to the transport of the abundant farm-produce of the neighbouring districts, it carries on a considerable trade in its own manufactures, which include printing, weaving and tanning, &c. Pop. (1872) 48,658; (1921) 82,241.

Rennet is the enzyme which causes the curdling of milk, and occurs in the gastric secretion of all mammals. It is also found in other animals, is secreted by some bacteria and occurs in many seeds, some of which (e.g. *Withania coagulans*) are used for its commercial preparation. It is usually obtained by digesting the dried rennet stomach (the abomasum or fourth compartment) of the calf with water containing 5 per cent. of salt or a little boric acid. The extract is either sold as such or is evaporated at a low temperature in a vacuum, yielding a powder. Rennet is largely used in cheese making. When it is added to milk the caseinogen of the milk is converted into casein and this separates out as a curd, carrying down with it the fat globules of the milk. The curd gradually contracts, expelling the clear whey, which is almost free from fat and contains the milk sugar and lactalbumin. Rennet acts most rapidly at about blood heat (98° F., 37° C.) and only very slowly curdles milk which has been boiled. Rennet preparations have been obtained of which one part by weight was capable of coagulating one million parts of milk. See DIGESTION, FERMENTATION.

Rennet. See APPLE.

Rennie, JOHN, civil engineer, was born at the farm of Phantassie, near East Linton, East Lothian, 7th June 1761. After being for some time a workman in the employment of Andrew Meikle, inventor of a thrashing-mill, he attended the lectures of Robison and Black at Edinburgh University. He visited (1784) the works of Messrs Boulton and Watt at Soho, near Birmingham, and was immediately taken into employment by that eminent firm. Here his mechanical genius soon displayed itself; and so highly did Watt esteem Rennie that he gave him, in 1789, the sole direction of the construction and fitting-up of the machinery of the Albion Mills, London; and the ingenious improvements effected in the connecting wheel-work were so striking that Rennie at once rose into general notice, and abundance of mill-work now flowed in upon him. To this branch of engineering he added, about 1799, the construction of bridges, in which his pre-eminent talent and ingenuity displayed themselves. The chief of his bridges were those of Kelso (1803), Leeds, Musselburgh, Newton-Stewart, Boston, and New Gallopway, with the Waterloo Bridge (see LONDON). Another of his works is Southwark Bridge; he also drew the plan for the London Bridge, which, however, was not commenced till after his death. He superintended the execution of the Grand Western Canal in Somerset, the Polbrook Canal in Cornwall, the canal between Arundel and Portsmouth, and, chief of all, the Kennet and Avon Canal between Newbury and Bath; he drained a large tract of marsh land in the Lincoln Fens. The London Docks, the East and West India Docks at Blackwall, the Hull Docks, the Prince's Dock at Liverpool, and docks at Dublin, Greenock, and Leith were designed by him, and wholly or partially executed under his superintendence. He planned many improvements on harbours and on the dockyards of Portsmouth, Chatham, Sheerness, and Plymouth; executing at the last-mentioned port the most remarkable of all his naval works, the celebrated Breakwater (q.v.). He made great improvements in the diving-bell. He died 4th October 1821, and was buried in St Paul's Cathedral. A striking characteristic of his works is the remarkable combination in them of beauty and durability; and though they were frequently objected to on the ground of costliness, yet in the end their lasting qualities more than compensate for this. In person Rennie was of extraordinary stature and herculean strength. See Smiles's *Lives of the Engineers* (1874).

GEORGE RENNIE (1791-1866), eldest son of the preceding, was born in Surrey, educated at Edinburgh University, was superintendent of the machinery of the Mint, and aided his father. With his brother John he carried on an immense business in shipbuilding, railways, bridges, harbours, docks, machinery, and marine engines.—**SIR JOHN RENNIE** (1794-1874), knighted in 1831 on the completion of London Bridge, was engineer to the Admiralty. See his *Autobiography* (1875). He wrote on harbours.

Reno, the largest town in Nevada, 32 miles NW. of the capital, Carson City. It is a manufacturing centre, and is the seat of the State University of Nevada. Pop. 12,000.

Renoir, AUGUSTE (1841-1919), French painter of the Impressionist school, born at Limoges, spent most of his early life in Paris, becoming friends with Sisley and Monet, and began painting, choosing everyday subjects and experimenting with light and colour. Throughout all his life Renoir expressed his fondness for the 'sensuous' qualities in colour, always using the full brush, but about 1880 he came under the influence of Ingres, and on a

visit to Italy was much struck by the simple modelling of Raphael. From this period date most of his nudes, treated with a hard, glossy brilliance. In 1890 Renoir left Paris for Provence, and turned his attention more to landscapes. His work is chiefly characterised by its opulent colouring, applied in transparent layers. See IMPRESSIONISM, studies by Fosca (1925) and Volland (trans. 1926).

Renouvier, CHARLES (1815–1903), French philosopher, was born at Montpellier and educated at the École Polytechnique, Paris. His chief works are *La Science de la Morale* (1869), *Uchronie* (1876), *La Philosophie analytique de l'histoire* (1896–97), *Le Personnalisme* (1903), and *Critique de la doctrine de Kant* (1906). Renouvier's idealistic 'neocriticism' continues in modified form the philosophy of Kant, and lays great stress on the liberty of the individual, and on personal experience. See the studies by Séailles (1905) and Arnal (1907).

Rent, in common speech, is money paid for the use of land or houses. In political economy it usually means money paid for the use of land; and it is in this reference that the theories and discussions of economists regarding rent have arisen. Economists have generally held it to be the great merit of Ricardo that he elucidated the true theory of rent. Anderson, Malthus, and West had indeed enunciated it before, but the classical statement of it (fully developed in his *Principles of Political Economy*, 1817) came from Ricardo. According to that theory the amount of rent paid represents the excess of the price of the produce of the land over the cost of production on that land. The cost of production includes the usual wages paid to the labourer, and the usual interest on the capital applied to the land, as well as remuneration of management. In other words, after the labourer has been paid the usual wages and the farmer has received the usual return for his capital and trouble from the produce of the land, the remainder is rent.

It will be seen therefore that the amount of the rent depends on the price obtained for the produce. Rising prices for agricultural produce mean rising rents. And in this, as in other departments, prices depend on the relation of demand to the supply. A rapidly increasing demand, or in other words, a rapidly growing population, and a supply that cannot nearly keep pace with it will lead to a great rise in prices. Such was the condition of England at the end of the 18th century and the beginning of the 19th, when a rapidly growing population had to depend almost solely on the home market. At such a time there was a great rise in rents. During the last generation the population has increased with a similar rapidity, yet, owing to free trade, the enormous development of the means of transport, and the opening up of vast agricultural lands in America and the colonies for the supply of the home market, prices have fallen and also rents. The demand has increased, but the supply has increased vastly more, and in spite of the growing population rents have fallen. The general truth however remains that rent depends on prices, and not prices on rent. Or, to use the Ricardian formula, which, however, is not a satisfactory expression of the fact, rent is not an element in the price of corn.

After having been much overrated as a discovery in political economy, the Ricardian theory of rent is now in many quarters unduly depreciated. It still remains generally valid under the conditions contemplated by its expounder. Those conditions are a system of land-holding by private owners who do not cultivate their land, capitalist farmers, and free labourers; the relation of the three classes

to each other being determined by competition. In other words, the economists who have worked out the theory have had in view England, and other countries in so far as they are similarly circumstanced as England. But even in England there are many things which greatly modify the operation of the principle—the influence of custom, the natural conservatism of all classes, local attachment on the part of the farmer and labourer, &c. Very important also is the fact that many of the landlords have regard to social and political considerations, as well as to reasons of fairness and equity in fixing their rents. It must, moreover, be remembered that a disturbance in agricultural prices, such as that caused by the introduction into European markets of the enormous supplies from America, may have rendered the Ricardian theory ludicrously inapplicable to the rents actually paid, particularly under long leases. Under these circumstances rent was often paid not out of the surplus of the farmer's profits, but out of his capital. The Ricardian theory of rent therefore formulates a tendency which, even under the conditions contemplated, accords with facts only in a rough and general way.

When we consider economic history and the existing economic conditions of the world we may perceive how limited in scope the Ricardian theory of rent has been. In many countries custom has decided, and still decides, the rent paid for land. In very many countries it has not been either competition or custom that has regulated rent, but the owner has wrung from the cultivator all that he could. The only limit to the exactions of the owner has been his own pleasure or caprice or the endurance of the cultivator. In countries, however, where the state is the owner of the land rent may more correctly be regarded as a tax.

The rent paid for land occupied by towns and that paid for mines are in some important respects different from the rent of agricultural land. The rent paid for land in towns is much more directly influenced by the increase of population and the growth of prosperity. Inasmuch as the owner receives great advantages from such causes while contributing little or nothing, economists of standing maintain that such land should be under municipal ownership and control. The rent paid for mines is materially affected by the fact that mines become exhausted, while the agricultural properties of the soil are permanent in the main. As regards rent generally, it should be repeated that economic formulas are of comparatively little value. The main thing is a thorough knowledge of the facts and conditions, which vary continually according to the time and country with which we are concerned. For other aspects of rent, see also LAND LAWS, LANDLORD AND TENANT.

Renton, a town of Dumbartonshire, on the right bank of the Leven, 2 miles N. by W. of Dumbarton. Founded in 1782, it has a Tuscan column (1774) to the memory of the novelist Smollett, who was born close by, and it carries on calico-printing, dyeing, and bleaching. Population 5000.

Renwick, JAMES, the last of the martyrs of the Covenant, was born at Moniaive, Dumfriesshire, 15th February 1682. He attended Edinburgh University with a view to the ministry, but was denied his degree, as he refused the oath of allegiance; and, after witnessing the deaths of Cargill and others of the martyrs, he resolved to embrace the cause for which they suffered. He was chosen by the 'Societies,' as the bands of men devoted to the Covenant were called, to proceed to Holland to complete his studies in 1682, was ordained at Groningen in 1683, and at once proceeded to Scot-

land, where his first sermon was preached at Darnead Muir in the same year. His life was now exposed to great hazards; he was obliged to move from place to place, and was often reduced to destitution. In 1684 he published his *Apologetic Declaration*, for which he was outlawed. When James II. came to the throne in 1685 Renwick with 200 men went to Sanquhar, and published a declaration rejecting him. A reward of £100 was offered for his capture, he was hunted from place to place, and made many hairbreadth escapes, but was at last captured in Edinburgh. He was condemned and executed, 17th February 1688.

See Shield's *Life*, Renwick's *Choice Collection of Sermons*, &c. (1777), Simpson's *Life of Renwick* (1843).

Repairs is the legal as well as popular term to denote the repairs done to a house or tenement by a tenant or landlord during the currency of the lease. In England the burden of repairs is at common law thrown on the tenant, so that, unless the lease expressly says that the landlord is to do the repairs, the tenant will be bound to use the premises fairly and to keep house property wind and water tight. Usually the lease states who is to do the repairs. In the lease of farms the tenant is bound only to keep the house in repair, and not the out-buildings, though he is bound to keep the fences in repair. If the landlord is bound to do the repairs, and fails to do them, the tenant is not entitled to quit the premises on that account, though he will be entitled to sue the landlord for damage caused by the want of repairs. In Scotland the landlord is bound at common law to put the premises into tenantable repair at the commencement of the lease. The tenant is then bound to keep them in ordinary repair, but not to keep them in repair where some hurricane or extraordinary cause has done injury. In the United States the laws of the states vary; in several states it is enacted that a general promise to repair shall not bind the tenant to rebuild in case of destruction by fire.

Repentance, STOOLOF. See STOOLOF REPENTANCE.

Replevin, in English law, is a form of action by which goods which have been seized under a distress are taken back (security being given to the amount for which the goods were distrained), and the action of replevin commenced, to try the legality of the seizure.

Reporting, a notable department of journalism, has already been incidentally discussed at NEWSPAPER; the methods by which, as a rule, it is practicable are dealt with at SHORTHAND. An account of the history of parliamentary reporting, in some respects the most important, may first be given here.

Accounts of single speeches, and, at times, of entire debates in the English parliament, have come down from a very early period. The earlier volumes of the Journals of the House of Commons contain short notes of speeches; the later volumes record nothing but the votes and proceedings. Sir Symonds d'Ewes edited the *Journals of Queen Elizabeth's Parliaments*; and the Commons' Journals contain notes of speeches in the parliaments of James I. Rushworth, assistant-clerk in the Long Parliament, 1640, took down in a species of shorthand any speech of importance; and his account of *Remarkable Proceedings in Five Parliaments* forms one of the most valuable portions of his *Historical Collections*. During the reign of William III. a member now and then sent a copy of his speech to the newspapers, for printing which, however, they were sometimes called to account. In the reign of Queen Anne a monthly pamphlet, called the *Politi-*

cal State, gave an outline of the debates in parliament. In the reign of George I. the *Historical Register*, published annually, professed to give reports of parliamentary speeches. The *Gentleman's Magazine* began a monthly publication of the debates, the number for August 1735 containing a report of the debate in the House of Lords on the previous 23d January. Cave, the publisher, continued the practice in succeeding numbers. There was, however, no publication of the debates during the sitting of the Houses; parliament was always prorogued before anything said in the course of the session was given in the magazine. At first the names of the speakers were cautiously indicated by the first and last letter only, and in many cases the speaker's name was wholly omitted. Growing bolder by degrees, Cave printed the names at length. The House of Commons soon took alarm. The publication of the debates of either House had been repeatedly declared to be a high breach of privilege—as by the Commons in 1588 and by the Lords in 1698; and in 1738 Speaker Onslow called the attention of the House to the breach of its standing orders by Cave and others. The result was another thundering resolution against the publication of debates 'either while parliament is sitting or during the recess,' and a threat to proceed against offenders with the 'utmost severity.' The reports, notwithstanding, still appeared, but under the disguise of 'Debates in the Senate of Lilliput,' in the *Gentleman's Magazine*; and 'Debates in the Political Club,' in the *London Magazine*. Dr Samuel Johnson was employed by Cave in the composition of his parliamentary debates, and the reports from 1740 to 1743 are held to have been entirely prepared by him. It was not till thirty years later that the parliamentary debates descended from the magazines to the newspapers. The latter had, however, for some time resolved to report the debates, and they took advantage of the popular excitement arising out of the Luttrell-Wilkes election for Middlesex to try the right of the House to interdict the publication of its proceedings.

The ever-memorable contest between parliament and the press began at the close of the year 1770. The House of Commons followed up another solemn threat by prompt action; and the Lord Mayor of London and Alderman Oliver were sent to the Tower for refusing to arrest some printers of reports on the warrant of the Speaker, John Wilkes taking an active share in the controversy. The city of London loudly protested against the arbitrary proceedings of the House, and the whole country responded to the appeal. The power of parliament to imprison ceases at the end of the current session, and on the day of prorogation, 23d July, the Lord Mayor and Alderman Oliver marched out of the Tower in triumph, and at night the city was illuminated. Next session the House of Commons tacitly acknowledged itself beaten. The printers defied the House, continued to publish their proceedings, and slept, notwithstanding, secure in their beds. In a short time the House of Lords also conceded the point, and the victory was complete. It still remained for many years in the power of any member of the House of Commons, by the historic formula, 'Mr Speaker, I spy strangers,' to cause the exclusion of the public and the reporters from the House. Since 1875, however, a direct resolution of the House has been necessary. Secret sessions were held on six occasions during the Great War, 1914-18, under this procedure, reinforced by stringent Defence of the Realm Act regulations.

The old machinery of parliamentary reporting was susceptible of immense improvement. One of the Woodfalls (a brother of the Woodfall of Junius)

had so retentive a memory that when editor of the *Morning Chronicle* he used to listen to a debate in the gallery, and write it out next day, the taking of notes being at that time forbidden. His successor established a corps of parliamentary reporters to attend the debates of both Houses every night in succession. He thus brought out the night's debate on the following morning, anticipating his rivals by ten or twelve hours. The improvement in the reports of the debates from the period of the American Revolution until the year 1815 was but gradual. At the close of the French war, however, the publication of parliamentary debates became an object of national importance, and in the course of a few years assumed its present full, detailed, and accurate character. Increased facilities for the discharge of their important and arduous duties were from time to time given to the reporters, who till then had no means of entering the Strangers' Gallery except those which were common to the public generally. Amongst the professional parliamentary reporters of this period Charles Dickens was conspicuous. He was at work for the *Morning Chronicle* in 1834, and was one of the best reporters of his time.

Not a few distinguished lawyers, also, like Lord Merivale, Sir Edward Clarke, and Lord Hewart, reported parliamentary debates in their earlier days.

Exclusive accommodation for reporters was provided in the House of Lords in 1831, although, it is curious to note, the order prohibiting the reporting of debates was then still in force. The Press Gallery in the House of Commons dates from 19th February 1835. Modern organisation, and the use of telephone and private telegraph wires by the leading newspapers and press agencies, enables news of any important announcement in parliament, or decision of the legislature, to be despatched within a minute or two to all parts of the country, while the substance of interesting speeches is often in the columns of the evening newspapers almost before the orator has resumed his seat.

Cobbett's, afterwards Hansard's, parliamentary debates were originally compiled from outside sources, and a staff of reporters was not introduced until 1878. Since 1909, however, official reports of the proceedings in both Houses of Parliament have been published under government control.

Parliamentary sketch-writing was introduced in the 'fifties as a feature of the weekly press, and found its way, about twenty years later, into the daily newspapers, generally as an introduction to the more formal report. Distinguished writers like Sir Henry Lucy and H. W. Massingham raised this form of journalism to the level of literature.

Another comparatively late development is lobbying, a select number of press representatives being admitted to the members' lobby for the collection of political news and opinions.

(See *The Reporters' Gallery*, by Michael MacDonagh; also the introduction to *Pillars of the State*, by Herbert Sidebotham.)

A further important branch of reporting is that relating to judicial proceedings, civil and criminal, and this, in the higher courts particularly, calls for ability, experience, and always the utmost accuracy. A mistake may be fraught with grave consequences, as some newspapers have found to their cost, by reason of expensive actions against them for libel. Proceedings in open court, i.e. any hearing to which the public are admitted, can be reported in the press provided they are relevant to the case before the court, and that the account is fair and accurate, subject, however, to some prohibition as to obscene matter, and also to a discretion by the judge in certain instances. Much attention is given by newspapers to law reports, and an action

or trial arousing widespread interest obtains many columns of space.

The reporting of sport and athletic prowess, more especially horse-racing, football, cricket, and golf, demands quickness of eye, knowledge, and judgment, vivid and picturesque descriptive powers, and quick output of 'copy.' Very elaborate organisation exists to record and disseminate with almost incredible rapidity the results of racing and other sporting events. By means of 'tick-tacking'—a system of signalling by the hands and arms—an observer who watches the race through glasses from some vantage-point overlooking the course communicates with a colleague stationed at the nearest available telephone; thereafter trunk telephones, private telegraph wires, and tape instruments combine to spread the news with such speed that very often the result has reached every large town in the British Isles in less than a minute of the first horse passing the post.

Nowadays the reporter makes very great use of the telephone, local and trunk, for transmitting news matter to his office. In the case of long or verbatim reports of important political speeches, conferences, and trials he takes a prescribed 'turn,' varying in length according to the exigencies of the case and the size of the staff engaged, and then hurries to the nearest telephone to dictate direct from his shorthand notes to colleagues in silence boxes in the office of the news agency or journal, which may be several hundreds of miles away. This method has largely superseded the transcription by the reporter himself of his notes and the despatch of the report to the post-office for telegraphic purposes.

The interests of reporters are in charge of two bodies—the Institute of Journalists (a chartered organisation embodying employers and employed) and the National Union of Journalists, which is avowedly a trade union of employees. The qualifications, status, and remuneration of reporters have considerably improved in recent years.

Repoussé (Fr.). This term is applied to a peculiar method of ornamenting metal which resembles Embossing (q.v.). Briefly stated, it is metal-work formed in relief by striking the sheet, usually a thin one, from behind with a hammer or punch, the rough forms so produced being afterwards chased or otherwise finished. After the parts which require to be convex are 'raised' from the back or inside of any object, such as a vase or flat dish, it is either filled with or placed on a bed of pitch and then worked upon the face with small punches, and afterwards with chasing, engraving, and other tools. Stamping produces work somewhat similar in general appearance, but of a much more mechanical nature, since the die used determines exactly the pattern, and no variety is obtained. See **DIE-SINKING**. Some kinds of hammered iron, again, such as open ornamental gates and grilles, are rather examples of forging than of repoussé. Among the best existing pieces of ancient Greek bronze sculpture some have been beaten up (not cast), and are therefore of the nature of repoussé work. A number of the famous artistic productions—notably those of the 16th century—referred to under the head **METAL-WORK** are executed in repoussé. This art, by which, in the hands of a master, work can be executed with a delicacy, softness, and beauty unattainable by any other process, was revived (in a true artistic sense) in France about the middle of the 19th century. Some of the finest modern works in repoussé have been executed by Antoine Vechte and Morel Ladeuil. One of the largest objects ever produced in repoussé in England is the Elcho Volunteer Challenge Shield. It is of iron, 6 feet high, and was designed by F. Watts, R.A.

Elaborate work in repoussé is necessarily very costly, especially if the metal employed is hard, such as iron, copper, or silver, which is usually the case when important designs are to be executed. But the process is also applied in Birmingham to decorate comparatively cheap articles in Britannia metal, which is soft and easily worked.

Representation, in politics, is the function performed by the elected members of legislative and administrative bodies. Ancient democracies were usually constituted on the principle of government by the whole body of citizens; at Athens, for example, all important questions were decided by the vote of the Ecclesia. In England, as in many other countries, the freemen of townships and small districts elected their own officers and managed their own affairs; the shire-moot of early times was attended by the reeve and four men from each township; it was, in fact, a representative assembly, properly so called. When the smaller kingdoms were united under one head the change was not at first favourable to popular government; it was impossible in those days to bring together representatives from a wide area; and the conduct of national affairs fell into the hands of the king and his councillors and the great men of the realm. But feudal custom required that a superior should consult his vassals, or some of them, before levying any exceptional aid; under the influence of this idea courts or assemblies of a more or less representative character were formed throughout western Europe. In England the high court of Parliament (q.v.) was organised on a feudal basis, like the neighbouring parliament of Scotland; but, as early as the 13th century, Clergy, Lords, and Commons sent representatives to parliament. For subsequent history in England, see PARLIAMENT. The mediæval Italian republics had aristocratic institutions, and the States-general (q.v.) in France had no legislative power. It was not until the 17th and 18th centuries that the subject of representation became at all prominent with the establishment of the Dutch republic (but see STADHOUDER), the Civil War in England and the discussions of the philosophers, Locke, Hobbes, Hume, Rousseau, the Encyclopedists, whose theories of the sovereignty and will of the people were put to such a startling test in the French revolution of 1789. The European history of the 19th century and of the first decades of the 20th can almost be summarised in the struggle between the parties of liberalism and reaction. In many cases the immediate results of the 1830 and 1848 revolutions were not lasting, but as a consequence of the Great War, 1914-18, several states were established on the principles of self-government and self-determination (see REPUBLIC). This scheme of parliamentary institutions, by which a nation determines its own destiny, being ruled by elected representatives in the name of the whole body of citizens, has been taken from Great Britain, and has now penetrated to countries like Egypt and Persia.

In framing or criticising the constitution of a representative body we encounter practical questions of considerable interest. We have to determine, first, who ought to elect, whether a property qualification should be required, whether owners of property should have more than one vote, whether manhood suffrage, household suffrage, or a more limited franchise will give the best results, and whether women ought to be allowed to vote (see WOMEN'S RIGHTS). We have then to consider how the electors are to be grouped.

The Representation of the People Act (1918) in Great Britain, for example, apportioned approximately 70,000 electors for one M.P., and gave the franchise to some 20 millions (including over 8

million women) out of a population of 42½ millions. It laid down three qualifications—residence, business, and university; men were to be over twenty-one years of age and women over thirty (see PARLIAMENT, *Electors*). Votes may be so distributed, however, that a majority of members is returned by a minority of electors, especially in those elections when there are three or more candidates for one seat. Thomas Hare (1806-91) was the author of a scheme of proportional representation, in which the whole country is treated as one constituency, each elector has one vote, and any candidate obtaining the necessary quota of votes is elected, while provision is made for transferring votes from a candidate who obtains more than the quota by enabling an elector to vote for several names in the order of his preference. Since the example set by Denmark in 1855, Sweden, Finland, Belgium, Australia, South Africa, and other countries have adopted various systems of proportional representation, of which there are altogether about 300. The votes allowed, less in number than the candidates, are non-transferable in Japan. In France and Austria a second ballot is taken between the principal candidates in triangular contests. 'Cumulative' voting enables the elector to give all his votes (as many as there are seats to be filled) to one candidate if he will. Proportional representation is used for Irish Senate and municipal and Scottish Education Authority elections, and, as regards the British parliament, only for the university constituencies.

Passing from election law, we have to consider what are the duties of elected representatives, and what should be their relation to their constituents. Should they be paid? Should they have a long term of office, that they may learn their business, or a short term, that they may never forget their dependence on the electors? Are they delegates, bound to act on the instructions of those who appoint them, or is it their duty to act on their own judgment, and to do what is best for the general welfare? The accepted theory in England is that a member is not a delegate; his constituents have no power to withdraw their mandate, and the member is bound to act on his own judgment. But the highly organised parties of modern times leave very little freedom to the individual representative: he can only secure election by pledging himself to vote for his party on certain issues.

For the Referendum, see INITIATIVE, &c., SWITZERLAND, and, for the representative system of the United States, CONGRESS, PRESIDENT, UNITED STATES. See DEMOCRACY and the articles on the various countries, under heading *Constitution*; also Mill, *Representative Government* (1861); T. Hare, *Election of Parliamentary Representatives* (1859); Lord Avebury, *Representation* (1883); Bryce, *American Commonwealth* (1888) and *Modern Democracies* (1921); de la Chapelle, *Reforme électorale* (1898); books on proportional representation by Commons (1907), J. H. Humphreys (1911), and publications of the P. R. Society; Delbrück, *Regierung und Volkswille* (1914); and Ramsay Muir, *National Self-government* (1918).

Reprieve (Fr. *reprendre*, 'to take back') is the suspension of punishment for a crime, and is used chiefly in connection with capital crimes. The power of suspending all sentences at any time is vested in the crown, or chief-magistrate of a republic, at discretion; and in Britain is exercised through the Home Secretary (see SECRETARY OF STATE, PARDON). There are also several grounds on which the judge or a court reprieves a sentence. Where the judge is not satisfied with the verdict, or is doubtful of the validity of the indictment, he reprieves the sentence in order to give time for some application to the crown. When the prisoner is a pregnant woman, and pleads that fact, it is proper to put off the execution of the

sentence until after her delivery. When a woman pleads her pregnancy as a reason for reprieve the traditional practice in England is to empanel a jury of matrons, and, if they bring in a verdict of 'quick with child,' execution is stayed. Another cause of reprieve is the insanity of the prisoner, for, if before execution it appear the prisoner is insane, whether the insanity supervened after the crime or not, the judge ought to reprieve him. A reprieve is usually followed by remission or commutation of the punishment to which the prisoner has been sentenced.

Reprisal is the retaking, from an enemy, of goods which he has seized, or the capture from him of other goods, as an equivalent for the damage he has wrought. Letters of Reprisal are the same as Letters of Marque (q.v.).

Reprobation. See PREDESTINATION.

Reproduction is the general term for the whole sequence of processes by which new individuals arise. From a parent organism, or more usually from two parents, offspring take origin, often at successive reproductive periods, which implies multiplication; these offspring give rise in due time to others, and this implies a sequence of generations. It is not possible to separate reproduction from growth, at the limit of which it usually occurs; or from the activation of the reproductive organs at maturity, in which, in vertebrates, hormones are often concerned; or from the division of labour implied in there being two sexes, egg-producing or female individuals and sperm-producing or male individuals; or from the ways in which the sperm-cell is brought into contact and union with the egg-cell—a process in which the insemination, the pollination and the like, must be distinguished from the microscopic union called fertilisation, to which Weismann applied the useful term *Amphimixis*. But the process of reproduction has also to take account of development; and, it may be also, of the antenatal relation between parent and offspring. Yet again, it has to do with the liberation or separation of the offspring from the parent. Nor can the study of reproduction be separated off from heredity, the relation of organic continuity between successive generations, which secures the begetting of like by like, and yet allows of the emergence of those novelties or variations which form much at least of the raw material of further evolution.

Modes of Reproduction.—In one-celled organisms, whether Protophytes or Protozoa, the unit divides into two or more parts (by fission, budding, and spore-formation) and each of these parts grows into the likeness of the whole. But even at this low level of unicellular life it often happens that two individuals combine to form one (total conjugation), which may then proceed to divide into many. Or specialised reproductive units (gametes), the result of division and sometimes dimorphic, may unite in pairs to form a zygote, which either grows into the original form or proceeds to divide into many individuals. Very suggestive is the partial conjugation of such ciliated Infusorians as the Slipper Animalcule (*Paramecium*), where there is an exchange of nuclear elements and then a separation of the conjugants. This seems to secure vigour and variability in the stock.

Among many-celled organisms, both plants and animals, there is a frequent occurrence of asexual reproduction, in which a considerable part of the parent is separated off to start a new individual. Thus the freshwater *Hydra* gives off buds; a sea-anemone may split longitudinally into two; a ribbon-worm or Nemertean may break into pieces; two or three starfishes can actually multiply by separating off their arms; a liverwort may give off

multicellular gemmæ, and a tiger-lily may liberate bulbils. In short, there is great variety of asexual multiplication, and it often leads to the formation of colonies, as in Zoophytes and corals, Bryozoa and Compound Tunicates.

But the big fact is that all the many-celled animals and the great majority of many-celled plants show sexual reproduction, though in certain types the asexual mode may also occur in the same organism. Thus, while the main mode of multiplication in the freshwater *Hydra* is the liberation of asexually-produced buds, there is also sexual reproduction by eggs and sperms. This phase, sexual reproduction, covers several distinct facts: (a) the formation and segregation of special reproductive cells; (b) the production of two different kinds of special reproductive cells, which are usually inter-dependent; and (c) the production of these (the spermatozoa and the ova) by different (male and female) organs or individuals. (a) In plants like ferns and mosses, one phase in the life-history is the formation of spores. These are special reproductive cells which develop without fertilisation; and in the life-history of the liver-fluke we find not only an adult reproduction by means of egg-cells and sperm-cells, but a larval multiplication by means of spore cells, which can hardly be called ova. See GENERATIONS (ALTERNATION OF). (b) In some animals, such as certain Rotifers (q.v.), the males are not known; and in some other types they are absent for long periods (as in summer green-flies), or unnecessary even when they are present. In other words, parthenogenesis often occurs; and it must be ranked as one of the modes of sexual reproduction. For although there is no fertilisation, there is multiplication by means of egg-cells. (c) Many common animals, such as snails, earthworms, and leeches, are hermaphrodite; that is to say, each organism is both an egg-producer and a sperm-producer, often, it must be noted, at different times (dichogamy). In the cases mentioned there is cross-fertilisation in spite of the hermaphroditism; in a few other cases, such as the liver-fluke and some tapeworms, there is self-fertilisation or autogamy.

Advantages of Sexual Reproduction.—To account for the occurrence of sexual reproduction in almost all organisms with bodies, even when asexual reproduction is also retained, there must be advantages in the sexual method. (1) There is an advantage in the fact that a larger number of offspring can be started at once by the sexual method, and there may also be less of a drain on the resources of the body. That sexual reproduction is often fatal, as in butterflies, is hardly an objection to the general proposition that sexual multiplication, if it is practicable, is less expensive physiologically. Here it may be noticed that it would make for clearness if the term multiplication were used as often as possible for modes of increasing individuals, so that the term reproduction might be kept more or less distinct for modes of sexual union and the like. (2) Although asexual multiplication occurs in some complicated animals, such as Tunicates, it is attended with obvious difficulties in types of high differentiation and integration. Thus it does not occur in arthropods or molluscs, or in any vertebrates above the level of Tunicates. (3) In the third place, the outstanding fact implied in having specialised reproductive units is that they have not shared in the building up of the 'body,' and that they have retained an organisation continuous in quality with the original germ-cell from which the parent arose. They are thus not very liable to be tainted by the mishaps so frequently befalling the 'body' which bears them. A separated off fraction or bud, of sea-anemone or *Hydra*, must start with all the disabilities that the parent

body may have acquired—an obviously undesirable handicap. (4) In the life-history of the germ-cells, and in the mingling of sperm-cell and egg-cell in fertilisation, there is abundant opportunity for new permutations and combinations of hereditary qualities—for variations in short. This is perhaps the crowning advantage of sexual reproduction, that it favours the emergence of the new. In any case we have stated some of the reasons which account for the superseding of asexual by sexual reproduction.

Growth and Reproduction.—Growth involves a multiplication of the complex molecules that constitute the living matter; and in many-celled organisms it also implies the continual multiplication of cells. What in one-celled organisms would be a process of multiplication or reproduction, is in many-celled organisms a mode of growth. Thus, for organisms that multiply asexually, it is plain that reproduction is discontinuous growth; and one of the reasons why it must occur is discoverable in cases where a 'limit of growth' is reached—that is to say, a definite size which is physiologically the optimum for the organism concerned. Beyond this 'limit of growth' there is a setting-in of instability, and this is the prelude to reproduction. The detailed physiology is quite uncertain; but the fact is clear that reproduction tends to occur at the limit of growth, either for the organism as a whole, or for certain parts. In numerous cases, however, the limit of growth is evaded, as in many fishes, reptiles, animal colonies, and plants; and this makes the analysis of reproduction more difficult. In the more highly differentiated organisms, moreover, the periodic occurrence of reproduction cannot be interpreted as the direct result of an instability consequent on reaching a limit of growth, for the regulation of the balance of the body has become very subtle, involving, for instance, a periodic activation of hormone-producing tissue in the reproductive organs or gonads.

The importance of the relation between reproduction and the limit of growth may be illustrated in reference to the cell or any compact one-celled organism. When a growing cell (or unicellular organism) of regular shape, spherical let us say, increases its volume several times, its surface does not increase at the same rate. In fact the volume increases as the cube of the radius, and the surface only as the square. This disproportion is very important, for it is by the surface that the living matter of the cell is fed, aerated, and purified, in short, kept alive. If the cell goes on growing beyond the 'limit of growth,' the profitable size at which the surface balances the requirements of the volume of living matter, instability will set in; and the regulated way of dealing with this is for the cell to divide into two, for this readjusts the ratio of volume and surface. In other words, as Herbert Spencer and Rudolf Leuckart pointed out long ago, the reproduction of the cell occurs at the limit of growth. No doubt other factors have to be considered besides the ratio of surface and volume; thus there is the ratio between the kernel of the cell and the general cell-substance—the ratio of nucleoplasm to cytoplasm; no doubt there is as yet very little understanding of the precise nature of the 'cytolytic,' 'auto-toxic,' 'enzymatic' instability that directly induces the cell-division; no doubt there is difficulty in passing from the consequence of the limit of growth in a single cell to the reaching of the limit of growth in a large animal; but it seems justifiable to say that a consideration of the limit of growth in cells and cell-aggregates throws some light on the physiological necessity for reproduction.

Nutrition and Reproduction.—Another general

idea to be kept in mind is the antithesis between nutrition and reproduction. In conditions of abundant food the common hydra produces many adherent buds, literal reproductions of itself. A bud, while still attached to the parent, may bear buds of its own. Eventually, a check to nutrition occurs; conditions set in which are not favourable to continued assimilation; the buds separate off, and this may be followed by a phase of sexual reproduction.

Similarly a planarian worm in good nutritive conditions may form asexually a chain of four daughter-worms; a check to nutrition may occur; links separate, and sexual reproduction may set in. There are many illustrations of this organic seesaw between nutrition and reproduction. Fruit-trees are root-pruned, because the check to nutrition favours the reproductive activity which we know as flowering and fruiting. But if foliage and vegetative activity is desired, the flower-buds are nipped off. Similarly it is well known that castrated domesticated animals tend to put on flesh and fat. Nutrition and reproduction are antithetic. It is not accidental that the flower oftenest occurs at the end of the vegetative axis, where food-supplies are at a minimum; but this consideration is in itself too simple, for account must be taken of the occurrence of what are called metabolic gradients.

In a simple planarian worm the everyday chemical routine or metabolism is most intense at the anterior end of the body, and gradually wanes to a point distant from the head by about three-quarters of the total length. There the regulative influence exerted by the head is at a minimum, and it is at that point that preparation begins to be made for asexual reproduction and for the development of a second head, namely the head of the posterior part when that is liberated as a separate worm. Behind the minimum line the metabolic gradient rises again, but soon falls again towards the tail. There can be no doubt that the physiology of reproduction must take account of areas where the regulative control of other parts wanes away, and where cells tend to mutiny and assert their own individuality.

So, to return to the growing axis of the plant, the growing point is the region with the highest rate of metabolism, and there is a gradual decrease down the stem—a metabolic gradient. Within a variable distance from the growing point a controlling sway is exerted over the incipient buds; they cannot develop until the tip of the stem has grown to some distance away from them. If the growing point is covered with a small cap of plaster of Paris, it loses its physiological dominance, and the buds which were inhibited will begin to develop. If the plaster-cap be removed, the development of the buds will stop and the young shoots will die. But if the lateral shoots developing from the buds had been able to outstrip the apex of the stem before the cap was removed, then the inhibiting power of their growing points will predominate over that of the apical shoot, which will therefore die. Here, then, is another set of considerations to be kept in mind in trying to understand reproduction; but this line of inquiry is still very young.

Adaptations in Reproduction.—In typical vertebrate animals and in many others a rhythm has been established in the body such that reproductive activity sets in at a time of year favourable to the starting of a new generation or a new family. This is, of course, a very complex adjustment, for, while it is of great importance that the young should be born at a favourable time of year, this may be secured not by altering the pairing-time, but by altering the period of antenatal life. Simi-

larly, among seed-plants there may be a long or a short interval between the time of pollination and the time of seed-scattering. And just as an insect may have a long larval life—in the ground or in the water—so a seed may remain for a long time a seed before it becomes a seedling. The life-histories that are most readily interpreted are those of annual animals and annual plants in countries with well-defined seasons, for summer is then the time of pairing and pollinating, autumn the time of early development and separation from the moribund parent, winter the time of lying latent and well-protected, whether as seed or cocoon, and spring the time of resumed development and youth. But the variations on this theme are often puzzling. There are many of the rodents that have three or four litters in the year, but this is very different from the state of affairs in not a few insects where there are several generations in a summer. There are slowly-developing types, like elephants and 'century plants,' that are not mature till many years have passed; there are some midges and worms, and two or three amphibians that are reproductive in larval life (pædogenesis). Another set of contrasts is disclosed when we compare: (a) egg-laying animals whose eggs are fertilised outside the body, as in salmon, to take one example out of a million; (b) egg-laying animals whose eggs are fertilised at the moment of liberation, as in frogs; (c) egg-laying animals whose eggs are fertilised inside the body, as in hens; (d) animals whose eggs hatch just as they are being laid (ovo-viviparous), as in the case of some lizards and snakes; and (e) animals in which the young are hatched out within the mother, as in the primitive *Peripatus* (q.v.), or in the common brown lizard (viviparous). Taking mammals alone: (a) the Monotremes are actually oviparous; (b) the Marsupials are prematurely-bearing, with no true placenta except in *Perameles*, with no more than a provisional yolk-sac placenta in all the others; (c) the Placentals, including all the other mammals, have a more or less prolonged ante-natal partnership (or symbiosis it might be called) between the mother and the unborn young. This is anticipated in oviducal ante-natal connections in two dog-fishes and in a few other cases. Where a true amniotic and allantoic placenta is developed, as in all mammals above Marsupials, the term eu-placental might be used, and for other symbiotic connections we suggest the terms—pre-placental for cases like *Peripatus*, para-placental for cases like the two dog-fishes referred to, and vitello-placental for all the Marsupials except *Perameles*.

Reproduction and Hormones. In a higher animal the reproductive maturity is marked by a multiplication and ripening of the cells in the gonads, which often increase in size at the breeding period and bring about some degree of tumescence. Especially in the male there is a restless urge to secure the relief that the liberation of the reproductive elements brings. But not less important is the activation of glandular endocrinal tissue associated with the reproductive organs, and the result is the production of sex-hormones or gonadal hormones, which are distributed through the body by the blood. These hormones serve to stimulate the development of hitherto latent sex characters, some of which are ancillary to reproduction. Thus the swelling up of the first fingers in male frogs is of service in the sexual amplexus, and the activation of the mammary glands in the female mammal prepares for the future suckling of the young. The hormones prepare various tissues of the female for the reception and fixing of the egg-cell, for the establishment of the placenta, and for similar functions. There is also in both sexes a marked effect on the nervous system, and

this may serve as the liberating stimulus for psychical predispositions which have been previously more or less latent. In highly evolved organisms like birds it is impossible to ignore the psychological aspect of reproduction.

Reproduction and Death.—While reproduction is concerned with the beginning of new lives, it not infrequently involves the ending of the life of the parent. In many cases reproduction is the beginning of death. In some simple animals, such as certain Annelid worms, the parent, especially the mother, may rupture and die in liberating the reproductive elements. The case of the Palolo-worms (e.g. *Eunice viridis*) is of special interest, since the great part of the body, laden with eggs and sperms, is set adrift and breaks up, while the head-end remains in the crevice of the coral-reef and re-grows the body which has been lost. In this case the nemesis of death is evaded, and it is one of the trends of evolution to lessen the physiological expensiveness of reproduction. Some insects, such as mayflies and many butterflies, die in a few hours after reproduction; and the same is true of such strong animals as lampreys and eels. The exhaustion is fatal, and the males are sometimes victims as well as their mates. But among higher animals there is a strong tendency to reduce the sacrifice, not to speak of the fatality, of reproduction. The familiar tragedy of the human mother's death in child-birth must be regarded as altogether exceptional and unnatural.

The Rate of Reproduction and Increase.—The rate of reproduction depends upon the constitution of the individual organism and on its immediate environment and nutrition. The rate of increase, which is much more difficult to estimate, depends upon the wide and complex conditions of life which are often included in the phrase 'the struggle for existence.' While it is true that organisms sometimes exhibit an extraordinary increase in numbers in favourable areas and seasons, and while we know of many forms and even of whole races which have dwindled away and become extinct, the fluctuations in the numbers of plants and animals seem for the most part to be imperceptibly gradual. Their rate of reproduction is adjusted to the conditions of their life; the rise or fall of the population is seldom emphatic. The essay of Malthus (1798), in which he showed that the increase of human population tended to outrun the means of subsistence, but was met by various checks, afforded suggestions to Darwin and Wallace, who extended the induction of Malthus to plants and animals, recognising in their increase the fundamental condition of the struggle for existence, and analysing the checks as various forms of natural selection. But Herbert Spencer's analysis of the laws of multiplication was even more penetrating. Including under the term individuation all those race-preservative processes by which individual life is completed and maintained, and under the term genesis all those processes aiding the formation and perfecting of new individuals, he showed that in evolution there is an inverse ratio between individuation and genesis. Progressive evolution in the direction of individuation is associated with a diminishing rate of reproduction. But this does not imply that personal individuation directly checks personal productivity.

The Importance of Reproduction in Evolution.—As almost every individual life begins in the intimate union of two living units—the sperm-cell and the egg-cell—there is in the nature of the organism's beginning an evident possibility of variation. The two cells, and more especially the nuclei of the two cells, are intermingled; and in the vital combination which results new characteristics may be evolved, old features may be strength-

ened, peculiarities may be averaged off. On fertilisation as a source of variation, emphasis has been laid by Treviranus, Galton, Brooks, and others, while Hatschek regards the intermingling as an important counteractive of disadvantageous individual peculiarities, and Weismann finds in it the chief source of transmissible variations in many-celled animals.

In considering the evolution of animals great importance is always—and rightly—attached to the self-preserving struggles and endeavours which secure the satisfaction of nutritive needs; but the species-maintaining activities of reproduction have been not less important. Thus, Darwin insisted on the importance of sexual selection as a factor in evolution, and there can be no doubt that courtship has aided in the evolution of the psychical life of animals. Romanes, too, in his insistence on the importance of isolation, recognised 'the reproductive factor in evolution.' For by variations in the reproductive system a species may be divided into mutually sterile sets, which, prevented from intercrossing by this physiological barrier, are free to evolve along divergent paths. In a very different connection, Robert Chambers emphasised the importance of 'prolonged gestation.' Fiske directed attention to prolonged infancy as a factor in evolutionary progress, and Miss Buckley long ago pointed to the open secret that an increase of parental care and sacrifice as seen in birds and mammals has been a factor in, as well as a result of, the general ascent.

The elaboration of ante-natal symbiosis which we observe in the evolution of mammals; the growth of parental care, and the frequent subordination of self-preserving to species-maintaining ends; and finally, the rise of sociality from foundations based in organic kinship, are well-known facts of animal life which suggest the importance of the reproductive factor in evolution.

See EMBRYOLOGY, HEREDITY, SEX; Herbert Spencer, *Principles of Biology* (London, 1864-66); F. H. A. Marshall, *The Physiology of Reproduction* (London, 1910; new ed. 1922); P. Geddes and J. Arthur Thomson, *Evolution of Sex* (London, 1899); P. Geddes and J. Arthur Thomson, *Sex* (Home University Library, 1914); Crew, *Animal Genetics* (Edinburgh, 1925); M. Hartog, *Problems of Life and Reproduction* (London, 1913); A. Cresson, *L'Espèce et son Serviceur* (Paris, 1913); V. Hensen, 'Physiologie der Zeugung' in Hermann's *Handbuch der Physiologie*, vol. i. 1881; Godlewski, 'Physiologie der Zeugung' in Winterstein's *Handbuch der vergleichenden Physiologie*; J. Meisenheimer, *Geschlecht und Geschlechter im Tierreich* (Jena, 1922); Lippschütz, *The Internal Secretions of the Sex Glands* (London, 1924); J. Arthur Thomson, *Heredity* (rev. ed. London, 1926).

Reptile-Fund was abolished by Caprivi in 1890. See HANOVER.

Reptiles a very large class of Vertebrate animals, including Tortoises and Turtles, Lizards of many kinds, the divergent New Zealand 'lizard' *Sphenodon*, Snakes, and Crocodilians—five distinct orders with living representatives, but including also at least as many orders of wholly extinct types, such as Ichthyosaurs, Plesiosaurs, and Deinosauria.

Reptiles occupy a central position in the Vertebrate series: beneath them are Amphibians and Fishes, above them are Birds and Mammals. They begin the series of 'higher Vertebrates,' which at no period of life breathe by gills, which in embryonic life are provided with two birth-robes or foetal membranes—a protective amnion and a respiratory allantois. Their relationships seem to be threefold, with the Amphibians, with Birds, and with Mammals. But there is no doubt that they are most closely linked to Birds—a fact first clearly

recognised by Huxley, who emphasised the deep structural affinities of Birds and Reptiles by linking them together as Sauropsida, in contrast to Mammalia on the one hand and Ichthyopsida (Amphibians and Fishes) on the other.

Referring to the article BIRDS for a contrast between Mammals, Birds, and Reptiles, we shall simply notice that Reptiles are cold-blooded, the temperature of the body not greatly exceeding that of the surrounding medium; that the heart is three-chambered, except in Crocodilians, where four chambers first occur; that mostly venous blood goes from the heart to the anterior viscera, and mixed blood to the posterior region, only the head and anterior regions receiving purely arterial blood; that the body is covered with scales, with which subjacent bony plates or scutes are sometimes associated; that the skull articulates by a single condyle with the backbone, and the lower jaw works against the quadrate bone; that the great majority are oviparous, while in some the eggs are hatched within the mother. The earliest remains of Reptiles are found in Permian strata, and the golden age of Reptiles was in Mesozoic, especially in Jurassic and Cretaceous, times.

Classification of Living Reptiles.—As the orders of Reptiles with living representatives are separately discussed, it will be enough here to give a general classification. Order 1, Chelonina: Tortoises and Turtles. 2, Rhynchocephalia: one form—the New Zealand lizard *Sphenodon* (q.v.), whose extinct ancestors date from the Permian. 3, Lacertilia: Lizards (q.v.). 4, Ophidia: Snakes (q.v.). 5, Crocodilia: Crocodiles (q.v.), Alligators (q.v.).

EXTINCT REPTILES.—The classification of the extinct Reptilian types is still very uncertain; but many authorities agree in recognising the following orders:

Anomodontia.—Reptiles with lizard-like body, limbs adapted for walking, biconcave vertebrae, and teeth fixed in sockets. The order is restricted to the Permian and Trias, and exhibits affinities with the Labyrinthodont Amphibians and with Mammals. Among the representative genera are *Pariasaurus*, *Galesaurus*, *Deuterosaurus*, *Dicynodon*, and *Placodus*.

Sauropterygia.—Reptiles without exoskeleton, with long neck and short tail, limbs adapted for walking or for swimming, biconcave vertebrae, teeth fixed in sockets. All of them seem to have been carnivorous. The order is represented from the Trias to the Upper Chalk, and exhibits affinities with Amphibians. Among the representative genera are *Plesiosaurus*, *Mesosaurus*, and *Nothosaurus*.

Ichthyopterygia.—Marine Reptiles, with whale-like body, without exoskeleton, with limbs modified as paddles, with biconcave vertebrae, with teeth implanted in a continuous groove. Many were carnivorous and fed on fishes. Seeley has shown that some were viviparous, the fossilised young being found in the fossilised mothers. The order is represented from the Upper Trias to the Upper Chalk, and exhibits affinities with Labyrinthodont Amphibians and with the New Zealand 'lizard' *Sphenodon*. Among the genera are *Ichthyosaurus* and *Ophthalmosaurus*. Some attained a length of 30 to 40 feet.

Rhynchocephalia.—As *Sphenodon* is the only surviving representative of the Rhynchocephalia, the order may be almost regarded as extinct. It is represented by Palaeohatteria from the Permian, besides *Champsosaurus*, *Hyperodapeton*, *Rhynchosaurus* from later strata. Within or near this order may also be included a remarkable form *Proterosaurus* from the Permian, a type for which Seeley established a distinct order, *Proterosauria*. The special interest of these forms is, according to

Baur, that they 'are certainly the most generalised group of all reptiles, and come nearest, in many respects, to that order of reptiles from which all others took their origin.'

Dinosauria.—The largest land Reptiles of crocodilian or more bird-like form, represented from the Trias to the Upper Chalk, exhibiting affinities with crocodiles and with birds. Representative genera are Iguanodon (sometimes measuring about 30 feet), Camptosaurus, Scelidosaurus, Stegosaurus, Ceratops (with long horns on the skull), Megalosaurus, Ceratosaurus (also horned), Brontosaurus (upwards of 50 feet in length), Atlantosaurus (with a femur 6 feet long).

Ornithosauria.—Flying reptiles, often called Pterodactyles, with a fold of skin extended on the greatly elongated outermost finger. The order is represented from the Lias to the Upper Chalk by such genera as Pteranodon, Pterodactylus, Dimorphodon, and Rhamphorhynchus. Some had an expanse of wing of about 25 feet, but many were small. Their affinities are uncertain.

See Huxley, *Anatomy of Vertebrated Animals* (1879); Nicholson and Lydekker, *Manual of Palaeontology*, vol. ii. by Lydekker (Edin. 1890); Hoffmann in Bronn's *Klassen und Ordnungen des Tierreichs* (Leip., in progress); Dumeril and Bibron, *Erpétologie Générale* (9 vols. Paris, 1834-54); British Museum Catalogues by Boulenger &c.; Holbrook, *North American Herpetology* (Phila. 5 vols. 1836-42); Schreiber, *Herpetologia Europæa* (new ed. 1912); Dünars, *Reptiles of the World* (N. Y. 1922).

Repton, a village of Derbyshire, 7½ miles SSW. of Derby and 4½ NE of Burton upon Trent. Here was founded the first Christian church in Mercia, of which Repton for a while was the royal and episcopal capital. It was the seat from before 660 till its destruction by the Danes in 874 of a celebrated nunnery, as afterwards of an Austin priory from 1172 till the Dissolution. Remains of this priory are incorporated in the buildings of the free grammar-school, which, founded in 1556 by Sir John Porte, has risen to be one of the great English public schools. The parish church has a graceful spire and a very interesting Saxon crypt, 17 feet square.

Republic (Lat *res publica*, 'the public good'), a political community in which the sovereign power is lodged, not in a hereditary chief, but either in certain privileged members of the community or in the whole community. According to the constitution of the governing body, a republic may therefore vary from the most exclusive oligarchy to a pure democracy. The several republics of Greece and that of Rome were, at the outset at least, aristocratic communities. The mediæval republics of Venice, Genoa, and the other Italian towns were also more or less aristocratic. The sovereign power was held to be vested in the franchised citizens, and every function—legislative, executive, or judicial—not exercised directly by that body could only be exercised by parties deriving their authority from it. But the extent of the franchise, and the mode of exercising it, varied much in these civic communities; and the most prosperous and long lived was Venice, which was also the most aristocratic of them all. In the 16th century the Seven Provinces of the Netherlands, on their revolt from Spain, adopted a republican form of government, as did Switzerland on becoming independent of the German empire. Great Britain was nominally a republic for eleven years (from 1649 to 1660). France was a republic from 1793 to 1805, and from 1848 to 1853; and the republic was again proclaimed 4th September 1870. Such government as Spain had between February 1873 and 31st December 1874 was of a republican form. France, Switzerland,

Andorra, San Marino, and the free towns within the German empire were the only European republics till Portugal was added in 1910. As a result of the Great War the empires of Germany, Austria, and Russia, with diminished areas, became republics. Hungary remained a kingdom, governed by a regent. Czechoslovakia and Poland are new creations. The Baltic is fringed with new republican states—Lithuania, Latvia, Esthonia, and Finland. In 1922 the republics in Russia formed a confederation with the title of Union of Soviet Socialist Republics; and more or less autonomy has since been granted to various areas within the union, some of which bear the name of republic. Republican governments were established in Turkey (with capital at Angora) in 1923, in Greece in 1924, in Albania in 1925. As an experiment in democracy, the most important long-established modern republic is the United States of America. Except during the short-lived empire of 1863-67, Mexico has been a republic since 1824. Since the revolution in Brazil in 1890 all the South American states (omitting the three Guiana dependencies) have been republics, most of them established in the second decade of the 19th century (see SPAIN, *History*). China became a republic in 1912. Persia in 1926 hesitated and drew back. In the republics of the ancient world the franchised classes exercised their power directly without any system of delegation or representation. The same was at first the case in the Swiss cantons, where, however, representative government has been gradually but generally introduced. Modern republics have been founded on the representative, not the direct, system, which can hardly exist except in a community that is very small and concentrated as to space. Germany, Switzerland, the United States of America, and others are *federal* republics, consisting of a number of separate states bound together by a treaty, so as to present to the external world the appearance of one state with a central government, which has the power of enacting laws and issuing orders that are directly binding on the individual citizens. The constitutions of the various republican countries are discussed under then several heads: see especially ATHENS, ROME, VENICE, SWITZERLAND, FRANCE, and UNITED STATES; also FEDERATIONS AND UNIONS, REPRESENTATION, DEMOCRACY.

Republican, a party name in American politics, which has had at different times different significations. In the first years of the Republic it was the alternative title of the Anti-federalists, who advocated the sovereignty of the states and the rights of the people, and finally secured those amendments and additions to the Constitution which were intended to guarantee state rights, and which declared that all powers not expressly granted to congress by the Constitution are retained by the states or the people. Before the war of 1812, however, the term Democrats (q.v.) had been substituted as the title of the party; and the name of Republicans went out of use until 1856, when it was taken up by the new party which was organised to oppose the Democrats, its original holders. This party was formed to combat the extension of slavery; it appealed to all who were opposed to the repeal of the Missouri Compromise (see MISSOURI) and the efforts to make Kansas a slave state (see KANSAS). It grew out of the Free-soil party (see FREE-SOILERS), and at once took the place, as opponents of the Democrats, that the Whig party, which had died of over compromise, had for some time feebly held. In 1856 it nominated Fremont for the presidency, and made a good fight. The decision in the Dred Scott Case (q.v.) and the progress of events in Kansas greatly strengthened the party, and after the divisions

among the Democrats over the same question in 1860 the success of the Republicans was assured. Electing Lincoln in that year, they held office continuously from 1861 to 1885, the Republican presidents being Lincoln, Johnson, Grant (twice), Hayes, Garfield, and Arthur. Since then the administration has been in Republican hands, 1889-93, 1897-1913, and from 1921, the presidents being Harrison, McKinley, Roosevelt, Taft, Harding, and Coolidge. The conduct of the civil war was in the hands of the Republican party, although, of course, northern Democrats formed a large proportion of the Union armies. For its history, see UNITED STATES; and see also SLAVERY. The strength of the party is in the north and west. Republicans claim great credit for their management of the finances of the nation, which brought about the resumption of specie payment. The slavery question has passed into history, and, although the actual enfranchisement of the southern negroes may demand the attention of the party, the principal opposition between Republicans and Democrats now is on the question of tariff, the former being strong protectionists. The Republican party has declared that the Covenant of the League of Nations contains stipulations 'not only intolerable to an independent people, but certain to produce the injustice, hostility, and controversy among nations which it proposed to prevent.'

Republican Bird. See WEAVER BIRD.

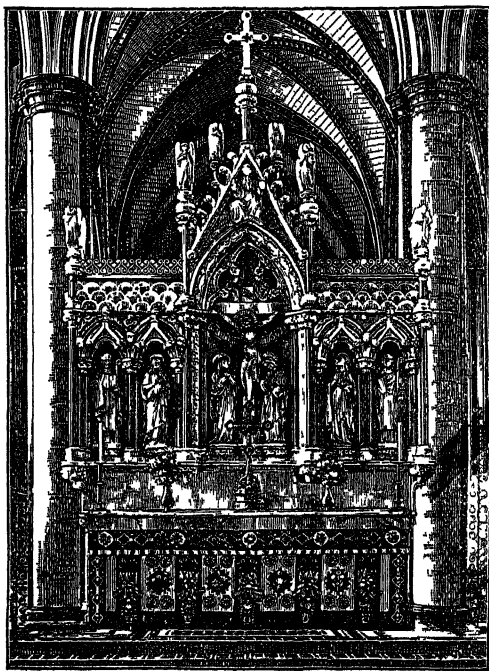
Requena, a town of Spain, 37 miles W. of Valencia, cultivates silkworms, saffron, and fruits; pop. 20,000.

Requests, COURT OF, an ancient court of equity in England, inferior to the Court of Chancery, and abolished 1641. Also, a local tribunal (known likewise by the name of Court of Conscience) instituted in London by Henry VIII. for the recovery of small debts. Similar local tribunals elsewhere have all been superseded by the county courts.

Requiem (Lat. *requies*, 'rest') or *Missa pro defunctis*, a special mass of the Roman Catholic Church, sung in commemoration of the Faithful Departed on All Souls' Day (2d Nov.), but also at funeral services and anniversaries of the deaths of individuals. It takes its name from the first words of the Introit, *Requiem æternam*, and differs from the ordinary mass in omitting the *Gloria* and *Credo*, and in inserting the *Dies Iræ*. The most celebrated musical settings of the Requiem Mass are those of Palestrina, Vittoria, Mozart, Cherubini, Berlioz, and Verdi. Brahms's *German Requiem*, a Protestant work, does not fit this definition.

Reredos (Fr.), the wall or screen at the back of an altar. It is usually in the form of a screen detached from the east wall, and is adorned with niches, statues, &c., or with paintings or tapestry. In some cases it is attached to the east wall and is of great size, covering the whole of the wall, as at All Souls College, Oxford. That splendid 15th-century reredos had been plastered over at the Reformation, but was discovered and restored in 1872-76. In Durham Cathedral is a very fine example of a reredos in the form of a detached screen; it was brought by sea to Newcastle from London by Lord Neville in 1380, being perhaps of French workmanship, and was restored in 1846. The lofty reredos (c. 1480) at St Albans, dividing the presbytery from the retro-choir, is of the same type and age as that at Winchester. A good example of the many reredoses erected in nearer times is that of Salisbury, designed by Sir G. G. Scott, and erected in 1875 at the cost of Earl Beauchamp to take the place of one demolished about 1790 by Wyatt. Owing to the imagery they contain, they have been the subject of controversy in the

Church of England—e.g. in the case of the Exeter reredos (1873-75), and of that of St Paul's (1889-91),



Reredos, Salisbury Cathedral

both of which were allowed, after frequent appeal, to remain.

Rescripts (Lat. *rescripta*), answers of the popes and emperors to questions in jurisprudence officially propounded to them. *Rescripta principis* were one of the authoritative sources of the civil law, and consisted of the answers of the emperor to those who consulted him, either as public functionaries or as individuals, on questions of law. They were often applied for by private persons, more especially women and soldiers, to solve their doubts or grant them privileges. The rescripts directed to corporate and municipal bodies were known as *Pragmaticæ sanctiones*, a name which has found its way into the public law of Europe (see PRAGMATIC SANCTION). Rescripts might gradually come to have the force of law, in so far as their determinations in particular cases were of general application.

Rescue, in English law, is the illegal delivery and discharge of a prisoner or of goods out of the custody of the law. If, for example, a tenant whose goods are distrained for rent take them by force from the bailiff, the distrainer has a right of action against the person who rescues the goods. A person who rescues a prisoner accused or convicted of treason, felony, or misdemeanour is himself deemed to be guilty of treason, felony, &c.; the punishment varies with the gravity of the charge. A person who rescues or attempts to rescue a murderer going to execution is liable to penal servitude for life.

Resedaceæ, a family of dicotyledons, mostly herbaceous, having alternate leaves and terminal spikes of hermaphrodite irregular flowers. Chiefly natives of Europe, the Mediterranean region, and the west of Asia, they are mostly mere weeds. Weld (q.v.) and Mignonette (q.v.) are the species most worthy of notice.

Reservation, MENTAL (Lat. *reservatio* or *restrictio mentalis*), the act of reserving or holding back some word or clause which is necessary to convey fully the meaning really intended by the speaker. It differs from equivocation (Lat. *equivocatio* or *amphibolia*) in this, that in the latter the words employed, although doubtful, and perhaps not fitted naturally to convey the real meaning of the speaker, are yet, absolutely speaking, and without the addition of any further word or clause, susceptible of that meaning. Few questions in casuistry have excited more controversy, or have been the subject of fiercer recrimination, than that of the lawfulness of equivocation and mental reservation. In the celebrated *Letters of Pascal* (q.v.) against the Jesuits it was one of the most prominent and, used as he employed it, the most effective topics; and Pascal's charges against the Jesuit casuistry of that day have been repeated in almost every popular controversy on the subject which has since arisen. There are several varieties of mental reservation, differing from each other, and all differing from equivocation. But as regards the morality of the subject all the forms of language calculated to deceive may be classed together. Mental reservation is of two kinds, *purely mental* and *not purely mental*. By the former designation is meant a mental reservation which cannot be detected, whether in the words themselves, or in the circumstances in which they are spoken. Of this kind would be the mental reservation implied if a person, on being asked if he had seen A. B. (whom he really had just seen *walking* by), were to reply: 'I have not seen him,' meaning '*riding on horseback*.' A 'not purely mental' reservation is that which, although not naturally implied or contained in the words, may nevertheless be inferred or suspected, either from them or the circumstances in which they are used. Of this kind would be the mental reservation of a servant, in giving the ordinary answer to a visitor's inquiry for his master: 'Not at home,' although his master were really in the house; or that of a confessor, who, in a country where the privileges of the secret of the confessional are known and admitted, on being asked whether a certain person had committed a crime, which the confessor knew from his confession that he had committed, should answer: 'I do not know,' meaning 'outside of the confessional.' And, in general, all such doubtful forms, whether of mental reservation or of equivocation, may be divided into *discoverable* and *undiscoverable*. Much of the odium which has been excited against the casuists for their teaching on this head has arisen from the confusion of their views as to these two classes of mental reservation.

According to the most approved Catholic authorities, 'purely mental' reservations and 'absolutely undiscoverable' equivocations are held to be in all cases unlawful, such forms of speech being in truth lies, inasmuch as they have but one real sense, which is not the sense intended by the person who uses them, and hence can only serve to deceive. This doctrine is held by all sound Catholic casuists, and the contradictory doctrine is expressly condemned by Pope Innocent XI. (Propp. 26, 27). On the contrary, mental reservations 'not purely mental' and 'discoverable' equivocations are held to be not inconsistent with truth, and in certain circumstances, when there is necessity or weighty reason for resorting to them, allowable. An historical example of such equivocation or reservation is in the well-known answer of St Athanasius to the question of the party who were in pursuit of him, and who, overtaking him, but not knowing his person, asked what way Athanasius had gone. '*He is not far off*,' replied Athanasius, and the party passed on in pursuit. And an ordinary

example of discoverable mental reservation is that of a person who, on being asked by one to whom he could not with safety give a refusal, whether he has any money, should reply: 'No,' meaning, 'none to lend to you.' In order, however, to justify the use of these devices of speech, casuists require that there shall be some grave and urgent reason on the speaker's part; as, for example, the necessity of keeping a state secret, or a secret of the confessional, or of a professional character, or even the confidence entrusted by a friend, or the ordinary and fitting privacy which is required for the comfort and security of domestic life and of the peaceful intercourse of society; and that the concealed sense of the form of speech employed, although it may be *actually undiscovered*, and even unlikely to be discovered, may yet be, in all the circumstances, *really discoverable*. Some Protestant moralists admit that in some cases even equivocation is permissible. See the articles CASUISTRY; LIGUORI; and Cardinal Newman's *Apologia*.

Reservation of the Sacrament. See LORD'S SUPPER.

Reserves. In the organisation of the military resources of most European countries the *reserve forces* are, first, those soldiers who, having served some time in the regular army, are still liable to be called upon to rejoin it when raised from a peace to a war establishment on mobilisation; and secondly, those who are liable to be called upon to follow in second and third lines if the occasion requires.

In Great Britain the Army Reserve is an important element in the army organisation, and the Territorial and Reserve Forces Act of 1907 made considerable changes. The Army Reserve consists of men who, having enlisted for 12 years, have served from 3 to 9 years (commonly 7) in the regular ranks. For the 'Special Reserve' see MILITIA. See also ARMY.

A reserve on the battlefield is a body of troops held back by the commanding officer so as to be ready to meet a counter-attack, to support a success, or cover a retirement. The *Naval Reserve* is dealt with in the article NAVY.

Resetting, or RECEIVING. See THEFT.

Reshd, a town of Persia, capital of the province of Ghilan, stands near the south-west shore of the Caspian Sea, 150 miles NW. of Teheran. Silk is grown and manufactured, and rice and tobacco are cultivated. Pop. 35,000.

Reshid-ed-Din, Persian historian. See PERSIA (*Literature*).

Residuary Legatee. See LEGACY.

Re'sina, a town of Italy, on the site of ancient Herculaneum, 4 miles SE. of Naples, at the foot of Vesuvius and facing the sea. Pop. 24,000.

Resin Cerate. See BASILICON.

Resins, a class of natural vegetable products composed of carbon, hydrogen, and oxygen. They are closely allied to the essential oils, all of which, when exposed to the air, absorb oxygen, and finally become converted into substances having the characters of resin; and in most cases they are obtained from the plants which yield them mixed with and dissolved in a corresponding essential oil. Like the natural oils, the natural resins are usually mixtures of two or more distinct resins, which admit of separation by their unequal solubility in different fluids.

The following are the general characters of this class of compounds. At ordinary temperatures they are solid, translucent, and for the most part coloured, although some are colourless and transparent. Some are devoid of odour, while others

give off an aromatic fragrance from the admixture of an essential oil. In their crude state they never crystallise, but are amorphous and brittle, breaking with a conchoidal fracture; when pure several of them may, however, be obtained in the crystalline form. They are readily melted by the action of heat, and are inflammable, burning with a white smoky flame. They are usually described as non-volatile, but it has been shown that common resin may be distilled in a current of superheated steam. They are insoluble in water, but dissolve in alcohol, ether, and the essential and fixed oils. They are insulators or non-conductors of electricity, and become negatively electric by friction. Many of them possess acid properties, in which case their alcoholic solutions redden litmus. These resins combine with the alkalies, and form frothy soap-like solutions in alkaline lyes. The resinous soaps thus formed differ from ordinary soap in not being precipitated by chloride of sodium.

The resins are divisible into the *hard resins*, the *soft resins*, and the *gum-resins*. The hard resins are at ordinary temperatures solid and brittle; they are easily pulverised, and contain little or no essential oil. Under this head are included copal, the varieties of lac, mastic, and sandarach, and the resins of benzoin (commonly called gum-benzoin), jalap, guaiacum, &c. The soft resins admit of being moulded by the hand, and some of them are viscous and semi-fluid, in which case they are termed *balsams*. They consist essentially of solutions of hard resins in essential oils, or admixtures of the two. They become oxidised and hardened by exposure to the air into the first class of resins. Under this head are placed turpentine, storax, balsam of copaiba, and the balsams of Canada, Peru, and Tolu. The gum-resins are the milky juices of certain plants solidified by exposure to air. For these, see GUM.

The resins are very widely diffused throughout the vegetable kingdom. They are generally obtained by making incisions into the wood of the trees which produce them; sometimes, however, they exude spontaneously, and in other cases they require to be extracted from the wood by boiling alcohol. The crude resins are separated from the essential oils with which they are usually mixed by distillation with water, the resin remaining while the oil and water pass off; and from the gummy and mucilaginous matters by alcohol, which dissolves out the pure resins, which can be precipitated from their alcoholic solution by the addition of water. The resins are extensively employed in medicine and the arts.

Various fossil resins are known, of which the most important is Amber (q.v.). Some chemists place bitumen and asphalt amongst this class; and amongst the fossil resins described by mineralogists may be mentioned Fichtelite, Hartite, Idrialite, Ozokerite, Scheererite, Xyloretin, &c.

The common resin, or rosin, of commerce exudes in a semi-fluid state from several species of pine, especially *Pinus taeda*, *P. mitis*, *P. palustris*, and *P. rigida* of North America, *P. pinaster*, *P. pinea*, and *P. laricio* of southern Europe, and *P. sylvestris* of northern Europe. The crude article, consisting of turpentine and resin proper, is subjected to distillation, when the resin alone remains behind. The resin thus procured is used very extensively in the manufacture of common yellow soap, also for sizing paper and various other purposes, including the preparation of ointments and plasters in pharmacy.

The other resins most generally known and used in Europe, and here all treated in separate articles, are Anime, Copal, Dammar, Mastic, Sandarach, Frankincense, Lac, and Kauri Gum. A number of resinous substances are now made synthetically.

Res Judicata, in Law, means that the subject-matter of an action has been already decided by a court of competent jurisdiction. A matter so decided cannot again be made a ground of action, as between the same parties.

Resolution, in Music, the relieving of a discord by a following concord; see HARMONY. For the Resolution of Forces, see COMPOSITION.

Respiration, or BREATHING, is a part of the life of all organisms. It consists of a series of changes, the first of which is the entrance of oxygen into the body, and the last the excretion of certain waste materials, the chief of them being carbonic acid. For the general relation of respiration to the other bodily functions see PHYSIOLOGY. The corresponding gaseous exchange in plants is dealt with in the article on PHYSIOLOGY (VEGETABLE). Here we shall describe the process as it occurs in man and other mammalia, leaving a sketch of the methods adopted in other types of animals (comparative respiration) for effecting the same purpose to a later paragraph.

The respiratory apparatus consists in mammals of the lungs and of the air-passages which lead to them. In aquatic animals the gills fulfil the same functions as the lungs of air-breathing animals. The muscles which move the chest and the nerves which supply them must also be included under the general heading Respiratory System, and using this expression in the widest sense, it includes all the tissues of the body, since they are all concerned in the using up of the oxygen and the production of waste materials such as carbonic acid.

Essentially a lung or gill is constructed of a thin membrane, one surface of which is exposed to the air or water, as the case may be, while on the other is a network of blood-vessels—the only separation between the blood and aerating medium being the thin wall of the blood-vessels and the fine membrane on one side of which vessels are distributed. The difference between the simplest and the most complicated respiratory membrane is one of degree only.

The lungs or the gills are only the medium for the *exchange*, on the part of the blood, of carbonic acid for oxygen. They are not the seat, in any special manner, of those combustion-processes of which the production of carbonic acid is the final result. These processes occur in all parts of the body in the substance of the tissues.

It is therefore usual to divide the respiratory process into *external* and *internal* respiration. External respiration is the gaseous exchange in the lung or gill, oxygen passing there to the blood from the aerating medium, and the carbonic acid in the opposite direction. Internal respiration is the reverse exchange which occurs in the tissues, and is associated with the life of the cells; here the oxygen in the blood is utilised by the cells, and replaced by the carbonic acid which they form as a result of their activity (oxidation). Of the two, internal respiration is the more important, but we shall not be able to study this until we have considered the relationship of the oxidation process to nutrition. External respiration is merely the beginning (the entry of oxygen) and the final phase (the exit of carbonic acid). In man and related animals it is the blood which carries the gases named from lungs to tissues, on the one hand, and from tissues back to the lungs on the other (see CIRCULATION). In the blood the gases are not merely in solution, but are in loose or easily dissociable combinations with certain substances, as we shall see later. One of these substances, called *hæmoglobin*, is specially concerned with the carriage of oxygen, and merits a few preliminary

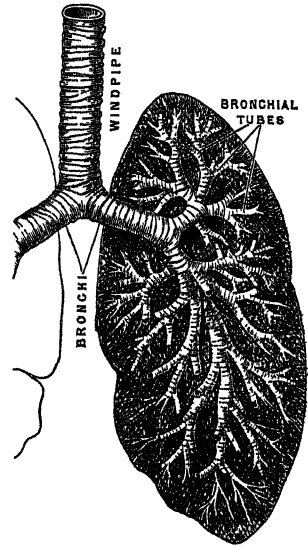
words. Hæmoglobin is the name of the red pigment of the blood, and its temporary union with oxygen is called oxyhæmoglobin; this is formed in the lungs, then carried by the arterial blood to the tissues, where it is dissociated or reduced (i.e. deprived of its respiratory oxygen), and returns in the venous blood to the lungs for a fresh supply of oxygen. The venous blood contains also the waste-product carbonic acid which is discharged from the body in the lungs. The pigment is contained not in the fluid part of the blood (blood-plasma) but in the red or coloured corpuscles which float in it, and forms their main constituent. Chemically it is a conjugated protein—that is, protein or albuminous material (globin) united to an iron-containing substance known as hæmatin ($C_{54}H_{32}O_{25}ON_4Fe$). In round figures hæmoglobin contains 0.4 per cent. of iron.

In many simple animals which have no circulatory or respiratory systems, and possess no blood, the gaseous exchange occurs at the whole surface of their bodies, and higher in the scale there is also a certain amount of cutaneous respiration. Thus, animals such as the frog, which have thin skins, can breathe with—i.e. the gases can diffuse through—the whole surface of their bodies if the under skin is well supplied with blood-vessels. A frog for this reason can live for days without its lungs, but if its skin is rendered impervious to gases will die very quickly, even with the lungs intact. But, as all the mammalia have thick skins, this method of breathing must be reduced to a minimum.

Structure of the External Respiratory Apparatus in Mammals.—This mechanism consists of the lungs, a series of minute air-chambers with a network of capillaries in the walls, the air-passages from the air-chambers of the lungs to the outer air, and the chest-walls with their muscles, which act like bellows and change the air in the lungs. The essentials of structure that a lung must possess have already been alluded to. The simplest lung that we can imagine would be an elastic membranous bag, well supplied with blood-vessels, and with a pipe connecting it with the air; the most complicated that exist are essentially of that construction, the complications that occur having for their object merely the enlarging of the surface exposed to the air. Let us begin with the air-passages. There are first the nose and mouth; these join the upper part of the gullet, known as the pharynx (see DIGESTION). From the pharynx arises the windpipe (trachea); this passes through the voice-box (larynx) into the chest-cavity; there it divides into two passages (the bronchi), one for each lung; the bronchi go on dividing again and again; the ultimate divisions (the bronchioles) open into clusters of air-chambers or alveoli. The air-chambers are about $\frac{1}{100}$ th inch in diameter. It has been estimated that there are some 725 millions of them, and that their total surface is about 2000 square feet. The walls of the air-chambers are formed of a thin membrane in which the blood and lymph capillaries ramify. The membranous walls are partly formed of elastic tissue. It is this that gives to the lungs their elasticity. The larger air-passages (trachea and bronchi) are kept open by horseshoe-shaped rings of cartilage; muscles stretch between the poles of the horseshoe, complete the ring, and permit the size of the passages to vary, at the same time resisting over-distension when the internal pressure rises. These larger air-passages are lined by a mucous membrane, containing mucous glands; the innermost layer is a ciliated epithelium; the cilia lash upwards, and thus keep the passages free from mucus and remove foreign particles. As the passages become smaller they lose their cartilages, and the muscles form a continuous circular layer. The lungs are invested by

a membrane (the visceral pleura). At the root of the lungs this membrane is continuous with a membrane which lines the chest-cavity (the parietal pleura). The potential space between the two is the pleural cavity; it is in reality a lymph space, and communicates with the lymphatics of the pleura. Owing to the air-pressure within the lungs the two pleurae are closely pressed together, the lungs entirely filling the chest-cavity. If the chest-wall is punctured the lungs partially collapse owing to their elasticity, and the respiratory movements are unable to move the air in the lungs.

The chest is an air-tight chamber enclosing the lungs and the heart. The walls of the chest are formed of bones (the ribs, sternum, and back-bone) and muscles; the bones and muscles are so arranged



The Trachea (windpipe), Bronchi, and one of the Lungs in section.

that the size of the chest-cavity can be altered. In this way the chest acts as a bellows and moves air in and out of the lungs. The ribs are sloped slightly downwards, especially after an expiration; when an inspiration is taken certain muscles fix the upper ribs, and those muscles connecting the ribs to each other contract and the ribs are raised, and thus the size of the chest-cavity is increased. At the same time a flattish muscle called the Diaphragm (q.v.), which separates the chest-cavity from the rest of the body-cavity, and which after an expiration is arched upwards (by the pressure of the abdominal viscera upon it), forcibly contracts, becomes flatter, and therefore enlarges the size of the chest-cavity, forcing the abdominal viscera downwards and causing the abdomen to protrude. (The relation of the lungs to the other main organs will be seen in the illustration at ABDOMEN; see also that at DIAPHRAGM.) In these two ways, then, the size of the chest-cavity may be increased. The result of this enlargement is that the pressure of the air within the cavities of the lungs is lowered; air therefore from without rushes through the nostrils (mouth-breathing warms the incoming air insufficiently) down the windpipe into the lungs, and thus a fresh supply of oxygen is introduced. The movements which produce this result are known as the inspiratory movements. In making an expiration the reverse effects are produced; the chest-cavity becomes smaller, the pressure of the air in the lungs increases, and some rushes out through the nostrils into the air until the pressures inside and outside are equalised. An ordinary expiration is effected by the elasticity of the lungs, by the passive fall of the ribs, and by the elasticity of the chest and abdominal walls. An ordinary inspiration is therefore the result of active muscular contraction, while an ordinary expiration is the result of mere passive elasticity of the parts concerned. There are certain other respiratory movements to be considered. During inspiration and expiration the glottis (the open-

it is the movement of the ribs, especially the upper ones, which is the most extensive. The respiratory rhythm is the time relation of the acts of inspiration and expiration. It is usually expressed as follows: In. = 3, Ex. = 4, pause = 3. The number of respirations in a healthy adult person usually ranges from 14 to 18 per minute. It is greater in infancy and childhood. It varies also much according to different circumstances, such as exercise or rest, health or disease, &c. Variations in the number of respirations correspond ordinarily with similar variations in the pulsations of the heart. In health the proportion is about 1 to 4, or 1 to 5, and when the rapidity of the heart's action is increased, that of the chest movement is commonly increased also; but not in every case in equal proportion. It happens occasionally in disease, especially of the lungs or air-passages, that the number of respiratory acts increases in quicker proportion than the beats of the pulse; and, in other affections, much more commonly, that the number of the pulse-beats is greater in proportion than that of the respirations.

The Breath Sounds.—If the ear is placed in contact with the wall of the chest, or is separated from it only by a good conductor of sound or stethoscope, a faint respiratory or vesicular murmur is heard during inspiration. This sound varies somewhat in different parts—being loudest or coarsest in the neighbourhood of the trachea and large bronchi (tracheal and bronchial breathing), and fading off into a faint sighing as the ear is placed at a distance from these (vesicular breathing). It is best heard in children, and in them a faint murmur is heard in expiration also. The cause of the vesicular murmur has received various explanations. Some think that the sound is actually produced in the alveoli, but most observers hold that the sound is produced by the air passing through the glottis and larger tubes, and that this sound is modified in its conduction through the substance of the lung. The alterations in the normal breath-sounds, and the various additions to them that occur in different diseased conditions, can only be properly studied at the bedside.

In fact, the whole subject bristles with medical questions, and further information of that side of the subject will be found in text-books on medicine. The organs of external respiration are the seats of the commonest diseases to which mankind is heir, from the common cold upwards. See, however, the articles BRONCHITIS, PLEURISY, PNEUMONIA, TUBERCLE, TUBERCULOSIS, &c.

Before we can pass on to the subject of nutrition and the part played by the tissues in internal respiration, it will be first convenient to study the blood, which is the medium by which the organs of external respiration (lungs, &c.) are brought into communication with the tissues; in connection with the blood it will be necessary to consider the questions of the blood-gases and the way in which the exchange of these between the blood and the air in the lung-alveoli is brought about, the reaction of the blood, and incidentally the part played by the nervous system in the regulation of breathing.

THE GASES OF THE BLOOD.—Before one can study the chemistry of respiration or its regulation, which is in part a chemical process, it is necessary to have a conception of the laws which govern the retention of oxygen and carbonic acid in the blood; but as the blood presents so many complications, we will at the outset consider the solution of gases in such a simple medium as water.

If water is shaken up with oxygen or other gas a definite amount of the gas will dissolve in the water, and under the same conditions the same quantity of gas will dissolve. The conditions that affect that amount are (1) temperature, which is important, but to simplify matters we will suppose the temperature remains constant, and so we will neglect that factor

for the present; (2) the pressure of the gas to which the water is exposed; and (3) the solubility of the gas in water. This is a property of the gas itself; some gases (for instance, oxygen) are but slightly soluble in water, while others, such as carbonic acid, are very soluble. The volume of gas which 1 c.c. of the liquid dissolves is called its coefficient of solubility. The effect of the second factor named, the pressure, is quite simple, namely, there is direct proportionality between the amount dissolved and the pressure. Double the pressure, and you double the amount of gas entering into solution; halve it, and you halve the amount, and so on. The results obtained might be plotted out on squared paper, placing quantities on the ordinate, and pressures on the abscissa; the 'curve' so obtained would naturally turn out to be a straight line. But with oxygen and carbonic acid in blood the curves are not straight lines. Expressed in the shape of a formula for gas and water $Q = K \times \frac{P}{P'}$, where Q is the quantity of gas, K the coefficient

of solubility, P the atmosphere pressure (760 mm. of mercury), and P' the pressure of the gas to which the liquid was exposed. The value of K at atmospheric pressure for oxygen is 0.04 c.c., and for carbonic acid 1 c.c. Further, when two or more gases are mixed together, each of them produces the same pressure as if the others were absent, and the total pressure of the mixture is the sum of the partial pressures of the individual gases in the mixture (Dalton-Henry Law).

Further, when the gas is dissolved in the liquid it exerts pressure there also; a familiar illustration of this is seen in an ordinary bottle of soda-water. When the cork is first drawn the imprisoned gas exerts high pressure and causes frothing, until later the bubbling ceases as the pressure falls. The pressure of a gas dissolved in a fluid finally equals that of the same gas in the atmosphere to which it is exposed, and as many molecules of the gas leave the fluid as enter it, and there is equilibrium. The pressure of the gas in the fluid is conveniently termed tension (T), so when there is equilibrium and $P = T$, our formula reads $Q = K \times \frac{T}{P}$, and we must carefully distinguish between the quantity of gas dissolved in a fluid and its tension.

There are numerous instruments (tonometers) for measuring the tension of gases in fluids; but the best for blood is known as Krogh's bubble tonometer. Briefly, it is a vessel introduced on the course of the circulating blood; into it a small quantity of air (a bubble of air) is placed. Exchange of gases takes place between the bubble and the blood, and the former is soon in equilibrium with the latter. When it has done so, the bubble is drawn into a small tube and analysed.

As an example, suppose the bubble on analysis proved to consist of 4 per cent. carbonic acid and 12 per cent. oxygen, together with nitrogen and aqueous vapour. The gas in the instrument was compressed by the pressure of the arterial blood (say 120 mm. of mercury) in addition to the atmospheric pressure of 760 mm. of mercury, and therefore the total pressure was $120 + 760 = 880$ mm. of mercury. Four per cent. of this would have been due to the carbonic acid; 4 per cent. of 880 is 35.2. Twelve per cent. would have been due to the oxygen; 12 per cent. of 880 is 105.6. That is, the carbonic acid and oxygen tensions would have been in round figures 35 and 106 mm. of mercury respectively.

Measurement of the Quantity of the Gases of the Blood.—This may be done by means of an air-pump, or by a chemical method. (1) The extraction of the gases from the blood by means of the mercurial air-pump depends upon the fact that blood gives off all its gases when it is boiled in a vacuum. The total gas obtained is first measured; then the carbon dioxide is removed by caustic potash, and the gas that remains consists of oxygen and nitrogen; the oxygen is then removed by pyrogallic acid, and the residual gas is nitrogen. (2) The chemical method depends on the fact that when a solution of oxyhemoglobin is shaken with potassium ferricyanide it gives off the same amount of oxygen as it would when boiled in a vacuum. The blood is therefore first laked with dilute ammonia; the ferricyanide solution is split into it and the oxygen which comes off is measured in a suitable apparatus. After this, tartaric acid is added to the mixture; this liberates the carbonic acid, which is then measured in the same way.

The chemical method is not quite so accurate as the vacuum pump, but it is much more convenient for the study of many problems, as it requires less blood, and, owing to its simplicity, a great number of observations can be made upon a single animal, or it can be used for the systematic investigation of the blood in man. We can now proceed to an examination of the blood-gases themselves.

Oxygen in Blood.—From every 100 c.c. of arterial blood, about 20 c.c. of oxygen can be removed by the air-pump. Nearly all of this oxygen is chemically combined with hæmoglobin: the amount in actual solution in the blood is 0.7 c.c. for every 100 c.c. of blood. The quantity of oxygen which 100 c.c. of blood takes up is called the 'oxygen capacity,' which should not be confounded with the 'specific oxygen capacity' defined below. In normal human blood the figure is 18.5 c.c.

Hæmoglobin owes its value as a respiratory pigment to three principal facts. (1) It can unite

with a large quantity of oxygen, and therefore blood can carry about thirty times as much oxygen to the tissues as plasma would under the same conditions. (2) The interaction between hæmoglobin and oxygen is a reversible one; the two unite in the lungs, where the pressure of oxygen is considerable; but when oxygen is absent or at a low pressure, as in the tissues, the hæmoglobin parts with its store of oxygen. (3) The oxygen is readily displaced from the blood-pigment by carbonic acid. At most, 1 gramme of hæmoglobin can unite with 1.34 c.c. of oxygen. This figure is not quite constant, probably on account of slightly different forms of globin (the protein constituent of hæmoglobin) united with the hæmatin (the iron-containing constituent) in different animals. The relation between the respiratory oxygen and the iron of the hæmoglobin is, however, quite constant, and is called the 'specific oxygen capacity.' Each gramme of iron in hæmoglobin unites with 400 c.c. of oxygen; these figures are in the relation of one atom of iron to two atoms of oxygen. The reversible nature of the reaction may therefore be expressed by the equation which in its simplest form runs $\text{Hb} + \text{O}_2 \rightleftharpoons \text{HbO}_2$. A reversible reaction is one which will go in either direction according to the concentrations of the substances present; thus if the concentration of oxygen in solution is increased, more of the hæmoglobin will become oxyhæmoglobin; and if it is diminished, oxyhæmoglobin will break up into hæmoglobin (usually called reduced hæmoglobin) and oxygen.

The reader must be clear that when we speak of the concentration of oxygen in solution we mean in physical solution, that is, not united chemically with the hæmoglobin. This quantity varies in the direct ratio of the oxygen pressure to which the hæmoglobin solution is exposed; therefore the problem before us is to determine the relative quantities of oxy- and reduced hæmoglobin when a hæmoglobin solution is shaken up with oxygen at different pressures.

Suppose we have six small vessels (Barcroft's saturators) and each contains a few c.c. of a solution of hæmoglobin and gases of the following composition:

No. 1.	Nitrogen and no oxygen.					
No. 2.	Nitrogen and enough oxygen to give 5 mm. oxygen pressure.					
No. 3.	" " " " "	10	"			
No. 4.	" " " " "	20	"			
No. 5.	" " " " "	50	"			
No. 6.	" " " " "	100	"			

Each vessel is rotated in a bath at body temperature for about fifteen minutes, i.e. until the oxygen and hæmoglobin have interacted; the solution is then withdrawn and examined for the relative quantities of oxy- and reduced hæmoglobin. The figures would be:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Percentage of reduced hæmoglobin . . .	100	68	45	28	18	6
Percentage of oxy-hæmoglobin . . .		0	55	72	87	94

If the pressures of oxygen are plotted horizontally, and the percentages of oxy- and reduced hæmoglobin vertically, a curve is obtained called the *oxygen dissociation curve of hæmoglobin*.

In the blood itself, as distinguished from a solution of pure hæmoglobin, there are additional conditions that influence such a curve, especially the high temperature of the body, the presence of certain salts, and the presence of acids, especially carbonic acid. These three factors tend to make the oxyhæmoglobin molecules break down more rapidly and form more rapidly. From the point of view of the body's needs it is clearly necessary not only that hæmoglobin should acquire oxygen at the pressure of that gas in the lungs, and part with it at the diminished oxygen pressure in the tissues, but that the two processes should occur at about the same rate, that is, within one second, which is about the time occupied by any given portion of blood in travelling along the capillaries. It would be futile to have an oxygen carrier in the blood

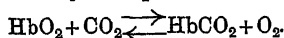
which took a fraction of a second to acquire its oxygen and a fraction of an hour to release it. Yet a solution of pure hæmoglobin is just such a substance, for its power of acquiring oxygen is very great, and its power of releasing it is very small. Happily, however, a hæmoglobin solution and blood are two very different things. In the red corpuscles, the hæmoglobin is dissolved in a medium containing various salts, of which those of potassium are most prominent; these salts confer on oxyhæmoglobin the property of giving up its load of oxygen when exposed to low concentration of oxygen in the capillaries of the tissues, while the reduced hæmoglobin acquires oxygen more readily at the higher oxygen pressure such as the blood is exposed to in the capillaries of the lungs. This is assisted by the high body temperature and the presence of carbonic acid. Observations on the rate of oxygenation and reduction at body temperature, in the presence of the salts named, and of carbonic acid at the same tension as that which pervades the body (about 40 mm. of mercury) show that the two processes present an extraordinary degree of symmetry, so wonderfully has nature adapted the conditions of life in order that the needs of the body may be served by a substance hæmoglobin, which alone is but ill adapted for oxygen-transport.

A comparison of the curves of dissociation presents to the eye graphically the superiority of hæmoglobin as an oxygen carrier when it is present in the actual blood over that which it possesses in a pure solution. In the blood itself one sees that at an oxygen pressure of over 60 mm. of mercury (the pressure in the lung alveoli is about 100) the blood will nearly saturate itself with oxygen, and that at pressures below 50 the blood loses its oxygen rapidly, whilst at 10 mm. pressure it is nearly completely reduced.

Research has also shown that the relation of hæmoglobin and salts is more fundamental than a mere question of solution. Hæmoglobin may be regarded as a weak acid which unites with any available base, so that the material actually present in the red corpuscles is in part potassium hæmoglobinate. Oxyhæmoglobin is a stronger acid than reduced hæmoglobin, so that when the latter takes up oxygen it adds to its store of potassium. Indeed the more that is discovered about hæmoglobin the more complex its reactions become. Professor A. V. Hill considers that all the known facts can only be explained on the assumption that when hæmoglobin unites with oxygen it breaks up into globin and some form of hæmatin, and that the hæmatin unites with the oxygen; this recombines with globin to form oxyhæmoglobin, which then unites with an increased quantity of potassium. The bases (K and Na) in the red corpuscles vary in relative amount in different animals. In man it is mostly K, in ruminants Na.

Carbonic Acid in Blood.—The relations of carbonic acid in blood, though similarly complex, illustrate the remarkable chemical adaptation of which the living body is susceptible. Carbonic acid, as already stated, renders oxyhæmoglobin less stable, so that it yields up its oxygen more readily. If blood is exposed to oxygen and varying admixtures of CO_2 , its hæmoglobin contains less oxygen the more CO_2 is present in the mixture. If carbonic acid tends to displace oxygen, it is also true that oxygen tends to displace carbonic acid. This has been quantitatively studied by exposing the blood to an atmosphere of CO_2 to which varying amounts of oxygen are added; and further, it can be shown that at any particular pressure oxygenated blood contains less CO_2 than reduced blood. When, therefore, the blood passes from an artery to a vein, its loss of oxygen may be attributed to two causes acting jointly: (1) the reduction in partial pressure of the oxygen which withdraws oxygen from the blood, and (2) the increase of partial pressure of CO_2 which expels it. In like manner oxygen enters the blood-corpuscles in the lung because (1) of the increased partial pressure of oxygen in the plasma forces it

in, and (2) because the CO_2 by diffusing away from the hæmoglobin makes it easier for the oxygen to go in. Similar statements apply to the entrance and exit of the flow of CO_2 into and out of the blood; in the lung it is partly withdrawn by diffusion into the alveoli, and partly expelled by the entrance of oxygen. Although by the air-pump 100 volumes of blood yield 50 or more volumes of CO_2 , the whole of the gas is not present in simple solution, but by far the larger amount is present in loose combination either with hæmoglobin or with salts (carbonates or bicarbonates). The chemical processes involved in the action of CO_2 on hæmoglobin are not beyond controversy. Some observers, notably Buckmaster, regard the action as simple and represented by the equation:



CO_2 would thus act like the gases CO and NO, a view which has not yet met with general acceptance, chiefly because all known acids act as CO_2 does, and it is by no means proved that such acids form compounds analogous to HbCO and HbNO . Another view may be adopted provisionally: this is based on the assumption that the sodium or potassium salt of hæmoglobin unites with oxygen more readily than does free acid. We have in the blood three acids, oxyhæmoglobin, reduced hæmoglobin, and carbonic acid, and two bases, sodium and potassium, and among the acids oxyhæmoglobin is a stronger acid than reduced hæmoglobin. The base present is not sufficient to satisfy all three, and will be distributed between them. Suppose in a hypothetical example there are 100 available atoms of base; and of these oxyhæmoglobin takes 30, reduced hæmoglobin 10, and CO_2 takes the remainder 60. Suppose next that all the reduced hæmoglobin is turned into oxyhæmoglobin by the entry of oxygen; this being a stronger acid than reduced hæmoglobin can seize base from the bicarbonate; hence the total hæmoglobin will now obtain not 40 but 60 atoms of the base, and the CO_2 will be left with 40; bicarbonate will thus be broken up and the CO_2 will have no alternative but to be expelled. If now we force back CO_2 into the solution in sufficient quantity to retake the base the reverse change will occur, ending in the withdrawal of Na and K from the oxyhæmoglobin, its consequent change to reduced hæmoglobin and the expulsion of the oxygen.

We may conclude this section of this article by giving a summary, and compare the gaseous content of arterial and venous blood. The average quantities in human blood are:

	For 100 volumes of Blood.	
	Arterial.	Venous.
Oxygen.....	18.5	12
Carbonic acid.....	50	56
Nitrogen.....	2	2

The amount of nitrogen is small, and is simply dissolved in the blood from the air; it has no physiological significance. The important gases are the other two; the numbers given for venous blood are mean figures, and vary not only in different veins, but even in the same vein under varying conditions of tissue activity. We see, however, that on the average every 100 c.c. of blood which pass through the lungs gain 6.5 c.c. of oxygen and lose 6 c.c. of carbonic acid. We will now study the mechanism by which this gaseous interchange is effected.

THE GASEOUS EXCHANGE IN THE LUNG.—The simplest explanation is that the process is one of mechanical diffusion. This view is generally regarded as adequate for normal breathing, and can be maintained if it can be shown that the pressure of oxygen in the alveolar air is as great as or greater than the tension of oxygen in the arterial

blood, and therefore *a fortiori* greater than that in venous blood. The oxygen pressure (100 mm. of mercury) in the alveolar air is less than in the atmosphere (152 mm.), is greater than the oxygen-tension in venous blood (35 mm.), hence oxygen passes from alveolar air to blood-plasma; the hæmoglobin immediately combines with it and thus the plasma is left free to absorb more oxygen, and this goes on until the hæmoglobin is saturated with oxygen. The reverse change occurs in the tissues where the pressure of oxygen is small (varying from 35 mm. to zero) and lower than in the plasma or in the lymph which bathes the tissue elements; the plasma parts with its oxygen to the lymph, the lymph to the tissues, and the oxyhæmoglobin then undergoes dissociation to supply more oxygen to the plasma and lymph, and thus in turn to the tissues once more. This goes on until the oxyhæmoglobin loses on the average about half its store of oxygen; 1 c.c. of arterial blood contains 0.2 c.c. of oxygen; 1 c.c. of venous blood contains 0.1 c.c. of oxygen. The measurements of the oxygen pressure (or CO_2 pressure) in alveolar air (collected by Haldane and Priestley's apparatus), and of the oxygen or CO_2 tension in the blood (by the tonometer) has been carried out largely by Krogh in animals, and it is seen that the oxygen-pressure of the alveolar air is always *higher* than the oxygen-tension of the arterial blood, and the CO_2 pressure of the alveolar air is always *lower* than the CO_2 tension of the arterial blood.

Some authorities doubted the applicability of such results to man and affirm that in cases of definite oxygen-want, such as during violent muscular exercise, or on the tops of high mountains, the lining epithelium of the pulmonary alveoli can, by a process of active secretion, transfer oxygen from the alveolar air to the blood. (That secretion is not impossible is shown by studying the swim-bladder of fishes. It morphologically corresponds to the lung, and the oxygen in it is far in excess of what can be explained by mere diffusion from the sea-water; this storage of oxygen, moreover, ceases when the vagus nerves which supply it are divided.)

To meet this objection an experiment was recently devised and carried out at Cambridge; its idea was to repeat as nearly as possible Krogh's work on a man experiencing oxygen-want. Professor Barcroft, who submitted to the experiment, lived for six days in a respiration chamber in which the oxygen pressure in the inspired air was gradually reduced from 180 mm. Hg on the first day to 84 mm. on the last; 84 mm. Hg corresponds to that experienced at an altitude of about 18,000 feet. At the close of the experiment Barcroft's radial artery was laid bare and a cannula inserted so that his arterial blood could be collected either when he was at rest or performing work; his alveolar air was collected and examined simultaneously. The following results were obtained:

	During Rest.	During Work.
Pressure of oxygen in alveolar air .	68 mm. Hg	57 mm. Hg
Tension of oxygen in arterial blood .	60 " "	48 " "

More recently Krogh's bubble aerometer has been applied to man, the blood being withdrawn from an artery by a hypodermic syringe. By this method comparisons have been made of the oxygen-tension in the arterial blood and alveolar air, both at the sea-level and at Cerro, a mining-town in the Andes (14,200 feet). In both cases equilibrium seems to be attained so closely that the difference between the two is within the region of experimental error:

	Barometric Pressure.	O_2 Pressure in Alveolar Air.	O_2 Tension in Arterial Blood.
Cambridge .	761 mm. Hg.	100 mm.	99
Cerro .	458 "	58 "	59
Edinburgh .	755 "	102 "	101

The following table summarises the main facts in relation to the two gases, and the arrows show the direction in which they pass, which is always from higher to lower pressures:

Pressure (Tension) of Gases.			
Lungs.	Arterial Blood.	Venous Blood.	Tissues.
Oxygen . 100 mm. →	Just under 100 mm.	→ 35 mm.	→ 0 to 35 mm.
Carbonic Acid . 40 mm. ←	Just over 40 mm.	← 48 mm.	← over 48 mm.

THE REGULATION OF RESPIRATION.—There are three factors, each of which plays a part in maintaining and regulating the rhythmic movements of respiration. They are the respiratory centre, the vagus nerves, and the chemical condition of the blood.

1. *The Respiratory Centre.*—In the central Nervous System (q.v.) there is a specialised small district called the *respiratory centre*. This gives out impulses which travel down the spinal cord to the centres of the spinal nerves that innervate the muscles of respiration. It also receives various afferent fibres, the most important of which are contained in the trunk of the vagus, a nerve from the same part of the brain which supplies many of our internal organs. The vagus is chiefly an afferent nerve in relation to respiration. It, however, also is in a minor degree efferent, for it supplies the muscular tissue of the lungs and bronchial tubes. The respiratory centre was discovered by Flourens; it is situated in that part of the brain-stalk known as the medulla oblongata (see BRAIN) and coincides in position with the sensory centre of the vagus. The existence of subsidiary respiratory centres in the spinal cord has been mooted, but the balance of experimental evidence is against their existence. Flourens found that when the respiratory centre is destroyed respiration at once ceases, and the animal dies. He therefore called it the 'vital knot' (*nœud vital*). The centre is affected not only by the afferent impulses which reach it by such nerves as the vagus, but also by those from the cerebrum; so that we have a limited amount of voluntary control over the respiratory movements. The respiratory centre is probably twofold, consisting of an inspiratory and an expiratory centre. Of these two the inspiratory centre is so much the more active that its importance is a subject of universal agreement; whereas, the existence of an expiratory centre is doubted by some physiologists, who regard expiration as a mere cessation of the active process of inspiration, and a mechanical falling-back of the tissues into their places.

2. *The Nervous Factor in Respiration.*—During each normal respiration, an impulse passes from the lungs to the respiratory centre by the vagus nerve. This can be detected by observing the sign of nerve-activity—viz. an electrical change (current of action) which always accompanies an impulse. The most sensitive apparatus for this purpose is the string-galvanometer of Einthoven. During normal breathing, then, it appears that the inspiratory centre alone is active, which is then checked by an inhibitory impulse that comes from the lung *via* the vagus nerve. But, even if both vagus nerves are cut through, respiration does not cease; the respiratory centre has therefore an inherent rhythm. In forced respiration the galvanometer shows again that the vagus nerves are active, and a second action-current during the expiratory phase suggests the view that there exists the double centre (inspiratory and expiratory), held by many physiologists—e.g. Dr Head. On dividing the vagus of one side of an animal Head observed (as others before him had also done) respiration became slightly slower and deeper; on dividing the second nerve—i.e. the vagus on the other side of the neck—this effect was more marked, but it is not constant, and when it does occur it is only temporary. On exciting the central, i.e. the upper, end of the divided nerve, inspiratory efforts increased until at last the diaphragm came to a standstill in the inspiratory position. But if a weak stimulus was employed the reverse was the case; the expiratory efforts increased, inspiration becoming weaker and weaker, until at last the diaphragm stopped in the position of expiration.

Head's interpretation of these previously-known facts was, in the light of further experiments now to be described, the following: There are in the vagus two sets of fibres, one of which produces an increased activity of the inspiratory part of the respiratory centre, and the other an increased activity of the expiratory part of that centre. Stimulation of the first stops expiration and produces inspiration; stimulation of the second does the reverse. The question now is, What is it that normally produces this alternate stimulation of the two sets of fibres? If we discover this we shall discover the prime moving cause in the alternation of the inspiratory and expiratory acts. It was sought and found in the alternate distension and contraction of the air-vesicles of the lungs where the vagus terminations are situated.

In one series of experiments *positive ventilation* was performed; that is, air was pumped repeatedly into the lungs, and so increased their normal distension; this was found to decrease the inspiratory contractions of the diaphragm, until at last they ceased altogether, and the diaphragm stood still in the expiratory position.

In a second series of experiments, *negative ventilation* was performed; that is, the air was pumped repeatedly out of the lungs, and a condition of collapse of the air-vesicles produced. This was found to increase the inspiratory contractions of the diaphragm, expiration became less and less, and at last the diaphragm assumed the position of inspiratory standstill.

Head regards ordinary respiration as an alternate positive and negative ventilation, though not so excessive as in the experiments just described. Inspiration is positive ventilation, and so provides the nervous mechanism of respiration with a stimulus that leads to expiration. Expiration is a negative ventilation, and so provides the stimulus that leads to inspiration. We must naturally be on our guard against regarding the forcible inflations and deflations produced by a pump as completely analogous to the changes produced in the lungs by ordinary breathing; nevertheless, the two sets of impulses are undoubtedly called into action if the respiratory processes are sufficiently energetic, and of the two sets of impulses those which are started by the inspiratory movement play a more active part in the regulation of respiration than those started by the expiratory movement, so much so that in unlaboured breathing they alone need be considered.

Physiologists are now occupied with the influence of the sympathetic nerves on respiration, but that subject is at present unripe for definite statements.

If positive and negative ventilation are used together rapidly and alternately at a rate quicker than the respiratory rhythm, both inspiratory and expiratory processes are inhibited, and the respiration ceases for a short time. This follows naturally from the experiments previously described. This can also be done voluntarily by oneself taking a number of deep breaths rapidly. The cessation of breathing, called *apnoea*, is not due, as at one time supposed, to over-oxygenation of the blood, but is, according to Head, produced reflexly; for under normal conditions arterial blood is almost fully oxygenated. Apnoea is observed if inert gases, such as nitrogen or hydrogen, are used instead of air. The pause, however, is then shorter, as the blood becomes venous, and in a short time stimulates the respiratory centre to activity. Under abnormal conditions, namely, after division of the vagi, apnoea obviously cannot be due to such reflex action. Fredericq held that even ordinary apnoea had a chemical rather than a nervous origin. He attributed it, however, not to over-oxygenation, but to a lessening of the carbonic acid in the blood, which is the view now adopted. This brings us to—

3. *The Chemical Factor in Respiration.*—Haldane and Priestley found on examining alveolar air that under constant atmospheric pressure the carbonic acid or carbon dioxide exerts an almost constant

pressure in the alveolar air of the same person. In different individuals this pressure varies somewhat, but averages 40 mm. in men and 37 in women and children. With varying atmospheric pressures they concluded that the percentage varies inversely as the atmospheric pressure, so that the pressure of CO_2 remains nearly constant. This conclusion, which has had to be somewhat modified, was a sufficiently close approximation to the truth to focus attention on the sensitiveness of the respiratory centre to slight changes in the tension of CO_2 in the arterial blood. These observations and the next to be described furnish the chemical key to the cause of the amount of pulmonary ventilation; it plays an important part in conjunction with the respiratory nervous system in the regulation of breathing. For the respiratory centre is not only affected by the impulses reaching it by the vagi and other afferent nerves, but it is also very sensitive to any rise in the tension of carbon dioxide in the blood that supplies it. The changes in the tension of this gas in the arterial blood are normally proportional to the changes in the carbon dioxide pressure in the alveoli, and the changes in the lung alveoli are transmitted to the respiratory centre by the blood. They found that a rise of 0.2 per cent. in the alveolar carbon dioxide pressure is sufficient to double the amount of alveolar ventilation during rest. During sudden muscular work the alveolar carbon dioxide pressure increases slightly, and the pulmonary ventilation is consequently increased.

The limitations in Haldane and Priestley's deductions became apparent when observations were made at different altitudes. At the summit of Monte Rosa (15,000 feet), for example, the carbonic acid pressure in the alveoli drops from 40 to 28 mm. Hg. If Haldane and Priestley were correct, respiration should then stop for want of the necessary stimulus; but respiration does not cease under these conditions; modifications of their view were therefore imperative; these may be considered in the next paragraph.

Many physiologists consider that the action of carbonic acid is not specific, but that other acids act in the same way, and that the real stimulus to the respiratory centre is the total acidity of the blood (hydrogen-ion concentration). A rise in the carbonic acid in the blood will, other things being equal, produce an increase in its hydrogen-ion concentration, and so stimulate the respiratory centre. At high altitudes, however, even though the CO_2 present in the blood falls, the hydrogen-ion concentration is maintained by the simultaneous excretion of alkali by the kidneys. This is called 'decrease of alkali reserve.' During exercise, too, the total ventilation of the lungs may so increase as to sweep a lot of the CO_2 out of the blood; but even then in spite of the fall in CO_2 pressure the hydrogen-ion concentration may rise owing to the presence of lactic acid. A fuller consideration of the meaning of the reaction of the blood is postponed to a further section. Another view has been advanced—viz. that the sensitiveness of the respiratory centre increases with reduction of the oxygen tension in the blood, even if this is slight. So that if a man has a total ventilation of 6 litres per minute at the normal CO_2 alveolar pressure, then if the oxygen tension in his blood is reduced, a smaller alveolar CO_2 pressure may be enough to stimulate the centre and produce a total ventilation, say, of 12 litres per minute. In its extreme form this view leads its upholders to believe that CO_2 is a *specific* stimulus. Haggard and Henderson point out that the stimulating effect produced by oxygen-want appears before any increase of lactic acid can be detected; their opponents might retort that the lactic acid (due to lack of oxygen in the brain)

may be formed in the respiratory centre itself. The reader without bias may be neutral and say that while increase in H-ion concentration (whether resulting from carbonic acid or not) produces its effect on the respiratory centre, CO_2 acts apparently in a specific manner because it diffuses into the cells of the centre more rapidly than any other acid. *Excessive* oxygen-want, however, causes a feeble type of respiration.

The onset of exercise increases the total ventilation before any chemical changes have time to have occurred; this initial increase is attributed to the influence on the respiratory centre of the higher regions of the brain.

The relative importance of the nervous and chemical factors in normal breathing may be briefly stated as follows: The inspiratory centre makes an effort, the degree of exhalation of the centre, and therefore, the magnitude of the effort, more especially in the matter of depth, is governed by the tension of acid (and especially the carbonic acid) in the blood, but it is cut short by an inhibitory impulse passing up the vagus, only to begin again when the effects of this inhibitory impulse are removed.

During foetal life the need of the embryo for oxygen is small, and is amply met by the transference of oxygen from the maternal blood through the thin walls of the foetal capillaries in the placenta. But when the child is born, this source of oxygen is no longer available, and the increasing velocity of the blood stimulates the respiratory centre to action, and is the essential cause of the first inspiratory efforts the new-born child makes to obtain the oxygen it requires. It is said that if the placental circulation is stopped while the child is still *in utero*, respiratory efforts are also made. Some regard the action of the air on the body surface as an accessory cause of the first respirations, and it is the practice to increase this in feeble children by stimulating the cutaneous nerves by the application of cold water to the skin. Such treatment always causes deep inspirations, even in the adult. There are other nerves stimulation of which influences the respiratory act; for instance, stimulation of the central end of the glossopharyngeal inhibits the respiratory movements for a short period; this accounts for the very necessary cessation of breathing during swallowing. Stimulation of the central end of the cut superior laryngeal nerve, or of its terminations in the mucous membrane of the larynx, as when a crumb is 'swallowed the wrong way,' produces an increase of expiratory efforts, culminating in coughing. There are many abnormalities of respiration familiar to the doctor in which the nervous mechanism is largely concerned; for instance, this is so for the spasmodic croup of children, for asthma, and for whooping-cough.

Before passing on to the next item on our programme (the acidity of the blood) it will be convenient to interpolate a brief consideration of artificial respiration and of ventilation, using the word in its generally accepted meaning, and not in the more specialised sense in which we have used it hitherto.

Artificial Respiration.—In experiments on animals in which it is necessary to open the chest, life can be maintained by pumping air into the lungs; this is done by means of some form of pump or bellows.

Artificial respiration is sometimes necessary in man to restore normal breathing, as for instance in those who are apparently dead from drowning. In such cases speed in commencing the artificial breathing, and perseverance in continuing the process are essential. Many have been restored to life after the efforts have been continued for an hour or more. It is now recognised that of the numerous methods that introduced in 1901 by Sir E. Sharpey Schafer of Edinburgh is the simplest and most effective. It has superseded the older methods of Marshall Hall and Silvester: the operator kneels by the side of or athwart the patient, who is laid on the ground face downwards with a thick folded garment under his chest. He faces the patient's head, and places his hands on each side over the lower ribs, then slowly throws the weight of his body forward, and thus forces air out of the lungs of the subject; he then gradually relaxes the pressure by

bringing his body up again, but without removing his hands. This is repeated regularly at the rate of twelve to fifteen times a minute until the patient breathes, or until all hope of restoration is given up. In no case should the treatment be given up for at least half-an-hour. Bystanders may help the principal operator by applying hot flannels to the body and hands of the patient; but until respiration has been re-established the clothes should not be removed nor any attempt made to give restoratives by the mouth. As the patient lies face downwards there is less risk than in other methods of the tongue falling back into the pharynx, and at the same time water and saliva or mucus can continue to escape by the mouth. In certain cases where there is obstruction in the wind-pipe, surgical interference may be necessary (see TRACHEOTOMY).

Ventilation.—Some observers have stated that certain noxious substances are ordinarily contained in expired air which are much more poisonous than carbonic acid, but careful researches have failed to substantiate this. If precautions be taken by absolute cleanliness to prevent admixture of the air with exhalations from skin, teeth, and clothes, the expired air only contains one noxious substance, and that is carbonic acid. Absolute cleanliness is, however, not the rule; and the air of rooms becomes stuffy when the amount of expired air in them is just as much as to raise the percentage of carbonic acid to 0.1 per cent. An adult gives off about 0.3 cubic feet of carbonic acid per hour, and if he is supplied with 1000 cubic feet of fresh air per hour, he will add 0.3 to the 0.4 cubic feet of carbonic acid it already contains; in other words, the percentage of that gas will be raised to 0.1. An hourly supply of 2000 cubic feet of fresh air will lower the percentage of carbonic acid to 0.07, and of 3000 cubic feet to 0.06, and this is the supply which is usually recommended. In order that the air may be renewed without giving rise to unpleasant draughts, each adult should be allotted sufficient space in a room, at least 1000 cubic feet.

Leonard Hill has pointed out that the effects of bad ventilation are not so much due to changes in the chemical composition of the air, as to the absence of movement in the air; moving air has a stimulating, and still air a depressing effect.

THE REACTION OF THE BLOOD.—Research has given us a method which represents the exact meaning of the words acidity and alkalinity.

When hydrochloric acid is added to water the water becomes acid because the HCl dissociates into its component ions of hydrogen and chlorine. If more complex acids are used, one of the ions is hydrogen, and the degree of acidity depends on the number of hydrogen ions in solution. HCl is a strong acid because the dissociation is nearly complete, and therefore serves as a standard. In the same way the degree of alkalinity depends on the concentration of hydroxyl (OH) ions, but in all solutions the product of the concentrations of H and OH ions is constant. Pure water dissociates to a trifling extent into H and OH ions, and we call water neutral, not because it is neither acid nor alkaline but because it is both in equal degree. In a solution that turns blue litmus red the H ions preponderate, but OH ions are not absent; in a solution which turns red litmus blue, the reverse is the case.

Blood is a fluid which turns red litmus blue, and so is spoken of as alkaline, but it also contains H ions. A constituency which returns a Liberal member to Parliament is labelled a Liberal constituency, but this does not mean it boasts no Conservatives. This analogy may help us to realise what one means in speaking of the acidity of the blood. The unit of acidity is the concentration of H ions in a normal solution of HCl (36.5 grammes to the litre). The H ion concentration of the blood is inconceivably small, being relatively to this unit only 0.000,000,032, or one gramme ion in 32 million litres. Small as this number is variations in it produce profound physiological disturbances; if the

figure in arterial blood rose to 0.000,000,034 breathing would be appreciably affected, and if it rose to 0.000,000,05 the person would be hopelessly out of breath. The chief acid to which this is due is carbonic acid, which in water becomes hydrogen carbonate (H_2CO_3); if carbonic acid gas (CO_2) is passed into water, or a physiological saline solution in increasing amount, the concentration of hydrogen ions increases also. Carbonic acid is continually being thrust into the blood by the tissues, but normally this produces no great preponderance of H ions, and the reaction is but little disturbed; this is because the blood-plasma contains certain substances spoken of as 'buffers' which enter into combination with the CO_2 , and so prevent it raising the acidity of the blood-fluid. The most important of these substances is sodium bicarbonate. The total amount of CO_2 in the blood is just about equal to that which water would absorb when shaken with the pure gas at 760 mm. pressure, but so small a quantity of this in the blood is free that the blood is in equilibrium with a CO_2 pressure of only about 40 mm. Hg (5 per cent. of an atmosphere). The maintenance of the acid-base equilibrium in the blood is most important. The various cells and tissues it nourishes demand a reaction which is next door to neutral, and perhaps there is no other collection of cells which are so sensitive to variations from the normal as those which make up the respiratory centre; the figures already given show how a very slight increase in the hydrogen-ion concentration of the blood stimulates them to excessive action, and produces exaggerated breathing (hyperpnoea). Such a rise in hydrogen-ion concentration is termed *acidemia*.

We have now to consider the way in which the normal acid-base relationship is maintained. Our present views concerning this equilibrium and its regulation teach that of the multitude of substances present in the blood-plasma only two need be taken into account. One of these is CO_2 , which, when it is dissolved in water, is *acid* (H_2CO_3); the other is sodium bicarbonate (NaHCO_3), and this is *alkaline*. The way in which the relative concentrations of these two substances affect the hydrogen-ion concentration of the blood is quite simple, viz. that the hydrogen-ion concentration varies directly with the ratio of the one substance to the other. To shorten the long phrases employed it has been agreed that the words 'concentration of' shall be expressed by square brackets and hydrogen ion by H. Concentration of hydrogen ions thus is abbreviated to $[\text{H}^+]$, and

this, as stated above, varies as $\frac{[\text{CO}_2]}{[\text{NaHCO}_3]}$, or what

comes to the same thing, $[\text{H}^+] = \frac{k[\text{CO}_2]}{[\text{NaHCO}_3]}$, k being a constant.

Suppose now a person was to hold his breath, the quantity of CO_2 in solution in his plasma would increase. If he could by an effort of will keep this up until he doubled the quantity of CO_2 in solution, he would also double the $[\text{H}^+]$ in his blood. If he did the opposite experiment, and by forced respirations he reduced the CO_2 in his blood to half, the $[\text{H}^+]$ would also be halved. These results could only be obtained if one assumes that the concentration of NaHCO_3 remains unaltered. But such an assumption is incorrect, for the lung is not the sole regulator of $[\text{H}^+]$. CO_2 , being a gas, is excreted by the lung; but NaHCO_3 , being a solid in solution, leaves the body by the kidney. This introduces us to the second organ which regulates the $[\text{H}^+]$ of the blood. Just as excess of CO_2 stimulates the respiratory mechanism, so excess of NaHCO_3 (or more correctly excess of alkalinity) throws the kidney into activity. Therefore in the experiment

cited above, where the CO_2 is 'washed out' by forcible breathing, the plasma will become more alkaline; the kidney will then begin to excrete NaHCO_3 . In other words, the two important substances we are concerned with both leave the blood, and the proportion between them will not be appreciably altered, that is $[\text{H}^+]$ will remain approximately the same as before. To the question why lung and kidney conspire to maintain in such a perfect way the constancy of the $[\text{H}^+]$ of the blood, no answer is at present possible.

The simplest case of a physiological upset of the acid-base equilibrium is ordinary muscular exercise. Here more CO_2 from the muscles passes into the blood, the respiratory centre responds to the rise of $[\text{H}^+]$, and the increased ventilation of the lungs which follows leads to the removal of the excess of CO_2 . In more violent exercise other acid substances (mainly lactic acid) are produced in addition, and more complicated resources of the body come into play; in disease also there are other complications, so that a study of the question is now occupying the attention of physicians. Such conditions are found in kidney and heart disease, in diabetes, and in surgical shock, to mention only a few. If the patient recovers, the restoration of the acid-base equilibrium is an important factor in recovery; if the patient remains ill or dies, his resources to this end are not effective. This is obviously not the place to discuss medical details. It will be sufficient to state that abnormal acids may be formed (as in diabetes) or excreted by the kidneys, and that at times other basic substances, of which the most important is ammonia, are thrust into the blood by the tissues.

The methods of estimation of acidemia must be left to technical treatises. The only point of importance which we will mention here is the meaning of a conventional sign P_{H} or $p\text{H}$, which is now in general use. Water, the standard of neutrality, contains 1 gramme of hydrogen ion in 10 million litres. All acid solutions contain more than this amount of H^+ ion, and alkaline solutions less. Reaction is usually expressed in terms of H^+ -ion concentration; the OH^- -ion concentration is disregarded and is always obtainable by calculation, since the product of the two concentrations is a fixed quantity. Instead of saying that water has a hydrogen-ion concentration O_{H} of 1/10,000,000 grammes, this is shortened to 10⁻⁷ grammes per litre. 10⁻⁷ means 1 divided by 10⁷ or 10,000,000. The 10 and the minus sign are omitted and the figure left is 7; 7 is called the P_{H} . (To be quite correct, the P_{H} of neutrality at standard temperature is 7.07. The reader should note that it has a negative sign, so that increase of P_{H} means decrease of acidity, and *vice versa*.) Similarly a 1/1000 normal acid has a H^+ -ion concentration of 1/1000 grammes or 10⁻³ grammes per litre. Its P_{H} is therefore 3; the P_{H} of blood is very near the neutral point. One sees that the P_{H} numbers are really logarithmic. The difference in the P_{H} of pure water (7.07) and of blood (7.4) is a difference in the region of the infinitely little, but as seen in our discussion of respiration these minute differences are of profound physiological importance.

The Effect of Respiration on the Circulation.—It need hardly be mentioned that breathing is so essential that it influences the well-being of the whole body; its relationship to the circulation of the blood is specially close. The main result is a rise of arterial blood-pressure during inspiration, and a fall during expiration. These variations are chiefly the result of the mechanical conditions dependent on the lungs and heart with its large vessels being contained within the air-tight thorax. If the intra-thoracic pressure is measured, it is found that it varies from -5 to -7 mm. of mercury at the end of expiration to -30 at the end of a deep inspiration—that is to say, from 5 to 7 to 30 mm. less than the atmospheric pressure (760 mm. of mercury). The pressure outside the heart and large thoracic vessels is correspondingly diminished during inspiration to the same extent, and produces its main effect (distension) upon the veins because they are never fully distended, and because the pressure within them is low. This results in a proportionately

more rapid flow of blood into the thorax, and therefore into the right side of the heart. Consequently the output from the right side of the heart increases, and thus *via* the pulmonary circuit the inflow into the left side of the heart is increased; in its turn, therefore, the output from the left ventricle rises, and so the aortic pressure is raised. This effect would be counteracted if the aorta and its branches within the thorax were as easily affected by changes of the intra-thoracic pressure as are the thin-walled and easily distensible veins; the thick wall of the aorta and its branches, however, prevents them from undergoing much change of this kind during ordinary breathing. The conditions in the veins are reversed when, with the expiratory act, the thorax returns to its former size; therefore the arterial blood-pressure falls.

To put it in a few words, when the chest cavity is enlarged in inspiration, not only is air sucked into the lungs but more blood is also sucked into the veins and so into the heart. In expiration the reverse occurs.

We thus see that these various conditions produce during inspiration an increased flow of blood into the right heart; this increased supply of blood is then passed *via* the pulmonary circuit to the left heart; this takes a little time; hence it is that the effect of inspiration in raising arterial pressure is not seen at the very commencement of the inspiration. In fact, in some animals which normally breathe very quickly (for instance, the rabbit) inspiration is over and the next expiration has begun before the rise in arterial pressure occurs. In artificial respiration in animals with an open thorax the respiratory undulations on the arterial blood-pressure curve are in the reverse direction. Forcible inflation with air (increased intra-alveolar pressure) produces an increased resistance to the pulmonary circulation, and the rate of flow into the left side consequently falls; the aortic pressure therefore falls, while the pressure in the pulmonary artery rises. Hence the effect of inflations of the lungs at the ordinary respiration rate is to diminish the aortic blood-pressure; this rises again, for the opposite reasons, in the intervals of deflation which correspond to expiration.

The mechanical explanation of the variations in blood-pressure with ordinary respiration takes no account of any nervous co-operation which is held to account partly for the parallelism in respiration and arterial pressure. It is noticed how slowly the heart often beats during the expiratory period; the changing rate of the heart is determined by rhythm in the activity of the vagus centre. When the vagi are cut the inequality in the heart rate disappears, but the respiratory waves in the blood-pressure continue. Whether the cause of the alteration of vagus rhythm is due to a reflex *via* the pulmonary branches of that nerve, or to an 'overflow' from the neighbouring respiratory centre, is a matter of difference of opinion. But after all, the variations in heart rate can only be a minor reason for the parallelism of the two curves. Another factor which some believe to be concerned in the expiratory undulations of arterial pressure is a rhythmical excitation of the vaso-motor centre, occurring coincidentally with the discharges from the respiratory centre. The idea is expressed in the word 'overflow.' Considering how closely the various centres in the medulla oblongata are connected by association fibres, it would not be surprising if the rhythm in one affected its neighbours.

Asphyxia, or suffocation, follows prevention of the due entry of oxygen into the blood, and its symptoms may be roughly divided into three stages. In the *first* the breathing becomes exaggerated (hyperpnea), then laboured and painful, inspiration, and later expiration, getting more violent; this brings the muscles of forced breathing into action, and the whole is due to the powerful stimulation of the respiratory centre by the increasingly venous blood. In the *second stage* the violent expiratory efforts become convulsive, and give way to general muscular convulsions, which arise from the further stimulation of the centres in brain and cord by venous blood. The convulsive stage is a short one, and lasts less than a minute. The

third stage is exhaustion.—In it the respirations all but cease, the spasms give way to flaccidity of the muscles, there is insensibility, the conjunctivæ are insensitive and the pupils are widely dilated. Every now and then a prolonged sighing inspiration takes place, at longer and longer intervals, until breathing ceases altogether, and death ensues. During this stage the pulse is scarcely to be felt, but the heart may beat for some seconds after the respiration has stopped. The condition is due to the gradual paralysis of the centres by the prolonged action of the venous blood. This stage may last three minutes and upwards. After death from asphyxia it is found that the right side of the heart, the pulmonary arteries, and systemic veins are gorged with dark venous blood, whereas the left side of the heart, the pulmonary veins, and the arteries are usually empty. The left ventricle undergoes early rigor mortis. In the first and second stages the arterial pressure rises, in the third stage it falls from heart failure, and the pressure in the veins then rises till death ensues: this is due to venous congestion.

INTERNAL OR TISSUE RESPIRATION.—This aspect of the subject we have long postponed. It is the utilisation of oxygen brought to the tissues, and the combustion that there ensues. Of the ultimate products, carbon dioxide and part of the water find their outlet by the lungs. We may begin by comparing the composition of the inspired or atmospheric air with that of expired air in the following table:

	Inspired Air.	Expired Air.
Oxygen . . .	20·96 vols. per cent.	16·08 vols. per cent.
Nitrogen . . .	79 " "	79 " "
Carbonic acid . . .	0·04 " "	4·4 " "
Watery vapour . . .	variable	saturated
Temperature . . .	"	that of body (37° C. or 98·4° F.)

The chief change is in the proportion of oxygen and carbonic acid. The loss of oxygen is about 5, the gain in carbonic acid about 4·5. If the inspired and expired airs are carefully measured at the same temperature and barometric pressure, the volume of expired air is thus found to be rather less than that of the inspired. The conversion of oxygen into carbonic acid would not cause any change in the volume of the gas; for a molecule of oxygen (O_2) would give rise to a molecule of carbonic acid (CO_2) which would occupy the same volume (Avogadro's law). It must, however, be remembered that carbon is not the only element which is oxidised. Fat and protein contain a number of atoms of hydrogen, which, during metabolism, are oxidised to form water; a small amount of oxygen is also used in the formation of urea. Carbohydrates contain sufficient oxygen in their own molecules to oxidise their hydrogen; hence the apparent loss of oxygen is least when a vegetable diet (that is, one consisting largely of starch and other carbohydrates) is taken, and greatest when much fat and protein are eaten. The quotient $\frac{CO_2 \text{ given off}}{O_2 \text{ absorbed}}$ is called the *respiratory quotient*. Normally it is

$\frac{4·5}{5} = 0·9$, but it varies considerably with diet, as

just stated. The amount of respiratory interchange of gases is estimated by enclosing an animal or man in an air-tight chamber, except that there is a tube entering and another leaving it; by one tube oxygen or air can enter, and is measured by a gas-meter as it passes in. The air is drawn through the chamber, and leaves it by the other tube; this air has been altered by the respiration of the animal, and in it the carbonic

acid and water are estimated; it is drawn into bottles containing a known amount of an alkali such as soda-lime; this combines with the carbonic acid, and its increase in weight gives the amount of carbonic acid. The water is estimated in bottles containing pumice moistened with sulphuric acid.

Ranke gives the following numbers from experiments made on a man whose diet consisted of 100 grammes of protein, 100 grm. of fat, and 250 grm. of carbohydrate *per diem*. The amount of oxygen he used in the same time was 666 grm., of which 560 passed off as CO_2 , 9 in urea, and 97 as water. Vierordt gives the following average numbers: oxygen used per 24 hours, 744 grm.; this leads to the formation of 900 grm. of CO_2 and 228 grm. of H_2O . The respiratory exchange is lessened during sleep. In the winter sleep of hibernating animals the respiratory quotient may fall to 0·5. In muscular exercise the quotient rises, because there is increased combustion of glucose, the chief fuel in muscular energy.

External or pulmonary respiration is much less obscure than tissue or internal respiration, and we have treated it at considerable length. It must be borne in mind, however, that pulmonary respiration is but the means, and tissue respiration is the end. Tissue respiration consists in the passage of oxygen from the blood of the capillaries to the cells of the tissues, and the passage of carbonic acid in the reverse direction. This gaseous interchange is no doubt brought about by a simple process of diffusion. The oxygen passes out of the plasma of the blood through the capillary wall, and then through the lymph until it reaches the cell in which it is going to be used, which we will suppose is a muscle fibre. In order that a constant stream of oxygen may pass from the blood to the fibre there must be a difference of oxygen pressure between the oxygen dissolved in the plasma and that dissolved in the lymph, and the latter must be at a greater pressure than that dissolved in the muscle fibre. The amount of oxygen which passes will, other things being equal, be directly proportional to these pressure differences, and as the amount varies greatly at different times, it is obvious that the pressure differences vary greatly also. When the muscle is at rest, the oxygen pressure in the capillaries is very near to that in the muscle fibre; when the muscle is active and using large quantities of oxygen, the intra-capillary oxygen pressure is much greater than the intra-muscular oxygen pressure. Such a change might be brought about by a rise in the intra-capillary oxygen pressure, or a fall in the intra-muscular oxygen pressure, or by both taking place simultaneously. Let us therefore inquire what is known about these quantities. The tension of oxygen in muscle has been calculated as being at most equal to 19 mm. of mercury; from this it may vary down to zero. Within these limits the conditions for diffusion can be increased by a drop in the intra-muscular oxygen pressure.

There is, in addition, a mechanism for raising the intra-capillary oxygen pressure. This is the increased quantity of acid (carbonic and sarcolactic acids) which is thrown into the blood as the result of muscular metabolism.

In glandular structures the oxygen pressure is higher than in muscle; they have a more copious blood supply, and equilibrium is more readily established. The quantity of oxygen used varies with the activity of the various tissues; weight for weight, glandular tissues use most oxygen, next comes muscle, and last connective and skeletal tissues. There are some tissues, notably the nervous system, about which we know but little in this connection. The amount of oxygen used by an organ or tissue per gramme per minute is called

its *coefficient of oxidation*. This is ascertained by (1) estimating the blood gases in the blood entering and leaving the organ, (2) determining the amount of blood passing through the organ in a given time, and (3) the weight of the organ investigated. The chief data are given in the following table:

Organ.	Condition of Rest.	Oxygen used per minute per gramme of Organ.	Condition of Activity.	Oxygen used per minute per gramme of Organ.
Voluntary muscle.	Nerves cut. Tone absent.	0.003 c.c.	Tone existing in rest. Gentle contraction. Active contraction.	0.006 c.c. 0.020 c.c. 0.080 c.c.
Unstriated muscle.	Resting.	0.004 c.c.	Contracting.	0.007 c.c.
Heart.	Very slow and feeble contractions.	0.007 c.c.	Normal contraction. Very active.	0.05 c.c. 0.08 c.c.
Submaxillary gland.	Nerves cut.	0.03 c.c.	Chorda stimulation.	0.10 c.c.
Pancreas.	Not secreting.	0.03 c.c.	Secretion after injection of secretin.	0.10 c.c.
Kidney.	Scanty secretion.	0.08 c.c.	After injection of diuretic.	0.10 c.c.
Intestines.	Not absorbing.	0.02 c.c.	Absorbing peptone.	0.03 c.c.
Liver.	In fasting animal.	0.01 to 0.02 c.c.	In fed animal.	0.08 to 0.05 c.c.
Suprarenal gland.	Normal.	0.045 c.c.	..	..

In all organs the table shows that increase of activity is accompanied by increase of oxidation. Much interest centres about the order of time in which these events occur. This matter has been investigated in organs (muscle and salivary glands) which can be thrown into great activity for a short time; in each case most of the oxidation follows upon the activity, and not the activity upon the oxidation. The important inference is drawn that the contraction or secretion, as the case may be, is not caused by the oxidation in the sense that the machinery of a locomotive is driven by the energy derived from the oxidation of the coal; rather is the mechanism like that of a spring which is liberated at the moment of doing the work, and has to be rewound subsequently; the process of rewinding involves oxidation. In muscle, the heat-formation which occurs in the period following activity only takes place if the muscle is supplied with oxygen. The output of carbonic acid, in its turn, follows upon the intake of oxygen. The order of events is therefore (1) increase of functional activity, (2) increase of heat formation and oxygen taken in, and (3) increase of carbonic acid put out. The increase of oxygen-consumption after the muscular contraction is over is called the 'oxygen-debt' (A. V. Hill and Lupton). This debt represents the oxygen used in oxidising the lactic acid formed.

The phenomenon of oxidation (auto-oxidation) in the body is one of the most important aspects of metabolism, and the fact that it occurs at the temperature of the body is not the least surprising circumstance. The recent discovery of a substance in the tissues by Sir F. G. Hopkins, termed *glutathione* (a compound of two amino acids, glutamic and cystine), is important. This is a catalyst which forms a most effective factor in the process.

Most of the figures relating to the gaseous metabolism were obtained by examining the organs of dogs. If the animal is weighed, and the composition of the inspired and expired air and the amount of oxygen taken in and given out determined, one

can calculate how much is retained and utilised. In the dog, the amount is about 0.016 c.c. of oxygen per minute per gramme of body-weight. This figure, however, is not the same in all animals, and the size of the figure will indicate what we may term the *intensity of respiration*. Thus in cold-blooded animals, especially fishes with their small

supply of oxygen, the figure is very much smaller. Among warm-blooded animals great variations are also seen; the intensity of respiration, for instance, is much greater in birds than in mammals. Among the mammals the intensity varies, roughly, inversely with the size of the animal; thus in the mouse, an animal that breathes with extreme rapidity, the intensity is probably ten to fifteen times greater than in the dog, in man the average is half that in the dog, and in the elephant very much less.

We will now discuss the conditions in oxygen-want. Normally a man takes into his blood 400 c.c. of oxygen per minute; this rises to 3000 according to the violence of muscular exercise. During contraction of a muscle the blood-flow through it is momentarily retarded; this produces oxygen-want there, and so leads to lactic acid production; the acid automatically relaxes the walls of the arteries, and so increases the blood supply. Exercise is the commonest cause of dyspnoea (distressed breathing). This breathlessness is not wholly produced by chemical changes in the blood, for it occurs before such changes take place, but is partly due to impulses from the motor cortex of the brain spreading to the medulla oblongata, and affecting the respiratory centre and causing acceleration of the heart, but after this the H-ion concentration of the blood produces its effect, as discussed under acidemia. Another cause of oxygen-want is diminution of the supply. This is best exemplified in *mountain sickness*, a disorder which attacks climbers (especially if untrained) at high altitudes. Its most obvious symptom is vomiting, which usually comes on at some spot where the ascent is particularly arduous, either by reason of the gradient or the wind. On the ascent of Monte Rosa from the Italian side there are three such spots, one at an altitude of 9000 feet, and the other two higher. Actual vomiting, however, does not always occur; often there are bad headaches, sleeplessness, absence of self-restraint, recklessness, irritability, and an inability to carry out the more complex cerebral functions, such as arithmetical calculations. Even without physical exertion it may affect a large proportion of people if the ascent is sufficiently rapid and the altitude sufficiently high. Thus, of the many who are suddenly transferred to the top of Pike's Peak in Colorado (14,000 feet) by rail from the lower country, few are well enough next morning to realise their ambition of seeing the dawn from the summit.

Adaptation to high altitudes consists in (1) increased pulmonary ventilation, (2) an increase in the hæmoglobin of the blood, and (3) at altitudes such as those of the mining towns in the Andes increased affinity of the red corpuscles for oxygen. A deficient supply of oxygen in the blood makes the respiratory centre more irritable and so produces

	Height of Barometer	Respirations per Minute.	Litres breathed per Minute.	c.c per Breath.
Sea-level	760	17·1	10·4	614
Top of Pike's Peak	460	20·8	14·9	726

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	Red Corpuscles per cubic mm. in Millions.	Oxygen Capacity of Blood.
Sea-level.....	4.9	830 c.c.
After 1 week at 14,000 feet....	5.4	870 c.c.
After 2 weeks " " "	5.7	1040 c.c.
After 8 " " "	5.75	1060 c.c.

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Let us now contrast with this respiration at high pressures.

Space does not allow of more than a reference to

Historical.—Aristotle (384 B.C.) thought that the object of respiration was to cool the body. He observed that the warmer the animal the more rapid the breathing, and transposed cause and effect. Galen (131-203 A.D.) experimented upon the mechanics of respiration, and knew something of the nervous mechanism. He believed that 'soot' and water were excreted from the body by the lungs. Malpighi (1661) described the structure of the lungs. Van Helmount (1664) discovered carbonic acid; Black (1757) observed that carbonic acid is breathed out of the body. Priestley (1774) discovered oxygen. Lavoisier (1775) discovered nitrogen, found the composition of the air, and taught that the formation of carbonic acid and water resulted from the combustion that took place in the lungs. Vogel proved the existence of carbonic acid in the venous blood; Hoffmann found oxygen in arterial blood. Magnus extracted and analysed the gases of the blood in both states.

Comparative.—Most of the Protozoa, all the sponges and stinging animals, and many simple worm-types live in water, which washes their surface and saturates their substance, the oxygen dissolved in the water serving the same purposes as that mixed with the air. While many worms breathe simply through their skin, many of the aquatic forms have structures specialised for respiration—modifications of the legs or tentacles or vascular outgrowths of the body-wall. In echinoderms respiration is effected by the tube-feet, and sometimes by hollow 'skin-gills' as well. The crustaceans usually breathe by gills or through the skin; in insects air-tubes or tracheæ ramify throughout the body. Scorpions have plaited sacs or 'lung-books,' which are modifications of tracheæ; and these are developed in spiders also, with or, rarely, without the addition of ordinary air-tubes. The king-crab has 'gill-books,' adapted for breathing in water. Some molluscs breathe simply by the skin, others have external gills, most have gills sheltered by the mantle, and air-breathing forms like snails have a mantle-cavity which serves as a lung. In Balanoglossus there are numerous respiratory clefts opening from the pharynx to the exterior; Appendicularia and young tunicates have a pair of these; in adult tunicates the primitive clefts are replaced by numerous secondary slits.

on the wall of the pharynx, through which water drawn in by the mouth passes into an atrial or peribranchial chamber and thence to the exterior; the same is true of *Amphioxus*. Clefts from the wall of the pharynx to the exterior are, indeed, characteristic of vertebrates, but beyond amphibians they are transitory embryonic structures, never used for breathing. This loss of functional gill-clefts is associated partly with the development of an embryonic birth-robe known as the allantois, which secures the aeration of the embryo's blood, and partly with the transition from aquatic to terrestrial life. In the hagfish the nasal sac opens into the mouth; in fishes this is only true of the double-breathing Dipnoi; in all other vertebrates air passes through the nostrils in and out of the mouth and lungs. In the hag and lamprey there are purse-like gill-pockets, and the respiratory arrangements are otherwise peculiar. In fishes gill-filaments are borne on the skeletal arches separating the gill-clefts, and the blood-vessels spread out on the filaments are washed by currents of water. Young elasmobranchs have at first external gills and afterwards the internal gills characteristic of all fishes. The Dipnoi have gills, but they also come to the surface and gulp air, using their air-bladder as a lung, and thus pointing the way to amphibians. For, while almost all amphibians have gills in their youth, all the adults are lung-breathers, though some retain their gills as well. Among higher vertebrates there are many peculiarities, such as the single lung of most serpents, the balloon-like air-sacs around the lungs of birds, and the adaptations of cetaceans as aquatic lung-breathers, but the essential characteristics of pulmonary respiration are the same in all. The hæmoglobin, so important in respiration, occurs first in nemerteans, and is present in some other worms, some echinoderms, a few arthropods, some molluscs, and in all vertebrates except the tunicates, *Amphioxus*, and a few exceptional fishes. Among invertebrates, the hæmoglobin is as a rule not in special corpuscles but dissolved in the blood-plasma, and analogous pigments are not uncommon, especially one called hæmocyanin, containing copper, not iron, which turns bluish when oxidised.

Respirators are worn over the mouth (oral) or mouth and nose (ori-nasal) for changing the properties of the air inspired. The name was first given by Mr Jeffreys to an apparatus he contrived about 1835 for the purpose of warming the air, formed of numerous layers of fine perforated metal with wire soldered to them. Respirators were much used formerly in diseases of the nose, throat, lungs, &c. for impregnating the inspired air with medicated vapours; for this purpose they were constructed with a chamber containing a sponge or cotton-wool which was kept charged with the substance whose action was desired (carbolic acid, creosote, eucalyptus, or pine-oil, &c.). Respirators have also been devised for freeing the inspired air of impurities—e.g. in the case of firemen, who have to go into an atmosphere strongly charged with smoke; of needle-grinders and others whose work gives rise to much irritating dust; of those who are exposed to foul gases, &c. They were habitually worn by the troops in the forward areas during the Great War in order to minimise the risk of poisoning by enemy gas. All the air inspired was drawn through an alkaline and oxidising powder which destroyed the gases, and the respirators were so comfortable that they could be worn for several hours at a time. See **FILTER**.

Respite, a temporary delay of the execution of a criminal. See **RELIEVE**.

Respondentia is a loan raised by the master of a ship, when he has no other means of doing so, upon security of the cargo or goods on board the ship. The contract has reference to a particular voyage, and the conditions are that if the subject on which the money is advanced be lost by sea-risk, or superior force of the enemy, the lender shall lose his money; and that if the goods arrive in safety the loan shall be repaid with a greater than ordinary rate of interest, called marine interest. When the ship herself is hypothecated the contract is called *Bottomry* (q.v.). The lender of money on respondentia or bottomry has an insurable interest in respect of the loan.

Responsibility. See **INSANITY**, **INFANT**, **HUSBAND AND WIFE**, **EVIDENCE**, **CAPACITY (LEGAL)**, **MASTER AND SERVANT**.

Responsions. See **OXFORD**.

Rest-harrow (*Ononis*), a genus of plants of the family Leguminosæ, sub-family Papilionaceæ, having a 5-cleft bell-shaped calyx, the standard of the corolla large and striated, the keel beaked, the pod turgid and few-seeded. There are many species, chiefly natives of Europe, and generally herbaceous or half-shrubby. The Common Rest-harrow (*O. arvensis*) is abundant in pastures and by waysides in Britain. Its lower leaves have three leaflets, the upper are simple; the flowers are axillary and rose-coloured, or occasionally white. The plant is half-shrubby, with somewhat spiny stems; viscid; and its smell strong and unpleasant. The roots are tough and woody, whence its English name. It is sometimes a troublesome weed, but only in neglected pastures, and disappears before careful cultivation.

Restigouche, a river of Canada, rises in eastern Quebec, flows south-east into New Brunswick, then east and north-east into the Bay of Chaleurs, forming part of the boundary between the two provinces. Its length is about 200 miles.

Restionaceæ, a family of monocotyledonous plants, mostly natives of the southern hemisphere, abounding at the Cape of Good Hope and in Australia. They are herbaceous plants, or sometimes half-shrubby, have simple stems and narrow leaves, and are hard, wiry, and rush-like. They have generally a creeping root-stock.

Restoration, the resumption of monarchical government on the return of Charles II. to his kingdom, May 29, 1660. A form of prayer for that day was annexed to the Common Prayer-book from then until 1859; and, in commemoration of Boscobel (q.v.), 'Oak-apple Day' was long also celebrated by the displaying and wearing of branches and sprigs of oak, with gilded oak-apples.

Restoration, in its true sense, means bringing back or replacing what has gone; but the word has come to mean making new imitative work to take the place of decayed or fractured work, and in this sense it applies to pictures, sculpture, furniture, and architecture; but as applied to architecture it is allowed a still wider meaning—viz. the building up anew and with new materials of portions of buildings which have ceased to exist, such new work being designed afresh in imitation of what was supposed once to have existed.

In architecture an impulse was given to the restoration movement by a society called the Camden Society, and afterwards the Ecclesiological Society, which was composed of churchmen and clergy, and started at Cambridge in the year 1840. Our mediæval churches are generally composed of two or three and sometimes of all the styles; but the Gothic revivalists desired to see the buildings complete in one style, and consequently, if an ancient building were composed chiefly of one style, they would destroy all the subsequent work

and replace it by work designed in the same style. The subsequent work thus destroyed is generally spoken of as 'debased' work. Each one of the styles was in fashion in its turn, strangely enough each becoming fashionable in the order in which they were naturally developed. As might be expected, the movement produced specialists, of whom Sir George Gilbert Scott was the most noted. Into his hands was placed nearly every cathedral church in England, as well as a countless number of parish churches; however, he did but follow in the steps of the elder Pugin. Long before his death a cry of discontent arose. Even those who had felt that it might be possible to imitate the mediæval work accurately, so as to replace missing features, saw that this was a hopeless task, for not a single successful example of 'restoration' could be pointed to. Ruskin wrote strongly against 'restoration,' urging the folly of attempting to reproduce a lost work of art or any portion of it, and giving it as his opinion that the only right method of treating our ancient buildings—such indeed as had not been destroyed by 'restoration'—was to repair them structurally by propping leaning walls and mending leaky roofs. His words did but sound the note which was in the minds of many, and in 1877 was formed in London the Society for the Protection of Ancient Buildings, and restoration as understood by the school of Sir Gilbert Scott is now ancient history.

Restoration of Pictures. The restoration and the cleaning of pictures may be considered together: though cleaning, of course, more strictly applies to the removal from their surface of the accretions of dust or discoloured varnish which obscure their beauties, while restoration refers to the reparation of actual flaws in their surfaces of paint, or in the canvas or wood upon which the paint is laid. When a mastic varnish has been used by the painter, and has become discoloured and opaque, it may be removed by careful and gentle friction with the points of the fingers, previously covered with a resinous powder, which frays off particles of the hardened coating in the form of a fine white dust. When copal varnish has been applied, its removal is more difficult and dangerous, and is usually effected by an application of weak alcohol, spirits of turpentine, and oil. A pad of cotton wool is saturated in this mixture, and passed over the surface of the varnish, which it dissolves and removes; a similar pad steeped in pure oil being applied at intervals to stop the action of the spirit when it threatens to disturb the colour beneath the varnish. When portions of the paint or of the ground of priming on which it has been laid have been removed, these are sometimes filled up to the level of the remaining portions with glue, size, and chalk, and then carefully repainted with dry colour to match the surrounding portions of the surface.

The injuries of time to the various materials upon which colours are laid are very various, and require careful and skilful treatment. In panel pictures worm-holes must be carefully filled up with the last-named composition, and matched with the adjacent portion as just described. If the wood has split, its edges must be carefully brought together, and fastened securely with 'buttons' of hard wood; or the entire back may be protected with a kind of grating of mahogany spars, so adjusted as to admit of a slight contraction and expansion of the panel in varying temperatures. If the panel be too far gone to admit of this treatment, the wood is carefully removed by tenon-saws, planes, and files, till only the surface of priming and colour remains, which can then be remounted on canvas or a fresh panel. If the picture is on canvas which has become decayed, it may be

'relined' by having its back securely fastened, by paste or glue, to a new canvas, and afterwards ironed, a process which has the effect of restoring evenness to a cracked surface of paint; though if the artist has worked with a thick impasto the raised points of colour are apt to become flattened, and the character of the handling to be slightly altered. When a fresco has to be removed from a wall this is usually effected by pasting its surface on paper, and then with a chisel slowly detaching the mortar which bears the colour from the stones upon which it has been laid, each portion, as it is gradually withdrawn, being coiled on a large cylinder. All the operations to which we have referred require extreme caution and great practice for their successful accomplishment. When they are entrusted to careless and untrained hands damage is certain, and it is impossible to estimate the immense amount of injury to works of art that has been effected by ignorant picture-restorers. Proper care of a picture, however, and preservation from damp and dust, will obviate the necessity for its being subjected to restoration; and such protection may be most simply effected by carefully closing in its back, and by covering its surface with glass, which answers all, and more than all, the preservative purpose of varnish, with the additional advantage that it does not chill and discolour with time. Glass is being largely adopted in the great public galleries, for covering even oil-pictures, and it has only one disadvantage—its tendency to reflect the objects placed opposite it, and so to interfere with the ready and complete examination, as a connected whole, of the entire surface of a large, and especially of a dark, painting.

Restorationists, a general name for those who hold the belief in a general *apocatastasis*, or 'restoration' of all things, in which, after a purgation proportioned to the various moral conditions of their souls at the time of death, all men would be restored to the favour of God. The title itself is especially associated with a body of Universalists which flourished at Boston, U.S.A., in the first half of the 19th century; but for the doctrine, see **HELL** and **UNIVERSALISTS**.

Resurrection, the revival of the human body in a future state after it has been consigned to the grave. We find traces in Zoroastrianism, and especially in later Judaism, but the doctrine is more characteristically Christian. In the earlier Hebrew Scriptures there is no mention of it. It is not to be found in the Pentateuch, in the Psalms, nor even in the earlier prophecies. It is supposed to be alluded to in Isaiah (xxvi. 19), and in Ezekiel (xxxvii.) in the well-known chapter as to the revival of dry bones in the valley of vision; and in the last chapter of Daniel (xii. 2) there is the distinct affirmation that 'many that sleep in the dust of the earth shall awake, some to everlasting life, and some to shame and everlasting contempt.' There is also a well-known passage in Job (xix. 25-27) which was long thought to refer to the doctrine of the resurrection of the body; but all recent criticism denies the validity of this reference. It is therefore not till the later Judaism that the doctrine appears, and it is sometimes said, doubtfully, to have been derived from Persia or elsewhere. In the time of Christ it had become a formal doctrine of the Pharisees. The general body of the Jewish people seem also to have believed in it; the Sadducees alone disputed it. It appears, in fact, to have become bound up in the Jewish mind with the idea of a future life, so that an argument which proved the one proved the other. It should be added that Mohammedanism (q.v.) cherishes gross beliefs on this head.

The Gnostics denied the resurrection of the body,

and made the change a purely spiritual one. The Catholic belief was greatly developed by Tertullian, Jerome, and Augustine, who, however, insisted that the resurrection body, though identical with the original one, is a glorified body. A third view, represented by Origen, affirms that the spirit must always have a bodily organism, and that the perfected personality necessarily assumes a spiritualised embodiment; in this view resurrection is limited to perfected spirits.

See the articles IMMORTALITY, CONDITIONAL IMMORTALITY, HEAVEN and HELL.

Resurrectionists, or **BODY-SNATCHERS**, the names popularly given to those who made it their business to dig corpses out of their graves and sell them as 'subjects' to lecturers on anatomy. From about the middle of the 18th century the supply of subjects, heretofore mainly obtained from the bodies of executed criminals, was altogether inadequate. The resurrectionists invented a new profession to supply the lack, and in the first quarter of the 19th century drove a most flourishing trade. An expert pair of resurrectionists in about forty-five minutes could prise up the coffin out of a newly-made grave by means of a peculiar crowbar for the purpose, burst in the lid, and remove the corpse. They carefully replaced the clothing in the coffin; the stealing of the naked corpse being by the law of England a misdemeanour only, the removal of the clothes was a felony, punishable by transportation. Painful precautions against body-snatching were taken. Heavy gratings were securely fixed over new-made graves, spring-guns were set, and often the relatives of deceased persons sat armed by their graves night after night until it was assumed that the corpses would be no longer serviceable to 'the doctors.' Guard-houses or towers were sometimes built for the accommodation of the watchers. To the popular horror was added a strong suspicion that resurrectionists would on occasion manufacture corpses—a suspicion confirmed in the notorious case of Burke and Hare (see BURKE, WILLIAM). The Anatomy Acts of 1832 and 1871 rendered the trade of the resurrectionist superfluous.

Retainer is, in English law, the act of engaging an attorney or counsel to attend to a certain suit or case. The retainer of an attorney may be either verbal or in writing; but the retainer of counsel is usually by written memorandum handed to his clerk, together with a small retaining fee. A general retainer is given by a party who wishes to secure the services of counsel in all actions brought by or against him. The term retainer is also used to denote the right of an executor to retain a debt due to himself from his testator's estate.

Retford, EAST, a town of Nottinghamshire, on the right bank of the Idle, an affluent of the Trent, 24 miles E. by S. of Sheffield. It has a handsome town-hall (1867), a grammar-school (1552; rebuilt 1858), paper-mills, iron-foundries, &c. It was first formally incorporated by James I. Pop. of municipal borough (1851) 2943; (1891) 10,803; (1921) 13,412.

Retimo (*Rithymnos*), a seaport of Crete, on its north coast, 40 miles W. of Candia; pop. 7000.

Retina. See EYE.

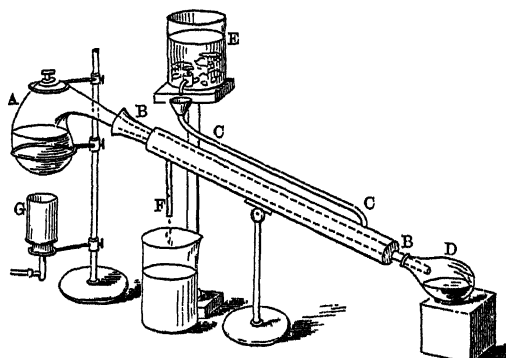
Retinite, a variety of amber; formerly also a name for Pitchstone (q.v.).

Retinospora. Some species of Juniper, Cupressus, Chamaecyparis, &c., vary their foliage, the juvenile stage being followed by a second and third stage. The juvenile stages can be perpetuated, and were in this form largely brought from Japan into European gardens. Their origin being

unknown, they were thought to belong to one genus only, which was called Retinospora. When it became known that these mysterious trees and shrubs were but growth-forms of different coniferous genera, Retinospora fell, *ipso facto*, to the ground for botanical science, but it lingers in gardens.

Retired Pay. See PENSIONS.

Retort, a vessel employed by chemists for the purpose of distilling or effecting decomposition by the aid of heat. It may be made of glass, earthenware, or metal, according to the purposes for which it is to be employed. Glass retorts are the most common, and their ordinary form is seen in the figure. They may be employed for the production



Retort fitted with Liebig's Condenser :

A, bulb of the retort, into which the liquid to be distilled is put; D, the receiver, into which the end of the retort is placed; BB, the condenser, receiving a supply of cold water from E by means of the pipe C, the heated water escaping at F; G, the heating apparatus, a Bunsen burner in this case.

of such products as do not require any extraordinary degrees of cold for the condensation of their vapour—as, for instance, for the production of hydrocyanic or nitric acid. The globular vessel in which the neck of the retort is inserted is from its function termed the *receiver*. Cold may be applied to the neck of the retort—for the purpose of condensing the vapour—in various ways, as by the application of a cold wet cloth, by a current of water, or by a special apparatus known as *Liebig's Condenser*, shown in the figure at BB.

In ordinary cases requiring a higher temperature than glass could bear earthen retorts are used; for the preparation of hydrofluoric acid retorts of lead are employed; while for the preparation of strong sulphuric acid platinum is the best material for the retort. Iron retorts are employed in the laboratory for the preparation of oxygen from black oxide of manganese and some other processes, and in gas-works for the destructive distillation of coal. See DISTILLATION.

Retours. See RECORDS (Scotland).

Retreat, a period of retirement to a religious house, for self-examination, meditation, and prayer. Retreats commonly last either three or seven days, and are conducted by a cleric, who delivers addresses daily. They are in use both in the Roman and, among the High Church party, in the Anglican Church.

Retriever. As the name implies, the retriever is a breed of dog trained to find out and bring back any killed or wounded game. The work of the retriever was long done by various breeds of dogs, such as the pointer, setter, or spaniel, but, in addition to it spoiling these dogs for their regular work, they were found to be too hard-mouthed, the worst fault possible in a retriever, as he wastes more in game injured than would have been lost

without him. Crosses with the Newfoundland were tried, and gradually two kinds of retriever were introduced. One variety, known as wavy-coated, was probably the result of a cross with the setter; the curly-coated is from the water-spaniel or poodle.

Retrograde, in Astronomy, a term applied to the motion (real or apparent) of a celestial body when that is opposite in direction to the yearly course of the sun from west to east. The superior Planets (q.v.) retrograde when in opposition (see CONJUNCTION). As their motion is then nearly parallel to the earth's, they, moving more slowly than it, appear to *fall behind* for a time. This period of retrogradation is of course longer for the planets whose motion is slower, and less for those whose speed more nearly approaches that of the earth. The inferior planets, which move faster than the earth, retrograde when in inferior conjunction. Their course being then nearly parallel to the earth's, they gain upon it, and appear to pass the sun from east to west. Thus Venus, when nearing the end of her appearance as an evening star, descends each night nearer to the western horizon, until so near the sun as to be lost in his rays. Passing then to his west side, the planet reappears as a morning star.

Retz, JEAN FRANÇOIS PAUL DE GONDI, CARDINAL DE, was born at Montmirail in 1614, of a family originally Italian, that had acquired great estates in Brittany and formed connections with the noblest families of France. His uncle was Archbishop of Paris, and he was early destined for the church in spite of amours, duels, and every form of unclerical behaviour. A friend reproaching him with his debts, 'Cæsar,' said the splendid young prodigal, 'at my age owed six times as much as I do.' Retz was entangled in political intrigues from his childhood up, even under the watchful eye of Richelieu, and, having at length in 1643 obtained the coadjutorship with reversion of the archbishopric of Paris, he skilfully used the position to make the Paris populace devoted to himself. He plotted actively against Mazarin, and was one of the main instigators of the outbreak of the Fronde in October 1648. During the next four years he rose and fell with the fortunes of his party, receiving, however, a cardinal's hat from Rome, until 1652, when he was flung into prison, first at Vincennes, then at Nantes. After two years he made his escape, wandered in Spain and England, appeared at Rome—where, it is said, he secured the election of Pope Alexander VII.—and at length in 1662 made his peace with Louis XIV. by resigning finally his claim to the archbishopric in exchange for the abbacy of St Denis and restoration to his other benefices, with arrears. He spent the rest of his life mainly in quiet at Paris, at Commercy, and St Mihiel in Lorraine. His enormous debts, reaching to four millions of francs, he provided for in 1675 by determining to 'live for his creditors,' making over to them his whole income save 20,000 livres. He died at Paris, 24th August 1679.

Retz was connected by marriage with Madame de Sévigné, and figures in a perhaps too pleasing light in her delightful letters. His *Mémoires*, coming down but till 1655, throws much light on the dark and troubled intrigues of the Fronde, and displays quite remarkable skill in narrative and elaborate character-drawing. His own character has been sketched with faithful, if unkindly, truth by his great antagonist, La Rochefoucauld, and the sum of the whole is contained in the words: 'He has raised up the greatest disorders in the state without having formed any plan how to profit by them.'

The earliest edition of his masterpiece in a kind peculiar to French literature appeared at Nancy in 1717, but the first adequate edition was given in the 24th vol. of Michaud and Poujoulat's collection (Paris, 1836). Later and better editions are by Gêruzez (1844) and Champollion-Figeac (1859); but the best is that in the series of 'Les Grands Écrivains de la France,' edited successively by A. Feillet, J. Gourdault, and R. Chantelauze (10 vols. 1872-90). See works by Curnier (1863), Topin (3d ed. 1872), Chantelauze (1878-79), Gazier (1876), and D. Ogg (1912).

Retz, RAIS, or RAIZ, GILLES DE, a 15th-century monster of iniquity, was a Breton of high rank and family connections, who distinguished himself under Charles VII. in the struggle with the English, fighting by the side of the Maid at Orleans, and bearing the alms-dish at the coronation. Born in 1404, he was made marshal of France at twenty-five, but soon retired to his estates, where for over ten years he is alleged to have indulged in the most infamous orgies, having kidnapped or enticed to his castle as many as 150 children, who were sacrificed as victims to his unnatural lusts or his sorceries. He was at length hanged and burned at Nantes in 1440, after a trial closed by his own confession. It should be noted that the whole story is by no means free from suspicion, and, moreover, that both the Bishop of Nantes and the Duke of Brittany were active personal enemies of Retz. Attempts have been made to find in him an historical original for 'Bluebeard' (q.v.) by persons ignorant of the world-wide diffusion of stories of forbidden chambers and punishments for curiosity. See Vincent and Binns, *Gilles de Rais* (1926).

Retzsch, FRIEDRICH AUGUST MORITZ, painter and engraver, was born in Dresden, 9th December 1779, and studied at the academy of his native city, where he became a professor in 1824. He died 11th June 1857. He has acquired great celebrity by his etchings in outline of Schiller and Goethe—those of Goethe's *Faust* being particularly well known—Fouqué's tales, and Shakespeare. His masterpiece is 'The Chess-players' (Man against Satan). Retzsch likewise painted admirably in oils.

Reuchlin, JOHANN, also known by his Græcised name of *Capnio*, humanist and one of the first promoters of Hebrew studies in Germany, was born at Pforzheim in the Black Forest, 28th December 1455. He received his earliest education at Schlettstadt, and in 1473 was appointed travelling companion to Prince Friedrich of Baden. In this capacity he visited Paris, where he studied Greek under Hermonymus of Sparta, besides assiduously practising the composition of Latin. Two years later Reuchlin went to Basel, where he continued his study of Greek, and wrote his Latin dictionary, *Vocabularius Breviloquus* (1476). In the same year he paid a second visit to France, studied law at Orleans (1478) and at Poitiers, then, returning to Germany (1481), set up as lecturer at Tübingen. In 1482 and again in 1490 he was in Italy on the business of Duke Eberhard; in 1492 we find him studying Hebrew under a learned Jew, Jacob Jehiel Loans, the imperial physician. In 1496 Reuchlin went to Heidelberg, where he became the main promoter of Greek studies in Germany, though not a public lecturer. In 1498 he was sent to Rome by Philip the Elector-palatine, and applied himself more vigorously than ever to the study of Hebrew and Greek. Reuchlin returned to Stuttgart in 1499, and in 1500 obtained a judicial appointment. In 1506 appeared his *Erudimenta Linguae Hebraice*. His Hebraic studies, which embraced the post-biblical Jewish literature, were drawing him into bitter strife with learned Jews, Jewish proselytes, and the Dominicans, and directly and powerfully helping on the Reformation. It was in 1510 that Johann Pfefferkorn, a Jewish proselyte, in the

true spirit of a renegade, called upon princes and subjects to persecute the religion of his fathers, and especially urged the emperor to burn or confiscate all Jewish books except the Bible. Reuchlin remonstrated, maintaining that no Jewish books should be destroyed except those directly written against Christianity. This tolerant attitude drew upon Reuchlin the enmity of the Dominicans, and particularly the inquisitor, Jakob von Hoogstraten. These enemies of Reuchlin held possession of the universities of Paris, Louvain, Erfurt, and Mainz; but all the distinguished and independent thinkers in Germany were on the side of the brave and humane scholar. Among the Reuchlinists we may especially mention the names of Ulrich von Hutten (q.v.) and Franz von Sickingen (q.v.); and to this controversy we owe the *Epistolæ Obscurorum Virorum* (q.v.). A quarrel broke out between Ulrich Duke of Württemberg and the Swabian League, in the course of which Reuchlin became a prisoner of Duke Wilhelm of Bavaria, who, however, in 1520 appointed him professor at the university of Ingolstadt. In 1522 the plague broke out at Ingolstadt, and Reuchlin taught once more for a term at Tübingen, but soon after fell sick and died at Liebenzell, near Hirschan, on the 30th of June.

Reuchlin edited various Greek texts, published a Greek grammar, a whole series of polemical pamphlets, and a satirical drama (against the Obscurantists), and in *De Verbo Mirifico* and *De Arte Cabalistica* shows a theosophico-cabbalistic tendency. See Lives by Barham (Lond. 1843), Geiger (1871), Horowitz (1877); a work on him by Holstein (1888); and W. S. Lilly's *Renaissance Types* (1901).

Reumont, ALFRED VON, German historian, was born at Aachen on 15th August 1808, and died there on 27th April 1887, having from 1829 to 1860 followed a diplomatic career, chiefly in Italy. His numberless works deal mainly with Italian history, and one of the best known, his *Lorenzo de' Medici*, appeared in English in 1876.

Réunion, formerly called ÎLE DE BOURBON, an island belonging to France, lying in the Indian Ocean, 115 miles SW. from Mauritius and 350 E. from Madagascar. An ellipse in shape, it has an area of 764 sq. m., being 38 miles in length and 28 in breadth. Population, 174,000, mostly white. The backbone of the island is a volcanic range, culminating in two higher peaks, the Piton des Neiges (10,069 feet) in the centre of the island, and in the south-east Piton de Fournaise (8612 feet), one of the most active volcanoes in the world. The central parts of the island between these volcanic peaks consist of plateaus and terraces, separated by deep cauldron-shaped valleys and narrow, but profound, gorges and ravines. Piton de Fournaise is surrounded by a vast dreary desert called the *Pays Brûlé* ('Burnt Land'). Except in the mountainous parts the soil is in general very fruitful. The scenery is often beautiful. Streams, although not large, are very numerous, and fall in cascades to the sea. The climate is hot, but on the whole not unhealthy. Rainfall averages 45½ inches in the year. Cyclones sometimes occur during the hotter and rainy part of the year (November to April), and high spring-tides occasionally do serious damage during the remaining drier months. One-third of the island is cultivated, one-third under timber, and one-sixth is grass-land. Tropical fruits, sugar (the staple crop), coffee, vanilla, cinchona, maize, vegetables (potatoes, &c.), spices, tobacco, and similar products are grown. By far the most important export is sugar; others are coffee, vanilla, rum, potatoes, and tapica. The capital is St Denis, on the north coast, with 21,500 inhabitants, a college, a botanic garden, &c.; it is a bishop's seat. The remaining towns are St Paul, on the north-west,

with 19,000 inhabitants, and with marine workshops; St Pierre, on the south-west coast, pop. 28,000; Pointe des Galets, a port between St Denis and St Paul; Salazie, with warm mineral springs, a health-resort; and St Louis. The coast towns are connected by a railway 78 miles long. The colony is administered by a governor and an elected council. Réunion and Mauritius were discovered by the Portuguese navigator, Mascarenhas, and named after him the Mascarene Isles. The French took possession of this island in 1649, and called it Bourbon, which was changed to Réunion at the Revolution, and to Ile Bonaparte in 1809. Réunion has been the official name since 1848. The island was in the possession of Britain from 1810 to 1815.

Re'us, a town of Spain, 58 miles by rail SW. of Barcelona. Its prosperity dates from about 1750, when a number of English merchants settled there. It is a busy centre of the cotton, silk, and silk-ribbon industries, and manufactures wine, soap, brandy, and leather. Pop. 30,000.

Reuss, a tributary of the Aar in Switzerland, rises on the northern face of the St Gothard, flows northwards past Andermatt and Amsteg, between which places its bed lies at the bottom of a wild and narrow gorge, spanned by the Devil's Bridge and other wonders of Swiss roadmaking, and enters the southern end of the Lake of Lucerne. This it leaves again at its north-western end, at the town of Lucerne, and, again going nearly due north, reaches the Aar near Windisch (Aargau). Its length is 90 miles; its basin, 1317 sq. m.

Reuss, the name of two former principalities of Germany, lying between the republic of Saxony on the E., Prussian Saxony on the N., and Bavaria on the S. The principality of Reuss-Greiz (the Elder Line) was 122 sq. m. in extent. The chief town was Greiz (q.v.). The principality of the Younger Line was Reuss-Schleiz-Gera; area, 319 sq. m.; capital, Gera. The surface is hilly, being traversed by the Frankenwald (Thüringerwald), whose summits reach upwards of 2000 feet in height. The chief rivers are the Saale and the White Elster, the valleys of which are well cultivated. More than a third is covered with forests; cattle are fattened on the extensive meadows; and woollen, cotton, and silk goods are woven. The reigning prince of each state was a hereditary sovereign, and always bore the name of Heinrich. The two principalities became republics in 1918, united in April 1919, and in December Reuss and other states united to form the republic of Thuringia (q.v.).

Reuter, FRITZ, German humorist, was born at Stavenhagen ('Stemhagen') in Mecklenburg-Schwerin, on 7th November 1810. His father, the burgomaster, sent him to Rostock and Jena to study law. But in 1833 he was arrested and condemned to death—in common with other members of the Jena *Burschenschaft* (q.v.) *Germania* he had indulged in wild students' talk about the fatherland and national unity; that was his only offence. The capital sentence was commuted to one of thirty years' imprisonment. Young Reuter was dragged from one fortress prison to another in Prussia and Mecklenburg, and often subjected to great hardships and even wanton cruelty, and did not regain his freedom until Frederick-William IV. ascended the throne of Prussia in 1840. Although a general amnesty gave him back his liberty after seven years of imprisonment, his career was spoiled and his health incurably ruined; an affection of the stomach created in him an abnormal craving for strong drink, which he never conquered. It was eleven years more before he settled down to his

life's work. His father, a stern and severe man, having in the meantime turned his back upon him as a good-for-nothing, he tried to resume his legal studies, learned farming, taught pupils, but lived chiefly on the kindness of a friend and on a small annuity left him by his father, who died in 1845. Reuter began to write first in High German; but having thrown into rough verse form, in Low German, the jokes and merry tales of the countryside, he published them—*Läuschen un Rimels* (1853), and the book became at once a great favourite with all who spoke and read Low German. Two years later he wrote an equally successful Low German poem, *Reis' nah Belligen*, describing in broad humorous fashion the journey of certain peasants to Belgium in search of culture. The next seven years (1856–63), passed at Neubrandenburg, were the period in which he wrote his greatest books. The first of these were a second volume of *Läuschen un Rimels* (1858), and the deeply tragic poem *Kein Hüsung* (1858), picturing the wretchedness of the semi-serfs on the great Mecklenburg domains. The rest, except *Hanne Nüte* (1860), a poetic narrative in which birds figure prominently as speaking characters, were all written in prose in Low German (*Platt-Deutsch*), and were published under the general title of *Olle Kamellen*, which may be given in English as *Old-time Stories*. These books, more especially *Ut de Franzosentid* (1860; Eng. trans. as *The Year '13*, 1873), *Ut mine Festungstid* (1862), and his masterpiece, *Ut mine Stromtid* (1862–64), spread Reuter's fame abroad through all Germany, and lifted him to the proud position of Germany's greatest humorist next after Jean Paul; as a literary artist he ranks in many respects above Jean Paul. These tales have the indubitable flavour of real life: they deal with the characters and doings of rural Mecklenburg, are told with the verve of the born story-teller, and are bathed in the purest and sunniest humour. Like every true humorist, Reuter is master of a tender pathos. Uncle Bräsig in *Stromtid* is one of the greatest creations of German literature. The best witness to Reuter's own character is the history he wrote (*Ut mine Festungstid*) of the miserable seven years he spent in prison: the book has not one word of bitterness or a single trace of revengeful feeling throughout; good-nature and humour are its dominant notes. Besides the works quoted, Reuter also wrote *Schurr Murr* (1861), sketches of country life, partly autobiographical; *Dörchläuchting* (1866), a kind of humorous historical novel; the satirical *Ur-geschicht von Meckelnborg* (1874), and others. Reuter lived at Eisenach in Thuringia, at the foot of the Wartburg, from 1863 till his death on 12th July 1874.

His *Sämmtliche Werke* were published in 13 vols. at Wismar in 1863–68; to these Adolf Wilbrandt added two more in 1875, together with a biography. There have been several editions since—one by Müller in 19 vols. in 1905; and lives or books about him by Glagau (2d ed. 1875), Ebert (1874), Gaedertz (1890, 1900, 1905), Naatz (1895), and Brandes (1899). See collections of his letters published in 1895 and 1909.

Reuter, BARON PAUL JULIUS DE, was born at Cassel, 21st July 1821. In Aachen he formed in 1849 an organisation for collecting (partly by pigeon post) and transmitting by telegraph commercial and financial news; and in 1851 he transferred his headquarters to London. As telegraphs extended throughout the world he multiplied the ramifications of his system till it embraced the remotest regions. He even maintained couriers where the telegraphs did not reach—e.g. between Pekin and Kiakhta. In 1865 Reuter converted his business into a limited liability company, and in 1871 he was made a

baron of Saxe-Coburg-Gotha. In 1872 the Shah of Persia gave him the sole right of making railways, working mines, forests, &c.—a monopoly never made effective, and annulled in 1889, when the concession of the Imperial Bank of Persia was conferred on him. He died 22d February 1899. For the development of 'Reuters' see H. M. Collins, *From Pigeon Post to Wireless* (1925).

Reutlingen, a town of Württemberg, 8 miles E. by S. of Tübingen and 20 S. of Stuttgart. Many of its houses are old and picturesque. The church of St Mary (1247–1343), with a tower 243 feet high, is a noble Gothic edifice. Woollen and cotton yarns are spun, and cloth, leather, cutlery, hosiery, paper, &c. are manufactured. Reutlingen was formerly a free imperial town and a member of the Swabian League; it came to Württemberg in 1802. Pop. 30,000.

Reval, or REVEL (Est. *Tallinn*), a Baltic seaport, capital of Esthonia, stands on a small bay on the south side of the Gulf of Finland, opposite Helsingfors (52 miles distant), and 232 miles by rail WSW. of St Petersburg. It is divided into the (old) upper and (new) lower towns. The former (Domburg) contains the cathedral and the castle. The new town extends outside the city walls. There are several mediæval guild-houses with valuable archives, an important museum of antiquities, and a palace built for Catherine by Peter the Great. The Church of St Olai has a tower 463 feet high. Reval exports grain (wheat, oats, rye, barley) and flax, veneer and joiner's work, asbestos, mineral oil, glycerine, hides, &c.; and imports manufactured goods, coal, &c. Pop. (1922) 122,419. Reval was founded by Waldemar II. of Denmark in 1219, and became a flourishing Hanse town. It was long held (from 1346) by the Livonian Knights, was made over to Sweden in 1561, and was besieged by Peter the Great and annexed to the Russian empire in 1710. In 1713 a naval harbour was founded.

Revalenta Arabica. See LENTIL.

Reveill   (the true French form being *r  veil*), the morning call for troops. See BUGLE.

Revelation is a familiar theological expression, properly used of all divine knowledge communicated through whatever source. Conscience and reason are in themselves modes of revelation, in so far as they witness to us of the divine laws which bind our moral life, and in harmony with which the health and happiness of that life can alone be found. History is also a species of revelation, unfolding, as it does, the same divine laws collectively in the race. Then nature reveals the divine power, wisdom, and goodness; and science, the interpreter of nature, in so far as it makes known the great laws governing the material universe, truly makes known the divine will to us. But it is with the Scriptures of the Old and New Testament that the idea of revelation has come to be especially associated. These books, however, are only the highest or most distinguished form or medium of revelation. They contain a revelation for us; but the revelation is not the record, but the knowledge which the record conveys to our minds. See BIBLE, INSPIRATION.

Revelation, BOOK OF, the last book of the New Testament canon. It is also called the Apocalypse, and belongs to the class of writings known as Apocalyptic. Apocalyptic literature is peculiar to the Jewish people. It began with the Book of Daniel, though Apocalyptic elements are found in Ezekiel and some of the older prophets, and flourished in the intermediate period between the Old and New Testaments. Among the most important Apocalypses may be mentioned the

Book of Enoch, the Apocalypse of Baruch, the Assumption of Moses, the Ascension of Isaiah, and the fourth Book of Ezra, which is probably almost contemporary with our Book of Revelation. The leading ideas of Apocalyptic are: (1) The belief in the near approach of the Day of the Lord, when the kingdom of saints would be set up on earth; (2) The vindication of God's own people, who are to receive supremacy over the nations of the earth; (3) The execution of a terrible punishment upon their enemies and persecutors; (4) The belief that the pious dead would rise to partake in the triumph of God's people. (5) Linked with this belief in the establishment of the Kingdom of God on earth was the conviction that in the future life good men would be rewarded and compensated for their sufferings, and bad men would receive punishment for their crimes and sins.

The book of Revelation is an attempt to combine these Apocalyptic ideas with the Christian faith. It must always be open to question, however, whether in the book of Revelation it is Christianity that has captured Apocalyptic or Apocalyptic that has captured Christianity.

Circumstances under which the Book was written.

—The book of Revelation was written during a time of fierce persecution. The clash between the Roman Empire and the Christian Church had already commenced. The establishment of Emperor worship as the national religion of the Empire was a challenge to Christianity. It was impossible for devoted Christians to take part in the rites and ceremonies which Emperor-worship entailed. Their refusal led to a charge of disloyalty, and brought them into bad odour with the populace. Only one martyr is mentioned by name in the book itself (Antipas ii. 13), but there is a reference in vi. 9 to 'the souls of them that had been slain for the word of God and for the testimony which they held'—which shows that martyrdoms must have been common at the time. According to the statement in xiii. 15, an edict was issued that as many as would not worship the image of the beast (i.e. the Emperor) should be killed. Moreover, the profession of Christianity entailed social ostracism and a commercial boycott. The devotees of the cult of Caesar wore on their right hands or foreheads a special sign, and all who did not bear the 'mark of the beast,' as it was called, were not allowed to buy or sell in the markets. The very existence of Christianity was at stake. And, just as the book of Daniel was written to encourage the Jewish people to remain loyal to God under the fiery persecution of Antiochus Epiphanes, so the book of Revelation was composed to comfort Christians in the distress caused by the effort of Domitian to destroy the Christian faith.

Methods of Interpretation.—The book of Revelation has always been a riddle and enigma to Christian thinkers. Even before the days of Dionysius of Alexandria there were critics who attempted to refute the book as a whole, criticising every chapter and pronouncing it unintelligible and nonsensical. Many attempts have been made to find the key for the interpretation of the book. (1) One theory generally known as 'the continuous historical' maintains that the book contains a complete chart of human history from the writer's own day to the end of the world. Part of it therefore belongs to the past and part of it is still to be realised in the future. This explanation, however, is generally discredited to-day. The writer says specifically that his statements 'must shortly come to pass.' He expects that his prophecies will be realised in his own age. Moreover, it is impossible to identify the forecasts of the Apocalypse with anything that has happened in human history during the 1900 years which have elapsed between the

writer's day and ours. (2) The second theory, which is generally called 'the futurist,' holds that the prophetic elements in the book of Revelation refer to the events which will happen in connection with the end of the world. They are not concerned at all with the intermediate history, but deal only with the drama which is to be enacted at the final *dénouement*. This theory is open to the same objections as the first. It is in conflict with the writer's explicit statements with regard to the proximity of the events recorded, and it is false to the whole spirit of prophecy. (3) A third theory, which is associated with the name of Dr Milligan, rejects the two preceding views as impossible and absurd, and maintains that the book of Revelation deals with the eternal warfare between the principles of good and evil in the history of the Church. The details must not be pressed—they are merely the poetic imagery in which the theme is worked out. 'The Apocalypse resembles all true prophecy which, whether in the Old Testament or the New, contains mainly the enunciation of great principles of God's government of men and not the prediction of special events. Even when the latter are predicted it is generally less for their own sake than for the principles they illustrate' (*Lectures on the Apocalypse*, p. 154). 'Thus, then, we are not to look in the Apocalypse for special events, but for an exhibition of principles which govern the history both of the world and of the Church.' Milligan's theory fails to meet the real needs of the case. It imposes an interpretation upon the book rather than elicits one from it. It evades the real difficulties and ignores the real problems. It was propounded at a time when Apocalyptic was a *terra incognita* and the real key to the meaning of the book had not yet been discovered. (4) The theory which is generally accepted by modern scholars is called 'the preterist.' It insists that the book of Revelation can only be interpreted in the light of the circumstances under which it was first written. It is relevant only to the situation which existed in the 1st century. Its predictions can only be explained in the terms of the history of the 1st century. The writer calls to his aid the ideas of Apocalyptic in order to meet the needs of his own age. He looked for the fulfilment of his prophecies within the limits of his own generation. He expected in his own day a great act of Divine intervention to vindicate the saints and inflict punishment upon their persecutors. His predictions were never fulfilled in the sense in which they were uttered. The end did not come as he anticipated; but in a different and a greater way God did protect his people and enable them slowly but surely to conquer the world.

The Question of Authorship.—The only indication which the book itself offers with regard to its author is found in the opening verse, where the writer's name is said to be John, and he is described as one 'who bore witness to the word of God' (i. 2), 'a brother and partaker in the tribulation of the saints' (i. 9), an exile in the isle of Patmos, 'for the word of God and the testimony of Jesus.' These statements do not in themselves offer us any sure ground for identifying him with the Apostle John, but later Christian tradition assumed this identification as a fact. Justin Martyr is the first to make a categorical assertion on the subject. 'A certain man,' he writes, 'whose name was John, one of the apostles of Christ, prophesied in a revelation made to him that the believers in our Christ should spend a thousand years in Jerusalem.' This opinion was not challenged till the 3d century, when Gains of Rome (210) and Dionysius of Alexandria denied on grounds of style and subject-matter that the fourth gospel and the book of Revelation could be the work of the same author.

Recent modern criticism corroborates the protest of Dionysius on the following grounds: (a) Ancient testimony is by no means unanimous as to the Johannine authorship. In many quarters the book was rejected from the New Testament canon, and this could not have been the case if its apostolic authorship had been universally accepted. (b) In subject-matter the character of the two books is widely different. In the fourth gospel the Apocalyptic element is at a minimum—in the Apocalypse it dominates every page of the book. (c) In style and phraseology there is the utmost diversity between the two documents. No man could possibly have written them both unless in the interval his style—and not only his style, but the personality of which that style was the expression—had been completely revolutionised. In fact, every unbiassed critic is compelled to admit that from almost every point of view the two books stand at opposite poles of thought. Some modern scholars have connected the authorship of the book with John the Presbyter, but the evidence is far too slender to warrant the deduction which is based upon it. Nor is it a likely theory to suppose that the author pseudonymously attempts to father his work on either John the Apostle or John the Presbyter. If that had been the case his description of the assumed author in the first chapter would have been much more definite and precise than it actually is.

The Sources of the Book.—Modern criticism has attacked the unity of the book and tried to prove that as it stands it is a compilation from many different sources. The first suggestion was made by Evanson as far back as 1792. Fastening on the differences which mark off the first three chapters from the rest of the Apocalypse, Evanson maintained that the letters to the seven churches, together with the introductory paragraphs of chap. 1, did not properly belong to the book at all, but were a later insertion. Vogel, in 1811-16, made the interesting suggestion that the Apocalypse was the work of two different authors—one of whom was John the Apostle, and the other John the Presbyter. His theory was worked out more fully in 1820 by Bleek, who thought the actual author of the book was John the Presbyter, who combined together two different works—the one containing chap. iv. 11, written before the fall of Jerusalem, the other containing chap. xii. xxii., and written after A.D. 70, foretelling the doom of Rome. The theory of a composite origin for the book received a new and important stimulus by the publication of Volter's elaborate theory in 1882. The composition of the Apocalypse passed through five stages: (a) The original groundwork was written by the apostle himself in 65. (b) To this ground he subsequently made additions. (c) Other additions were made in the reign of Trajan. (d) Others, again, in the reign of Hadrian. (e) The final redaction did not appear till the time of Antoninus Pius. A new turn was given to the discussion in 1886 by Vischer, who maintained that the groundwork containing the bulk of the Apocalypse was of Jewish origin, and that this was subsequently expanded by a Christian writer who added the opening and closing chapters and made a few insertions in the general body of the book. Vischer's theory caused a great stir when it was first produced, and won the adhesion of Harnack, who said that it made him feel 'as if scales had fallen from his eyes.' But the theory has failed to secure general support, because it is felt that the Christian elements are so woven into the tissue of the book that they cannot be so lightly detached as Vischer imagined. The compilation hypothesis has been further developed in recent times by Weyland (1886), Ménégos (1888), Kohler and Eugène de Faye (1892), much of which is based

upon Spitta's important work (1889). Most of these theories assume as their basis two Jewish Apocalypses, and maintain that these have been woven together by a later Christian redactor who also inserted much new material of his own. Other modern scholars—e.g. Weizsäcker, Sabatier, Bousset, Schon, and McGiffert, while regarding the compilation hypothesis as too complicated to admit of demonstration, think that there is clear evidence that the writer of the Apocalypse incorporated a large amount of old material into his work. There is no general agreement as to the details, but all these scholars think that there is sufficient evidence to prove that the bulk of chap. xi. and xii. is derived from older sources—and it is probable that similar material is inserted in chap. vii., viii., xiii., xviii., and xix. Dr Charles, in his investigations (*Studies in the Apocalypse*, 1913, and in his *Commentary*, 1920), thinks that it is possible to find traces of the combination of two Apocalypses in chap. viii., and he holds, too, that chap. xx.-xxii. have been disarranged in process of transmission. Gunkel's great book *Schöpfung und Chaos* (1895) made a contribution of a different kind to the interpretation of the Apocalypse. He is far more interested in the origin of the ideas of the book than in its literary analysis, and thinks it is only through the study of comparative mythology that the key for understanding the Apocalypse will be found. The best account of the modern theories is to be found in Moffatt's *Introduction to the Literature of the New Testament*, pp. 489-496.

The Date of the Book.—Ancient tradition assigns the book to the reign of Domitian (81-96). Irenæus, for instance, says 'the vision of the Apocalypse was seen not a long time ago, but almost in our own generation, at the end of the reign of Domitian.' The statement of Irenæus is endorsed by Eusebius and Jerome; and, though it is not unanimously accepted (since Epiphanius dates the banishment of John in the reign of Claudius, and the Syriac versions in the reign of Nero), it represents the predominant opinion of the early church. Some attempts, however, have been made in modern times to set aside this tradition and give an earlier date to the book. Both conservative and advanced critics have for different reasons combined to put back the date of the book. The conservatives were anxious to make the interval between the composition of the Apocalypse and the fourth gospel as long as possible, because they claimed John as the author of both books, and were compelled to find time for the development of his ideas and his linguistic style. Radical critics, on the other hand, like Burr and the Tübingen school, felt that an early date fitted into their scheme much better than a later. The internal evidence upon which those scholars who attribute the book to the reign of Nero mainly rely is the statement in xi. 1, which implies that the temple at Jerusalem is still standing. Those scholars, on the other hand, who prefer a date in the reign of Vespasian rely upon the reference to the seven kings in xvii. 11, and urge that this statement implies that the reigning emperor at that time was Vespasian; and, moreover, the frequent allusions in the book to *Nero redivivus* make it quite certain that Nero himself could not have been alive at the time when the book was published in its present form. There are, however, several fatal objections to a date earlier than the time of Domitian. (1) There is no evidence that the cult of Cæsar worship attained the dimensions implied by the book of Revelation before the time of Domitian. As Moffatt says, 'No worship of the Emperor which is adequate to the data of the Apocalypse was enforced till Domitian's reign.' (2) There is no evidence that there was before the time of Do-

mitian any such persecution in Asia as is described in the Apocalypse. The Neronian persecution was limited almost entirely to Rome, and, though there may have been spasmodic outbreaks in Asia between Nero and Domitian, there is no proof that they were as serious as the book of Revelation implies. (3) The allusion to the 'eighth emperor' in xvii. 11 carries us beyond the time of Domitian—at least upon what seems to be the most reasonable interpretation of the passage. There seem to be no adequate grounds, therefore, for disputing the Domitianic date. The indications which seem to point to an earlier period are probably best explained by supposing that they represent earlier material which the writer incorporated into his book.

The Value of the Book.—The Apocalypse seems at first sight to be the book of least spiritual value in the New Testament, especially now that modern criticism has robbed it of its prophetic interest. It is not easy to adjust the mind to the new perspective, but at any rate certain things appear to be visible through the mist. (1) The book is a record of the triumph of faith. Christianity has never had to face a more desperate situation than in the reign of Domitian. It was threatened with annihilation, and it seemed useless to struggle against the antagonism of the Empire. And yet it was in those dark and perilous days that the faith of the church shone out most brightly. It was possessed with the invincible conviction that God would intervene in order to save his chosen people. It pictured in its own way the form which the intervention would take. As far as the form was concerned, its faith was doomed to be disillusioned. But in other ways—ways surpassing what was possible to the imagination of his people at the time—God did vindicate his righteousness and save his church from disaster. As a story of one of the greatest achievements of faith known to history, the book of Revelation is of incomparable value. (2) In its conception of Christ it has made a useful contribution not only to faith but to Christology. Bousset has asserted that 'the Christology of the Apocalypse is the most advanced in the New Testament.' This perhaps may be an exaggeration, but it can scarcely be denied that no more exalted conception of Christ is to be found than in its pages. Much of its Christological interpretation is couched in Jewish Messianic categories, and sometimes, as in chap. xi., mythological ideas are pressed into service, and yet no description of Christ in the pages of the New Testament exceeds in poetic beauty and richness of thought the portrayal which we find in i. 12–18. (3) The letters to the Seven Churches will always have their appeal to the Church of Christ, because they deal with conditions and difficulties which for the most part are not confined to the 1st century but are common to all the ages. (4) The book does bear a remarkable witness to what must always be an essential element in the Christian faith—the belief in the ultimate victory of Christ.

The best edition of the Greek text of the Apocalypse is that of B. Weiss (with critical notes), 1891. The best modern commentaries are those of Bousset (2d ed. 1906), Holtzmann-Bauer (1908), Spitta (1889), Swete (1906), Benson (1900), C. A. Scott ('Century Bible'), Moffatt ('Expositor's Greek Testament'), A. Ramsay ('Westminster New Testament'), Charles ('International Critical Commentary', 1920). The following books deal with problems of criticism and interpretation. Peake, *The Revelation of John* (1919); Bleek, *Lectures on the Apocalypse* (1875); R. H. Charles, *Studies in the Apocalypse* (1913); W. M. Ramsay, *The Letters to the Seven Churches* (1904); Milligan, *Lectures on the Apocalypse* (1892), *Discussions on the Apocalypse* (1893); C. H. Turner, *Studies in Early Church History*, pp. 189 ff (1912); Burkitt, *Jewish and Christian Apocalypses*.

See also articles in Bible Dictionaries; New Testament Introductions (especially Moffatt, Zahn, and Jülicher); books on the Apostolic Age (especially Pfeiderer, *Primitive Christianity*, and Weizsäcker). Refer also to the books mentioned in the text of the article.

Revels, MASTER OF THE, an officer attached from an early date to the English royal court, whose function it was (distinct from the Lord of Misrule; see FOOLS, FEAST OF) to preside over the amusements of the court, especially during the Christmas holidays. A functionary of the kind seems to have been required in the days of Edward III.; under Henry VII. he was a recognised officer. He became a permanent appendage to the English court in the reign of Henry VIII., and his duties included the keeping of the tents and pavilions which accompanied the sovereign on a royal progress, as also the keeping of the dresses and masks used in entertainments given at court, and the providing of new ones when required. In Queen Elizabeth's time the Mastership of the Revels extended his authority to a general supervision of the stage, and his office was absorbed in that of the lord chamberlain early in the 17th century. See various works by Sir E. K. Chambers and by Mrs C. C. Stopes.

Revenue. The inland revenue is distinguished from the Customs Duties (q.v.), and includes (1) the Excise (q.v.), comprising alcohol duty, liquor and luxury licenses; (2) Stamps, with the 'death duties'—probate, account, legacy, and succession duty; (3) Taxes—property and income tax, &c. (see TAXES). The right of the Commons to regulate taxation and the outlay of the national income is treated at PARLIAMENT.

Reverberatory Furnace, a furnace so constructed that ores and other materials may be heated in it without coming in direct contact with the fuel. It consists essentially of three parts—viz. a fireplace at one end; in the middle a flat bed or sole, on which the material to be heated is placed; and at the other end a chimney to create a draught and to carry off the smoke or fume. Between the fireplace and the bed a fire-bridge is placed, and the whole built over with a flat arch, dipping towards the chimney. The flame plays over the fire-bridge, and the heat is reflected, or *reverberated*, on the material beneath; hence the name. See COPPER, LEAD, and IRON (puddling furnace).

Revere, PAUL, famous for his midnight ride, was born in Boston, Massachusetts, 1st January 1735, the son of a goldsmith from Guernsey, whose trade he followed after serving as a lieutenant of artillery in the expedition against Crown Point (1756). He also engaged in copperplate printing, and before the Revolution constructed a gunpowder-mill. A keen patriot, he was one of the party that destroyed the tea in Boston harbour, and he was at the head of a volunteer committee, consisting of thirty young mechanics, who formed a secret society to watch the British. When it was known that the latter intended to move, Revere crossed over to Charlestown, and on April 18, 1775, the night before Lexington and Concord, at a signal rode on to Lexington and to Lincoln, rousing the minute-men as he went; at Lincoln he was stopped, but a companion succeeded in reaching Concord. During the war he rose to lieutenant-colonel of artillery; afterwards he returned to his goldsmith's work, and in 1801 founded the Revere Copper Company at Canton, Massachusetts. He died 10th May 1818. His ride is the subject of a well-known poem by Longfellow.

Reverend (Lat. *reverendus*, to be respected), a title of respect given to the clergy. In the

Anglican Church deans are 'Very Reverend'; bishops, 'Right Reverend'; and archbishops, 'Most Reverend.' In Scotland the clergy in general are 'Reverend,' while it is now customary to use 'Right Reverend' of the moderator of the General Assembly, and 'Very Reverend' of ex-moderators and principals of universities, being clergymen. The style 'Reverend' is generally adopted by and given to the clergy of the different dissenting bodies; and in 1876 the Privy-council decided on appeal that there is no law restricting it to ministers of the Church of England. There have, however, been instances in which some dissenting ministers have repudiated it. See ADDRESS (FORMS OF).

Reversion is the right to the enjoyment of money, or of any kind of property, postponed until or contingent on the happening of a given event. Reversions are usually divided into three classes: Absolute Reversion, in which the emergence of the rights is certain, Contingent Reversion, and Reversionary Life Interests. In the first case, when the date of the emergence is also fixed, the value of the reversion is dependent merely upon the operations of interest (see INTEREST). When the date of the emergence of the reversionary right is uncertain, the purchase in an individual case must always be a speculation; but if there are a sufficient number of such rights, postponed to events of which there are sufficient observations from which to deduce laws of average, then the marketable value is easily calculated. For example, it is required to know what is the immediate value of £100 payable certainly on the death of a man aged sixty. Here the value of the reversion is £100, under deduction of the prior life interest, which in this case is the present value of an annuity equal to the interest of £100 on the life of a male aged sixty. When an insurance company buys a reversion, it is simply buying that which it sells when it grants a policy of life assurance. In the former case, however, an office, to secure its expenses and profits, will assume a high rate of interest and a long life; in the latter case, for the same reason, it will assume a low rate and a short life. By the Sale of Reversions Act, 1867, no purchase of a reversion is challengeable on the ground of undervalue merely. Where the reversion is contingent, problems arise whose solution requires the utmost skill on the part of the actuary. For instance, B, aged thirty, wishes to borrow £100 on the security of a sum payable to him in the event of his surviving A, aged fifty-eight. Here the security being doubtful, it could only be rendered marketable by assuring a sum to be paid in the event of B dying before A; and there would remain the important question of what this sum should be, so as to cover the loan and the premiums of assurance with yearly accumulations on both. The value of a reversionary life interest is found by deducting the value of a joint life annuity from the value of the annuity on the life of the survivor (see the Institute of Actuaries' text-book, part ii.).

In law a reversion is that right to property which remains after some particular estate has ceased which had been granted by the owner. Thus, before 1926, if A had a life-estate in B's property, and after he died the property returned to B, B was said to have the reversion or to be the reversioner. But by the passing of the Law of Property Act, 1925, after 1926 the only legal reversions are: (1) The estate of a tenant in fee simple where the land has been granted to another for a term of years; and (2) The estate of a tenant for a term of years who has granted a smaller term of years to a sub-tenant. Thus, if A is tenant in fee simple of land and grants it to B for 99 years, A has a freehold reversion. In Scots law reversion means the

right of redemption retained by a borrower over an estate disposed in security.

Reversion, a term applied when organisms exhibit ancestral traits which their parents do not possess, e.g. a fourth toe on a guinea-pig's hind-foot, or cross stripes on the fore-quarters of a horse. But many phenomena which have been called reversions admit of other interpretations. See ATAVISM, HEREDITY.

Review. See PERIODICAL.

Revilla-Gigedo, a rocky and uninhabited island group in the Pacific, 400 miles west of the coast of Mexico, to which it belongs. The largest of the islands is 20 miles long.

Révillé, ALBERT (1826-1906), a French Protestant theologian, was born at Dieppe, studied at Geneva and Strasburg, and was pastor of the Walloon Church at Rotterdam in 1851-72. Then he lived near Dieppe until his call in 1880 to the chair of the History of Religions in the Collège de France.

Revising Barrister. See BARRISTER.

Revival, or REVIVAL OF RELIGION, a term employed to denote an increase of faith and piety in individual Christians, particularly after a period of religious declension, and also an increase of religion in a community or neighbourhood, both through the revival of those who are already religious, and through the conversion of the previously irreligious. Such religious movements frequently extend, more or less generally, over a neighbourhood, or sometimes over a country. Instances of a similar kind are recorded in the Scriptures as occurring both in the history of the Jews and in the early history of the Christian church, particularly in the effusion of the Holy Spirit on the day of Pentecost, and afterwards in connection with the ministry of the apostles, when many were converted through a single discourse, or, in other cases, evidently within a short time. In the middle ages revivals took place in connection with the Crusades and under the auspices of the monastic orders (see CHURCH HISTORY); and sometimes with repulsive adjuncts, as in the case of the Flagellants (q.v.) and the Dancing Mania (q.v.). The Reformation of the 16th century, and the more partial movements of the same kind which preceded it, are also regarded as essentially revivals of religion—the Reformation itself the greatest which has taken place since the apostolic age. In Scotland there were notable 'works' in 1625 at Irvine and Stewarton, in 1630 at Kirk-of-Shotts, and in 1638. After the Reformation the next wide-spread movement of the kind was that in the first half of the 18th century from which the Methodist churches originated. It was accompanied with many circumstances similar to those which have attended later revivals of religion. The term revival did not begin to be commonly employed till after this period; and the revival which took place in New England and other parts of North America about the same time under Edwards, Bellamy, and the Tennents was generally designated the Great Awakening. The beginning of this revival seems to have had no connection with the Methodist movement in England, although subsequently they became connected through Whitefield's visits to North America. There were revivals at Cambuslang in 1742, and at Moulin in Perthshire in 1798-1800. A very extensive revival in Wales resulted in the formation of the Welsh Calvinistic Methodist Church, but was not confined in its effects to those who became connected with that church. Local revivals also in some instances attended the ministry of evangelical ministers of the Church of England; and in America there were revivals in 1796, in

1812-15, and again in 1827-32. In 1839 the attention of all Scotland was drawn to a religious movement at Kilsyth, originating in the preaching of William C. Burns (q.v.), and this was followed by similar occurrences in a number of other places, more or less evidently connected with it. The great American revival of 1859-61 began in New England, particularly in Connecticut and Massachusetts, and rapidly extended to New York and over the middle and western states. It was not generally attended with scenes of great excitement; strong but calm religious feeling was its general characteristic. It spread all over the United States, and it was believed that in a single year half a million converts were received into the churches. A similar movement took place in Ireland, and rapidly extended over the whole north, and subsequently to Scotland, Wales, and some parts of England, characterised less by excitement than intensity of religious feeling. Another remarkable revival originated about 1873 in the labours of two American evangelists, Moody (q.v.) and Sankey, and, like the Welsh revival under Evan Roberts in the winter of 1904-5, evoked little sensationalism. From America again came Torrey, Alexander, and Chapman. The Camp-meetings (q.v.) have been a great feature of American Methodism. The Salvation Army carries on its work largely by methods known as revivalistic. Revivals of religion have occurred also in other parts of the world. Sometimes they come as the reaction from national disasters, or in times of national crises, or are associated with natural phenomena, earthquakes, comets, eclipses, and so forth. Conversion (q.v.) is more likely to take place in the case of people of nervous or sensitive temperaments. Scientific diagnoses such as epileptic fits, states of catalepsy, have been put forward in explanation of the 'shafts of light,' 'crosses in the sky,' and other luminous manifestations sometimes reported at the moment of conversion.

See Fleming, *Fulfilling of the Scripture* (1681); Edwards, *The Work of God in Northampton, Massachusetts* (1736); Pringle, *Surprising Accounts of the Revival of Religion in the United States* (1802); Finney, *Lectures on Revivals of Religion* (1835, new ed. 1924); Tracy, *The Great Awakening* (1842); Bushnell (who depreciates the value of revivals), *Christian Nurture* (1847); Gibson (writing about Ireland), *Year of Grace* (1860); Fish, *Handbook of Revivals* (1874); Overton, *Evangelical Revival of the 18th Century* (1886); James, *Varieties of Religious Experience* (1902); Henri Bois, *Le Réveil au Pays de Galles* (1906). See also METHODISM, and the books there cited; and the journals and biographies of the Wesleys, Whitefield, the Haldanes, Burns, Moody, Torrey, Chapman, and other eminent evangelists.

Revival of Learning. See RENAISSANCE.

Revolution, any extensive change in the constitution of a country suddenly brought about. The most important events in modern history specifically known under this name are the English revolution of 1689 (Gizot by 'Revolution' means the 'Great Rebellion'); the American revolution of 1776; the French revolution of 1789; the revolution of 1830 ('the July revolution'), which deposed Charles X. and raised Louis-Philippe to power; the revolution of 1848 ('the revolution of February'), which established the second republic; and the revolutions by which the South American republics were established or are from time to time modified. The revolutionary periods are *par excellence* the years 1848-49, and the end of the Great European War. The French change of constitution in 1871 is not usually spoken of as a revolution, though in effect it was one. For the Revolutionary Tribunal, see DANTON.

Revolver. Revolving firearms date from the

beginning of the 17th century, when hand-guns having two or more barrels were mounted to turn upon an axis, and so arranged that the powder-pans came successively under the action of the lock; the barrels were not rotated by pulling the trigger, but were turned by the hand. The celebrated Marquis of Worcester invented several such. In 1815 Le Norman, a Parisian gunsmith, produced a pistol with five barrels, Devisme one with seven, but neither proved successful. The 'Mariette,' made with from four to twenty-four barrels, was the first to become popular, although from its weight, cumbersome mechanism, and short range, it could have been of little use except at close quarters. This pistol was the precursor of the 'pepper-box' pistol, to which it was closely allied; the barrels of both were bored in a solid mass of metal, and made to revolve as the hammer was raised to full cock. Not so old as the principle of revolving barrels, but still an invention of past generations, is that of a revolving chamber or breech-piece, pierced with cylindrical apertures to contain the charges, and so arranged that each chamber came successively into line with the barrel and lock common to all. E. H. Collier in 1818 patented an improved carbine with three revolving chambers, which appears to have been an efficient weapon. Colonel Samuel Colt produced his world-renowned revolver in 1835. This consists of a rifle barrel, a revolving cylinder with six or seven chambers, each furnished with its own nipple and cap, and a lever trigger, which operates the mechanism required to turn the chambers and fire the weapon. The double-action revolver is one in which by simply pulling the trigger the hammer is raised and released, and the chambers turned; whilst in the single-action revolver the hammer is raised by the thumb of the firer and released by the trigger. Breech-loading revolvers are of two kinds—the solid frame revolver, which requires the empty cases to be forced out by a diminutive ramrod (generally attached to the pistol by a swivel), and the self-extracting revolver, of which there are many kinds.

Revue des Deux Mondes, the best known of the French magazines devoted to literature, art, and general criticism, was founded in Paris in 1831 by François Buloz. It had appeared during 1829, but was languishing until purchased by Buloz, who firmly established it. Many of the best French writers have contributed to its pages.

Rewa, a state of India, in the Baghelkhand Agency.—REWA KANTHA is the name of a political agency under the government of Bombay, containing sixty-two small states, of which four are tributary to the British government, and most of the remainder to Baroda. The territory included, covering an area of 5000 miles, with a total population of 753,000, lies mainly along the south bank of the lower Nerbudda with patches north of it, and on the west borders on Broach, Baroda, and Ahmadabad.

Reward, in a legal sense, means some encouragement which the law holds out for exertions in bringing certain classes of criminals to justice. By statute 7 Geo. IV. chap. 64, the courts of assize may order the sheriff of the county in which certain offences have been committed to pay to persons who have been active in securing the apprehension of offenders charged with murder, or with feloniously shooting, cutting, stabbing, wounding, or poisoning, or with rape, burglary, housebreaking, robbery, arson, or cattle-stealing, or with being accessory before the fact to any of such offences, or to receiving any stolen property, a reasonable sum to compensate them for expense, exertion, and loss of time. So by a later statute

(14 and 15 Vict. chap. 55) courts of quarter sessions are authorised, in the case of any of the above offences which they have jurisdiction to try, to order such compensation; but the payment to one person must not exceed £5. If any one is killed in endeavouring to apprehend a person charged with one of these offences, the court may order compensation to be made to the family. The High Court has also a general power to order the payment of a reasonable sum to any person who has shown unusual courage or diligence in apprehending offenders. By the Larceny Act, 1916 (6 and 7 Geo. V. chap. 50), sec. 34, it is a felony, punishable by penal servitude to the extent of seven years, to corruptly take any reward for helping a person to recover property stolen or embezzled, unless all due diligence to bring the offenders to trial has been used. By the Larceny Act, 1861 (24 and 25 Vict., chap. 96), sec. 102, an advertisement offering a reward for the return of stolen or lost property, using words purporting that no questions will be asked or inquiry made after the person producing the property, renders the advertiser, printer, and publisher liable to forfeit £50 to any person who sues for the same. An action to recover the forfeiture from the printer or publisher of a newspaper can only be brought within six months after the forfeiture is incurred and requires the written assent of the Attorney-General or Solicitor-General.

When a reward is advertised for the recovery of lost property, or for information, or for doing any other act, the performance of the act constitutes an acceptance of the offer in the advertisement, and the person performing the act is entitled to sue for the reward.

Rewari, a town of the district of Gurgaon, in the extreme south of the Punjab, 50 miles SW. of Delhi by rail, an important centre for trade between Punjab and Rajputana; pop. 23,000.

Reykjavik, the capital of Iceland, is situated on the south coast of Faxa Bay, in the west of the island. The first Norse settlers are supposed to have made their home there in the 9th century, when Ingólfr Arnarson after three years' search found on the beach the high seat pillars he had thrown overboard; but till near the end of the 18th it remained a small fishing village. Some factories were set up and a trading-station established, but growth has been slow. A good sheltered harbour constructed since 1913. The most noteworthy buildings are the Alþingishús or Parliament House, the Cathedral (the seat of the Bishop of Iceland), the National Museum (containing also the large National Library), and the University (with four faculties). The Hnitbjörg museum contains a collection of Einar Jónsson's sculptures. Reykjavik also possesses banks, hospitals, and various schools, and exports a considerable amount of fish, chiefly cod, herring, and salmon, mostly salted. Pop. (1850) 1000; (1901) 6600; (1920) 17,679.

Reymont, WŁADYSŁAW STANISŁAW (1868-1925), Polish novelist, the son of a peasant, was for some time a strolling player and a railway worker, before definitely taking to literary work. He won the Nobel prize in 1924 for his huge novel, *The Peasants* (1904), a description of life on the land during the four seasons. His other chief work is *The Promised Land*, written after a stay in the industrial town of Łódź. Reymont is a realist, with an acute sense of observation and a keen sympathy with humanity.

Reynard the Fox, a well-known popular epic the characters of which are animals instead of men. It belongs to the series of Beast-fables (q.v.) which have delighted the popular imagination from early ages and in all lands, from India

to the Bushmen's country in South Africa (see FABLE). The stories that relate the knaveries of Reynard the Fox seem to have originated for the most part in northern France and Flanders from the 10th century onwards, and to have been composed and recomposed repeatedly in various forms in the 12th and following centuries. The authors or editors, so far as they are known, belonged chiefly to the ecclesiastical orders. The several versions differ not only in respect of language and of style, but also in the choice and arrangement of the episodes and incidents narrated. All turn upon the knaveries of Reynard the Fox, as practised by him in his quarrel with Isengrim the Wolf, who in all encounters generally comes off second best. The best versions, as the typical Flemish and Low German (to be referred to in detail lower down), reach a high level of literary excellence. The episodes are woven together into a veritable epic; the versification is agreeable and easy; the characters are consistent and well-sustained; the contemporary manners, and the localities and circumstances, that make the background of the story are true and realistic; and the story is told without any other obvious purpose beyond that of affording honest amusement. These features do not, however, characterise all the versions: some have been clearly written for a satirical purpose, some are loosely-connected strings of ill-told adventures, others drag out a long and weary length through innumerable indifferent verses, whilst in others still the characters are simply men disguised as animals. The earliest versions were in Latin; but they seem to have been soon supplanted by French in the 12th century, and in their new dress the stories attained a much wider popularity. Since the beginning of the 16th century nearly all the editions printed can be traced back to one of two sources, a Flemish or a Low German, both of which, however, are based upon French forms of the epic. The task of tracing the connections between the numerous versions that exist in the different tongues is one of great complexity and difficulty. It will suffice in this place to enumerate the more important, with mention of one or more trustworthy recent editions. The best Latin version, *Isengrimus* (ed. by Mone as *Reinardus Vulpes*, Stuttgart, 1832; and by Voigt, Halle, 1884), which possesses considerable literary merit, was written in Flanders about 1146-48 by an unknown author. The *Isengrimus* printed in J. Grimm's *Reinhart Fuchs* (Berlin, 1834) is not an older, but a later and abbreviated, form of the same poem. The best French versions that survive were edited by Méon (4 vols. Paris, 1826), with a supplement by Chabaille (1835), and by Martin (4 vols. Strasburg, 1882-88). They were written between the middle of the 13th and the middle of the 14th century, and run to enormous length, the separate cycles or groupings of the episodes being called 'branches.' Méon's work includes three cycles: (1) *Roman du Renart*, apparently the work of three if not more authors, Pierre de St Cloud, a priest of Lacroix in Brie, and a Norman priest Robert de Lison; (2) *Le Couronnement de Renart*, attributed to Marie de France; and (3) *Renart le Nouvel*, by Jacquemars Gielée of Lille, about 1290. The last two are transparent satires upon certain of the monastic orders. There is a fourth cycle, a voluminous compilation or imitation by a priest of the neighbourhood of Troyes, made near the middle of the 14th century, and entitled *Le Renart Contrefait* (ed. F. Wolf, Vienna, 1861). The oldest extant High German version, *Reinhart Fuchs* or *Fuchs* (ed. Reissenberger, Halle, 1886), more usually called *Reineke Fuchs*, was adapted by some one unknown, early in the 13th century, from a still older version, *Isengrimes Nôt*, itself a trans-

lation made from old French sources about 1180 by an Alsatian, Heinrich der Glîchesære. The Flemish version which has been the basis of most of the translations, continuations, and editions that have been made since the invention of printing is entitled *Reinaert de Vos* (ed. Martin, Paderborn, 1874). It was written by one William, but whether William de Matoc, William Utenhove, or more probably an unknown William, is uncertain, and dates apparently from the middle of the 13th century. The source upon which it is built is the nineteenth 'branch' in the *Roman de Renart* (last in vol. i. of Méon). The text that has been almost exclusively used in the later translations, &c., is that of a second edition, deviating in some respects from William's own, notably in the infusion of a didactic, satirical tendency; the author of this second edition is not known. It was from a prose version of this second edition, published at Gouda in 1479, that Caxton made his translation of *The History of Reynard the Fox* (1481; reprinted Edin. 1884). Upon this same edition was based the Low German version, *Reinke de Vos* (ed. Prien, Halle, 1887), which has been more often translated perhaps than any other version. Who the Low German translator was is not known, in spite of the question having greatly exercised many specialists. The *editio princeps* of *Reinke* is that of Lübeck (1498), and next to it stands that of Rostock (1517). There are Danish (by A. H. Weigere, Lübeck, 1553), Swedish (Stockholm, 1621), and several other High and Low German editions, for which, however, see the bibliography prefixed to Prien's *Reinke*. Nevertheless special mention must be made of Gottsch's High German prose version (1752) and Goethe's well-known High German poem, with Kaulbach's scarcely less known illustrations to the same. Popular High German translations are contained in Simrock's *Deutsche Volksbücher* (vol. i. 1845) and Marbach's *Volksbücher* (vols. xv.-xvii.).

English readers should consult the introduction to W. J. Thoms's edition of Caxton's *Reynard* (1845), Carlyle's *Miscellaneous Essays* (not quite accurate), F. S. Ellis's *History of Reynard the Fox* (1894), Joseph Jacobs's introduction to his version (1895); *The Epic of the Beast: consisting of English translations of Reynard the Fox and Physiologus* (introd. by William Rose, 1924).

Reynolds, JOHN FULTON, an American general, was born in Lancaster, Pennsylvania, 20th September 1820, graduated at West Point in 1841, and became commandant there in 1859. As brigadier-general he fought at Mechanicsville and Gaines's Mills, and was taken prisoner at Glendale, but exchanged in August 1862. At the second battle of Bull Run his own bravery induced his brigade to stand fast, and so prevented a complete rout. In November he was commissioned major-general, and in 1863 commanded a corps at Fredericksburg. He was killed at Gettysburg, where he commanded the left wing, on 1st July 1863. The state erected a granite shaft on the spot where he fell, and his men a bronze heroic statue on the field; and in 1884 an equestrian statue was unveiled in Philadelphia.

Reynolds, Sir JOSHUA, P.R.A., portrait and subject painter, was born at Plympton Earls, near Plymouth, on 16th July 1723, the year of Kneller's death. His father, a clergyman and master of Plympton grammar-school, intended him for the medical profession; but he developed a strong aptitude for painting, was continually studying the plates in Cats's *Book of Emblems*, Dryden's *Plutarch*, and the other volumes that came in his way, and at the age of eight had mastered the *Jesuit's Perspective*, and applied its principles to drawings executed by himself. In October 1740, accordingly, he was sent to London to study art,

and placed in the studio of Thomas Hudson, a portrait-painter, of very moderate abilities, much employed at the time. In 1743 he returned to Devonshire, and some of the portraits of local worthies which he then produced still exist. In the following year he was again in London pursuing his art; but in the beginning of 1747, after the death of his father, he settled in Plymouth Dock, now Devonport, where he learned much from a study of the works of William Gandy of Exeter. In 1749 he made the acquaintance of Commodore, afterwards Lord, Keppel, who invited him to accompany him on a cruise in the Mediterranean; and, after painting many of the British officers in Minorca, he made his way to Rome, where he studied Raphael and Michelangelo, and in the Vatican caught a chill which permanently affected his hearing, and necessitated his use of an ear-trumpet during the rest of his life. He also visited Bologna, Genoa, Florence, Parma, and Venice. Returning to England in October 1752, he soon afterwards established himself in a studio in St Martin's Lane, London, and attracted notice by his portraits of the second Duke of Devonshire and Commodore Keppel. Before long he was in excellent practice, and in the year 1755 he had no fewer than a hundred and twenty sitters, of whom he produced portraits in which the influence of the Italian masters, and especially of Correggio, is clearly visible; works in which he was certainly aided by such assistants as Marchi, but which he impressed with his own character and individuality. He soon removed to Great Newport Street; and finally, in 1760, he purchased a mansion on the west side of Leicester Square, to which he added a studio and reception-room.

He was now at the height of his fame, and a valued friend of his most celebrated contemporaries. In 1764 he founded the famous literary club of which Dr Johnson, Garrick, Burke, Goldsmith, Boswell, and Sheridan were members; all of whom were portrayed by his brush. He was one of the earliest members of the Incorporated Society of Artists, and contributed to its exhibitions till 1768, when, on the establishment of the Royal Academy, he was elected its first president; and in the following year he received the honour of knighthood from the king. In 1769 he delivered the first of his Discourses to the students of the Academy, fifteen of which have been published. They are full of valuable and well-considered instruction, and, along with his papers on art in the *Idler*, his annotations to Du Fresnoy's *Art of Painting*, and his *Notes on the Art of the Low Countries* (the result of a visit to Belgium and Holland in 1781), show a correct and cultivated literary style. He contributed his picture of Miss Morris as 'Hope nursing Love' to the first exhibition of the Royal Academy, along with his portraits of the Duchess of Manchester, Mrs Blake, Mrs Crewe, and Mrs Bouverie; and in 1771 completed his subject of 'Count Ugolino and his Children in the Dungeon,' usually regarded as his most successful effort in the direction of historical art. In 1784 he succeeded Allan Ramsay as painter to the king; in the same year he finished and exhibited his portrait of Mrs Siddons as the 'Tragic Muse,' in the possession of the Duke of Westminster, undoubtedly his greatest portrait, a work existing in several versions, of which one is in the Dulwich Gallery; and in 1787 he undertook three subjects for Boydell's Shakespeare Gallery, executing 'Puck,' 'The Witch Scene from Macbeth,' and 'The Death of Cardinal Beaufort.'

Hitherto he had devoted himself with little interruption to his art, having speedily recovered from a slight attack of paralysis from which he suffered in 1782; but in July 1789 his sight

became affected, and he ceased to paint, though he was still able to enjoy intercourse with his friends. The following year was embittered by an unfortunate dispute with the Academy regarding the appointment of a professor of Perspective, which led to his resignation of the presidentship, a resolution which he afterwards reconsidered and rescinded; and on the 10th of December 1790 he delivered his last Discourse to the students. Gradually his strength sank—for, unknown to his physicians, he was suffering from a painful form of liver complaint—and he peacefully expired on the 23d February 1792.

It is in virtue of his portraits that Reynolds ranks as the head of the English school of art. In the dignity of their style, the power and expressiveness of their handling, the variety and appropriateness of their attitudes, in the beauty of their colouring and the delicacy of their flesh-painting, his portraits have never been surpassed. He was at home alike in portraying the strength of manhood and the grace of the gentler sex; and his pictures of children have an especial tenderness and beauty which have given a world-wide celebrity to works like 'Master Bunbury,' 'The Strawberry Girl,' and 'Simplicity.' His efforts in the higher departments of historical and imaginative art were less successful, and too often these can be regarded only as among the failures of a great artist. In his technical methods Reynolds was unfortunately most careless and uncertain. He was continually experimenting in new processes and untried combinations of pigments, with the result that even in his own lifetime his works deteriorated, especially in their flesh-tints.

Personally Reynolds was a man of fine and varied culture, and he was distinguished by an exquisite urbanity, the expression of a most amiable and equable disposition, which was exceptionally fitted to win and retain friendship. His dignified gentleness, his mild reasonableness, tamed even the fierceness of Dr Johnson; and there was more of truth than is usual in poetic panegyric in the lines of Goldsmith which speak of this painter as

Still born to improve us in every part,
His pencil our faces, his manners our heart.

The first great collection of the works of Reynolds was brought together by the British Institution in 1813, and numbered 142 pictures; another gathering was formed by the same body in 1823; 154 examples of his art were included in the South Kensington Portrait Exhibition of 1867; and 231 were exhibited in the Grosvenor Gallery in 1883-84. His authentic works have been estimated by Taylor to number between two and three thousand; and from these some 700 engravings have been executed, some of them—such as the mezzotints of J. R. Smith, John Dixon, William Dickinson, Valentine Green, and James M'Ardell—ranking among the finest examples of the art.

The literary works of Reynolds have been published in various editions, including that of Malone, with memoir by Farington (1819), and that of Beechey (1835; new ed. 1890). See Northcote (a pupil of Reynolds), *Memoirs of Sir Joshua Reynolds, Knight* (1813); Leslie and Taylor, *Life and Times of Reynolds* (1865); E. Hamilton, *A Catalogue Raisonné of the Engraved Works of Reynolds* (1884); the important work by Sir W. Armstrong, *Reynolds* (1900); studies by Lord R. Sutherland-Gower (1902) and W. B. Boulton (1903); J. F. Molloy, *Reynolds and his Circle* (1906); and J. R. Davies, *Reynolds* (with some coloured reproductions, 1913).

Rhabdomancy. See DIVINING ROD.

Rhadamanthus, in Greek Mythology, the son of Zeus and Europa, and brother of Minos of Crete. He settled in Boeotia, where he married

Alcmene. So great was his reputation during life for the exercise of justice that after death he was appointed a judge in the under-world, along with Minos and Æacus.

Rhætia, an ancient Roman province embracing a large part of the Alpine tract between the basins of the Po and the Danube, now included in the Grisons and Tyrol. Its inhabitants were brave and turbulent, and were only subdued by Drusus and Tiberius after a desperate resistance. The province was then formed, to which Vindelicia was soon added; but later Rhætia was subdivided into Rhætia Prima and Rhætia Secunda (Vindelicia). The only important town in Rhætia was Tridentinum (*Trent*); the colony of Augusta Vindelicorum (*Augsburg*) was in its northern part.—For the Rhætic Beds, see TRIASSIC SYSTEM.

Rhamnaceæ (*Buckthorns*), a family of dicotyledons, consisting of trees or shrubs; often spiny; with simple, generally alternate leaves, and stipules minute or wanting. There are about 500 known species, natives of temperate and tropical countries, and very generally distributed over the globe. The prevailing principle in the buckthorns is a bitter extractive which is acrid or astringent, tonic and anti-febrile. Some of them are used in dyeing (see BUCKTHORN, and FRENCH BERRIES), some in medicine (see RED ROOT), and the fruit of some is pleasant (see JUJUBE); whilst *Hovenia dulcis*, a native of China and Japan, is remarkable for the thickening of its flower-stalks after flowering, so as to form a succulent sweet red pulp, with a flavour resembling that of a pear. The lotus of the ancient Lotophagi, celebrated by Homer, is the fruit of *Zizyphus Lotus*, a small shrub abundant in Spain, Sicily, Barbary, Tunis (see LOTUS). The wood of *Rhamnus Frangula* yields a superior charcoal for the manufacture of gunpowder.

Rhampsinitus, a Grecised form of the Egyptian name Ramses, or Rameses, apparently Rameses III., the builder of the pavilion of Medinet Abu at Thebes. Of him Herodotus (II., 121 *et seq.*) relates a story substantially the same as one of the most widespread folk-tales of the world. The king built a treasury of stone. The architect left one stone loose, so nicely adjusted as to be unnoticed. Before death he entrusts the secret to his two sons, who plunder the treasure at will, until the elder is caught in a snare. By his desire, the younger brother cuts off and carries away his head, so that he may remain unknown. By further wiles the younger brother continues to outwit the king, and at last marries his daughter.

Such is the oldest recorded version of Asbjörnsen's 'Master-thief' and Campbell's 'Shifty-lad,' Dr Barbu Constantinescu's Rumanian gypsy story of 'The Two Thieves,' a variant of the story of Trophonios and Agamedes in the treasury of Hyrieus at Hyria (Paus. ix. 37), of Augeias in Elis, and of Hermes (*ἀρχὸς φηλητῶν*), as well as of the Hindu legend of Karpura and Gata, or that of Ali Baba and the Forty Thieves in the *Arabian Nights*. The story occurs in the oldest version (12th century) of the romance of the 'Seven Wise Masters,' the *Dolopathos*, *sive de Rege et Septem Sapientibus*, from which Ser Giovanni probably derived the story as found in his *Pecorone* (written circa 1378), where it is related of an architect named Bindo who stole a golden vase from the treasury of the Doge of Venice. It will be found, more or less perfect, in every collection of European folk-tales, whether Norse, Gaelic, modern Greek, French, Breton, Albanian, Sicilian, Hungarian, Dutch, Tyrolese, Danish, or Russian, as well as Kabyl, Mongolian, Tibetan, and Singhalese.

See Liebrecht's translation (1851) of Dunlop's *History of Prose Fiction*; A. Schiefner in vol. xiv. of the

Bulletin of the St Petersburg Academy of Sciences; W. A. Clouston's *Popular Tales and Fictions* (1887); and Maspero's *Contes Populaires de l'Égypte Ancienne* (3d ed. 1906).

Rhapsodists (Gr., from *rhaptein*, 'to stitch together,' and *ōdē*, 'an ode'), a class of men in ancient Greece who travelled from place to place reciting poetry. They are distinct from the professional minstrels (*aoidoi*) of the *Odyssey*, although their legitimate successors; but they also seem, at first at least, to have been composers of epic poetry, although it is hardly probable that this was often the case after the 6th century B.C. We find distinct traces of the public recitation by rhapsodists of the Homeric poems as early as 600 B.C., at places so far apart as Sicily, Syracuse, Delos, Chios, Cyprus, and Athens. Indeed at Athens ancient law prescribed the recitation of Homer once every four years at the festival of the Great Panathenaea. To the early rhapsodists mainly belongs the credit of the wide diffusion of the Homeric poems throughout the Greek world. They themselves were held in high esteem and richly rewarded; but in later days the art came to be practised in a mere mechanical manner, and the influence of the rhapsodists ebbed accordingly. In Plato's *Ion* we get a picture of the rhapsodist as he was about the middle of the 4th century B.C. Ion is a native of Ephesus who goes from city to city reciting Homer to crowds of hearers, appearing on a platform in a richly-embroidered dress, a golden wreath on his head. He adds dramatic force to his declamation, and brings Homer home to his hearers' hearts, being himself possessed by Homer. Moreover, he interprets Homer in a continuous exposition, and is proud of his fluency of ideas. Ion is described as devoted exclusively to Homer, but there were a few of his brethren who gave themselves also to Orpheus, Musæus, Hesiod, Archilochus, or Simonides. It is unlikely that Homer was ever sung to music, although in earlier times there were heroic lays which were sung to the accompaniment of the lyre. As lyric poetry became more distinctly cultivated, such epic lays came to be simply declaimed, the rhapsodist holding a branch of bay in his hand instead of a lyre.

Rhatany, or RATTANY, a half-shrubby plant, of the family Leguminosæ, a native of the cold sterile tablelands of the Andes in Peru and Bolivia. It is called *Ratanhia* in Peru. It is valued for the medicinal properties of the root, which are shared more or less by other species of the same genus, also natives of South America. In the British Pharmacopœia the dried roots of two species (*Krameria triandra*, Peruvian Rhatany, and *K. argentea*) are official under the name *Krameria Radix*. The roots vary a good deal in size and thickness, but are always rough-looking, and reddish in colour. The bark has a strongly astringent taste, and when chewed tinges the saliva red; the wood is nearly tasteless. The dried root is a powerful astringent, and is employed in diarrhœa, mucous discharges, passive hæmorrhages, and cases where an astringent or styptic action is indicated. The finely-powdered root is also a frequent constituent of tooth-powders. Rhatany root is imported from various parts of South America, but chiefly from Lima. It is extensively imported into Portugal in order to communicate a rich red colour to wines. Its peculiar properties are due to rhatany-tannic acid, found in the root-bark to the extent of 20 per cent.; it also contains a red colouring matter.

Rhazes, or RÂZI, Persian physician and alchemist. See MEDICINE and ARABIA.

Rhé, ÎLE DE. See RÉ.

Rhea, an ancient Cretan earth-goddess, daughter of Uranus and Gæa, wife of her brother the Titan Cronus, and by him mother of the Olympian deities Zeus, Hades, Poseidon, Hera, Hestia, Demeter. She was early identified with the Asiatic nature-goddess Cybele, the Great Mother, who was worshipped on mountains in Mysia, Lydia, and Phrygia. Her Cretan *Curetes* corresponded to the Phrygian *Corybantes*, many of whom mutilated themselves like Attis in the frenzy of their orgies. The regular priests of Cybele, the Galli, made themselves eunuchs for conscience' sake. A Sibylline oracle decreed the introduction of the worship of the Great Mother at Rome in 204 B.C., and in 217 a temple was dedicated on the Palatine. The cult became widely extended under the Empire. In the 2d century A.D. the rites of the *Taurobolia* and *Criobolia* were added, in which candidates were baptised for purification and regeneration with the blood of sacrificial bulls and rams. See the article CYBELE.—RHEA SYLVIA was the mother of Romulus (q.v.).

Rhea, or NANDU, or SOUTH AMERICAN OSTRICH, a genus of Ratite birds, differing from the ostriches of the Old World in having three toes with compressed nails, fully feathered head and neck, proportionally larger wings, and no conspicuously feathered tail. The feathers have no aftershaft. The Rheas live chiefly on the open plains, and are predominantly vegetarian; they run very swiftly and swim well. They are polygamous, and the male incubates the twenty to thirty eggs which his hens lay. The eggs of *Rhea americana* (from Southern Brazil and Bolivia southwards), fourteen to twenty-four, are golden yellow, those of *R. darwini* (from the southern part of the continent) deep green, but both kinds fade into white. There is a third species, *R. macrorhyncha*, from north-east Brazil. Rheas are readily acclimatised, and will breed in Europe. See Hudson, *Argentine Ornithology* (1889).

Rhea Fibre. See BCMERIA.

Rhegium. See REGGIO.

Rhegius, URBANUS (1489-1541), reformer, born at Langenargen, Lake of Constance, was professor of Poetry and Rhetoric at Ingolstadt, and cathedral preacher at Augsburg, where he preached Lutheran doctrines and wrote satires. Later he removed to Celle.

Rheims. See REIMS.

Rheinberger, JOSEF (1839-1901), composer, was born at Vaduz, Liechtenstein, and early showed a marked aptitude for music. In 1851 he became a student and in 1859 a professor at the Munich Conservatorium. He lived at Munich till his death. A thorough and conscientious teacher, he was also a prolific composer along traditional lines, chiefly in the domain of choral music, but only a few of his twenty organ sonatas have survived.

Rheingau, a district, 14 miles long, stretching along the right bank of the Rhine, from opposite Mainz to the village of Lorch, 8 miles below Bingen, formerly belonged to the archbishopric of Mainz, and now forms part of the administrative district of Wiesbaden in Prussia. Protected by mountains from the north and east winds, and exposed to the mid-day sun, the Rheingau produces wines of the best quality, as Johannisberger, Rudesheimer, Marcobrunner, Assmanshäuser, &c.

Rheinland, also called Rheinprovinz, Rheinpreussen, Rhenish Prussia, the westernmost and (except the city of Berlin) the most thickly peopled of the provinces of Prussia, lies on both sides of the Rhine and the Lower Moselle, and is bounded on the W. by Luxembourg, Belgium, and the Netherlands. The southern end forms, with part

of Bavaria, the Saar Territory, placed by the Treaty of Versailles under the League of Nations till 1935, when it is to decide its future by plebiscite. The same treaty assigned some 400 square miles to Belgium (Eupen and Malmédy). Area of province 10,048, including 574 in the Saar region. Pop. (1885) 4,344,527; (1890) 4,710,313; (1910) 7,120,519; (1925) 7,250,195, not including the Rhenish Prussian part of the Saar Territory, which had in 1922 622,418 inhabitants. The capital is Coblenz. The surface is more or less mountainous, except in the extreme north, reaching 2500 feet on the west of the Rhine, but only 1800 on the east side. The soil of the higher tracts is not very fertile, and is largely forest land; but the valleys of the Rhine, Moselle, and Nahe are very fruitful, and so are the flat districts in the north. Of the total area, two-thirds is cultivated, including meadows and vineyards, and nearly one-third under forest. Grain, potatoes, beet-root, tobacco, hops, flax, &c. are the more important crops. Much wine and large quantities of vegetables are grown. Coal, iron, and lead are mined. The sulphur-springs of Aachen and Burscheid have a European reputation. Industry and manufactures are prosecuted with the greatest energy and success, this province ranking first in all Prussia in this respect. It is enough to name some of its towns: Cologne, Elberfeld-Barmen, Düsseldorf, Crefeld, Duisburg, Essen, Müncnen-Gladbach, Aachen. There is a university at Bonn. This province was formed in 1815 out of the duchies of Cleves, Jülich (Juliers), Guelders, and Berg, and numerous minor territories. The Treaty of Versailles provided that most of Rheinland should be occupied by the Allies, to be evacuated by various dates down to 1935. A separatist movement fomented by France ended in fiasco. The Ruhr (q.v.) basin was occupied later by the French.

Rhenish Architecture, the style of the countries bordering on the Rhine when the arts first revived after the fall of the Roman empire.

They and Lombardy being at the time of Charlemagne part of the same empire, Lombard Architecture (q.v.) has considerable affinity with that north of the Alps. Some very early examples of this style are still to be found in Switzerland. Architecture received great encouragement from Charlemagne and his successors, and the Rhenish style made great progress up to the beginning of the 13th century, when the fashion of copying the Gothic architecture of France superseded it. It is, however, a well-marked style, and is complete and perfect in itself. Like the Lombard style, it is round-arched, and has some remarkable peculiarities. Many of the earliest churches seem to have been circular (like the cathedral at Aachen, built by Charlemagne), but in course of time the circular church was absorbed into the Basilica, or rectangular church (see ROMANESQUE ARCHITECTURE), in the form of a *western* apse. Most German churches thus have *two apses*—an eastern and a western. They also have a number of small circular or octagonal towers, which seem to be similar in origin to the Round Towers (q.v.) of Ireland. They exemplify in a remarkable manner the arrangements of an ancient plan of the 9th century, found in the monastery of St Gall, and supposed to have been sent to the abbot, as a design for a perfect monastery, to aid him in carrying out his new buildings. The arcaded galleries at the eaves, and the richly-carved capitals, are among the most beautiful features of the style. Examples are very numerous from about 1000 to 1200 A.D. The three great specimens of the style are the cathedrals of Mainz, Worms, and Speier. The last is a magnificent building, 435 feet long by 125 feet wide, with a nave 45 feet wide, and 105 feet high. It is grand and simple, and one of the most impressive buildings in existence. There are also numerous fine examples of the style at Cologne—the Apostles' Church, St Maria im Capitol, and St Martin's being amongst the most finished

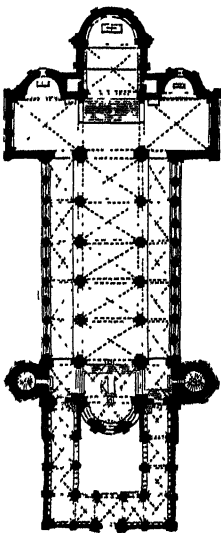


Fig. 1.—Plan of Church at Laach.

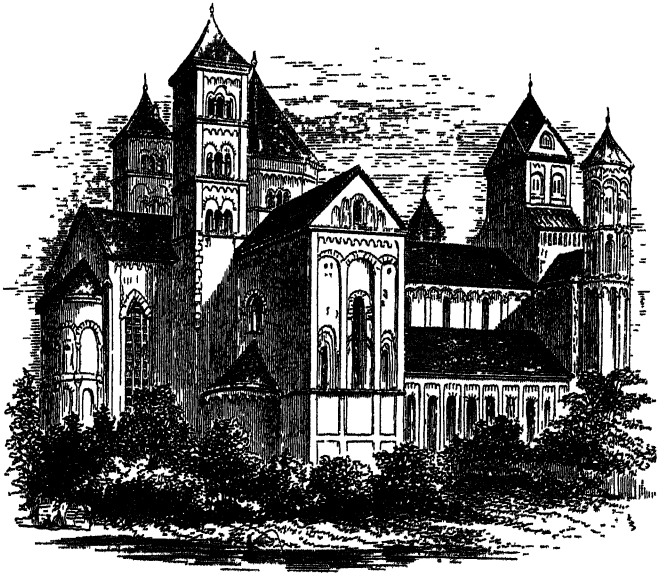


Fig. 2.—Elevation of Church at Laach.

examples of Rhenish architecture. The illustrations of the famous church of the Benedictine abbey at Laach, near Coblenz, explain the peculiarities of plan and elevation above referred to. The vaults in this case being small, the different spans were

managed (although with round arches) by stiling the springing; but in great buildings like Speier and Worms the vaults are necessarily square in plan, in this round-arched style, and the nave embraces in each of its bays two arches of the side

ailes—a method also followed by the early Gothic architects. From the use of the round arch and solid walls, the exteriors are free from the great mass of buttresses used in Gothic buildings, and the real forms are distinctly seen (see APSE).

Rhenish Prussia. See RHEINLAND.

Rhenium, an element (Re), of atomic number 75, whose discovery by Dis Walther Wonnack and Eva Tacke was announced in 1925.

Rheostat, the name given by Wheatstone to an instrument for varying an electric resistance between given limits. In Kelvin's form a platinum or platinoid wire is wound round two parallel cylinders, one of which is metal and the other of some insulating material. In any position the part of the wire which is effective as a resistance is the part that is on the insulating cylinder up to where it comes in contact with the metal cylinder. By means of a gearing of toothed wheels and screw shaft the two cylinders are turned simultaneously in one or the other direction, while at the same time a nut travels to or fro and guides the wire as it leaves the one cylinder and coils itself round the other. See ELECTRICITY.

Rhesus Monkey, or BOONDER (*Macacus rhesus*), a widely distributed and common Indian monkey. Like the Entellus (q.v.) or Hanumân, it is in part migratory, visiting the Himalayas in summer, and sometimes found at a level of 8000 feet. The body is stout, the limbs are strong, the skin hangs in loose folds about the neck, breast, and abdomen. The hair is grayish or brownish on the back and lighter beneath; the naked parts are copper-coloured; the large ischial callosities are bright red. It is a very intelligent and mischievous monkey, and readily tamed when young. It is



Rhesus Monkey (*Macacus rhesus*).

held in almost as great veneration by the natives of India as the Hanumân itself; and the killing of one of these animals is apt to arouse the greatest popular indignation. The monkeys live in troops in the forests, chiefly in hilly districts, and visit the cultivated grounds to carry away grain and other produce, which they store up for themselves among rocks. The native farmers leave a share for the monkeys, believing this to be necessary to avert their anger, as otherwise they would next year destroy the whole crop whilst green.

Rhetoric (Gr. *rhētorikē*) in its broadest sense may be regarded as the theory and practice of eloquence, whether spoken or written. It aims at

expounding the rules which should govern all prose composition or speech designed to influence the judgments or the feelings of men, and therefore treats of everything that relates to beauty or force of style, such as accuracy of expression, the structure of periods, and figures of speech. But in a narrower sense rhetoric concerns itself with a consideration of the fundamental principles according to which particular discourses of an oratorical kind are composed. The first to reduce oratory to a system were the Sicilian Greeks; its actual founder is said to have been Corax of Syracuse (c. 500 B.C.). He divided the speech into five parts, proem, narrative, arguments, subsidiary remarks, and peroration; and he laid great stress on the rhetorical capabilities of general probability. Later masters of rhetoric were Tisias; Gorgias of Leontini, whose style was burdened with too much ornament and antithesis; Antiphon, the earliest of the so-called 'Ten Attic Orators,' and the first writer of speeches for others to deliver in court. The speeches given by his great pupil Thucydides throughout his history, and the orations of Andocides, second of the Ten, are severely free from the florid ornament of later days. Lysias was an orator rather than a rhetorician; Isocrates first thoroughly taught rhetoric, which he defined as the 'science of persuasion,' as a technical method and discipline. His most celebrated pupils were Hyperides, Speusippus, and Isæus. The great Demosthenes was a pupil of the last. His opponent Æschines, and his contemporaries Hyperides, Lycurgus, and Dinarchus complete the Ten. Anaximenes of Lampascus composed the oldest extant manual of rhetoric, but the great classical work on this subject is the analytical masterpiece of Aristotle. According to him its function is not to persuade, but to discover the available means of persuasion in any subject. He regards it as the counterpart of logic, and arranges its uses as (1) the means by which truth and justice assert their superiority to falsehood and injustice; (2) the only method of persuasion suitable to popular audiences; (3) a means of seeing both sides of a case and of discerning the weakness of an adversary's argument; (4) as a means of self-defence. The means of persuasion he groups in two classes: (1) the inartificial proofs, such as statements of witnesses, contracts, and the like; (2) the artificial proofs, whether these are (a) *logical*, demonstration or seeming demonstration by argument; (b) *ethical*, when the speaker induces confidence by the weight of his own character; or (c) *emotional*, when he works persuasively on the feelings of his hearers.

Of these artificial proofs, first comes the *logical*, and this depends on the *enthymeme*, 'a syllogism from probabilities' and signs; next is the example. Of the materials of enthymemes, the topics or commonplaces of rhetoric, Aristotle distinguishes between the *common*, general heads applicable to all subjects as to their possibility or impossibility, and the *special*, those drawn from special arts or faculties.

He divides the three provinces of rhetoric thus: (1) *Deliberative* rhetoric, concerned with exhortation or dissuasion, and future time, its ends expediency and in expediency; (2) *Forensic* rhetoric, concerned with accusation or defence, and with time past, its ends justice and injustice; (3) *Epidictic* rhetoric, concerned with eulogy or censure, and usually with time present, its ends being honour and disgrace, or nobleness and shamefulness. In his first two books Aristotle deals with *invention*, the discovery of means of persuasion; in the third, with *expression* and *arrangement*; and he begins the subject by discussing the art of *declamation* or *delivery*. Under verbal expressions he discusses the use of metaphor, simile, proverbs, rhythm, and

variety of styles, as the *literary* and *controversial*, whether the *political* or the *forensic*.

Aristotle's method dominated the Peripatetic school, but later began to be modified by the florid influence of Asia, the originator of which was Hegesias of Magnesia. The school of Rhodes followed more closely Attic models, and gained great fame through its conspicuous leaders Apollonius and Molon (c. 100-50 B.C.). Hermagoras of Temnos (c. 120 B.C.) composed an elaborate system which long retained its influence. Later rhetoricians were Dionysius of Halicarnassus, Longinus, Hermogenes, Apsines, Menander, Theon, and Aphthonius. Among the earliest Roman orators were Appius Claudius Cæcus (c. 300 B.C.), Cato the Censor, Ser. Sulpicius Galba, Caius Gracchus, Marcus Antonius, and Lucius Licinius Crassus. The instructors in formal rhetoric were Greek, and the great masters of theoretical and practical rhetoric alike, Cicero and Quintilian, were both formed by Greek models. The former contributed to a discussion of its theories no less than three treatises, *De Oratore*, the *Brutus*, and the *Orator*; the latter's famous *Institutio Oratoria* still retains its value. Quintilian strove hard to reform the taste of the time, which had become Asiatic through exclusive attention to the form and perpetual exercises in the schools on imaginary subjects—the *suasorie* and *controversie* of the elder Seneca. The *Dialogus de Oratoribus*, long ascribed to Tacitus, was another protest against modern fashion. The younger Pliny's *Panegyric* long remained a model for later orators. During the first four centuries of the empire rhetoric continued to be taught by 'sophists' at Athens, Smyrna, Rhodes, Tarsus, Antioch, Alexandria, and Massilia. These were in most esteem under Hadrian, the Antonines, and Marcus Aurelius—among the most celebrated were Theodotus, Polemon, and Adrian of Tyre. Throughout the middle ages rhetoric formed one of the subjects of the *trivium*; its leading authorities were Martinus Capella, Cassiodorus, and Isidorus. The subject re-awoke with the revival of learning, and was taught regularly in the universities, the prescribed public exercises and disputations keeping it long alive; but in later generations it has constantly languished, in spite of more or less laborious or effective attempts to fan it into life by the sententious Blair, the solid Campbell, and the sagacious Whately. In America, however, considerable attention is paid to it as a branch of general education.

Rheumatism (from the Gr. *rheuma*, 'a flux') is a term which has been, and still is, rather vaguely and extensively used in the nomenclature of disease. But there is one very definite affection to which it is always applied; after this has been discussed the other senses in which it is used will be considered.

Acute rheumatism or *rheumatic fever* is indicated by general febrile symptoms, with redness, heat, swelling, and usually very intense pain, in and around one or more (generally several, either simultaneously or in succession) of the larger joints, and the disease shows a tendency to shift from joint to joint or to certain internal serous membranes, especially the pericardium and the endocardium; rheumatism being the most common origin of pericarditis, as has been already shown in the article on that disease. The pulse is strong and full, there is headache, but seldom delirium, unless in very severe cases; the tongue is covered with a creamy thick fur, the tip and edges being red; the urine is turbid, and abnormally acid; and the skin is bathed in a copious perspiration, with so characteristic a smell (resembling that of sour milk) that the physician can often recognise the disease

almost before he sees the patient. The joints are extremely painful, and the pain is much increased by pressure, and consequently by movement which gives rise to internal pressure. Hence the patient lies fixed in one position from which he dares not stir.

The usual exciting cause of acute rheumatism is exposure to cold, and especially to cold combined with moisture, and hence the greater prevalence of this disease amongst the poor and ill-clad. Sleeping in damp sheets or upon the damp ground, the wearing of wet clothes, and sitting in a cold damp room, especially if the sitter was previously warm from exercise, are examples of the kind of exposure which is apt to be followed by this disease. Rheumatism is not, however, a universal sequence to exposure to the cold. It only occurs when there is a special predisposition, or, as it is termed, a rheumatic diathesis or constitution, and the diathesis may be so strongly developed as to occasion an attack of acute rheumatism, independently of exposure to any apparent exciting cause. Acute rheumatism is often associated with Chorea (q.v.); but the exact nature of the relation between the two is not known. Scarlet fever is the only other disease which seems specially liable to be followed by acute rheumatism. Men are more subject to the disease than women, but this probably arises from their greater exposure to atmospheric changes on account of the nature of their occupations. The predisposition is certainly affected by age; children under ten years being comparatively seldom attacked, while the disease is most prevalent between the ages of fifteen and forty. Above this age a first attack is rare, and even recurrences are less frequent than earlier in life. Persons once affected become more liable to the complaint than they previously were. The disease is hereditary in a considerable proportion of cases; and even when it cannot be traced in previous generations the predisposition is very apt to exist in several members of the same family. The actual cause of the disease is probably microbial, and many cases have been traced to the '*Micrococcus rheumaticus*,' though often this cannot be discovered, and other organisms may be responsible.

In the great majority of cases acute rheumatism ends in recovery; and permanent damage to the affected joints is rare. It is, however, extremely apt to recur, either in the early stages of convalescence, or after an interval of months or years. The chief danger arises from implication of the heart, which very frequently occurs; probably in about one-half of those suffering for the first time either the pericardium or endocardium or both are affected. The younger the patient the greater the liability to these complications, which usually result in more or less permanent impairment of the heart's action (see HEART, PERICARDIUM). Another condition, much less common, but extremely fatal, is known as *rheumatic hyperpyrexia*, and is characterised by a very rapid rise of temperature to 108° or 110°, with head symptoms in the form either of drowsiness or of violent delirium.

The patient should be strictly confined to bed between blankets (i.e. without sheets), and be clothed in flannel; he must be carefully protected from draughts, and from undue pressure of the bed-clothes, and supplied with light nourishment and diluent drinks. Under such conditions, without other treatment, most cases recover in the course of time. Till the last quarter of the 19th century there was no general agreement as to what more should be done. When bleeding was used for most acute diseases this one was no exception. When that practice was abandoned numerous drugs were used, in some cases with apparent success. Quinine, iron, lemon juice, colchicum, large blisters to all the

affected joints, were all recommended; more in favour than any of these were alkalis in large doses. But in 1876 Stricker in Berlin and MacLagan in England called attention to another method of treatment which is now almost universally adopted. Though new to Europe it has long been in use elsewhere, for the natives of South Africa have from time immemorial treated the disease by willow-top infusion. This method consists in the administration of Salicin (q.v.), or one of its derivatives (salicylic acid, salicylate of soda, &c.). The last is at present most largely used. It is usually given in doses of 15 or 20 grains, together with bicarbonate of soda, every two or three hours at first; but its action needs to be carefully watched, as it often causes considerable depression, deafness, and other uncomfortable symptoms. It has a remarkable effect in reducing the fever and relieving the pains; but under this treatment, as without it, relapses are frequent. In rheumatic hyperpyrexia the only treatment that has been found effectual is sponging, or immersion in a tepid bath as often as the temperature rises to a dangerous point. Convalescence is usually very slow, and it is necessary to keep the patient in bed and on low diet for some time after the fever has disappeared to diminish the tendency to relapse. At this stage tonics, especially quinine and iron, are generally useful.

Chronic Rheumatism.—Chronic painful affections of the joints sometimes follow rheumatic fever and sometimes occur without it. The name is often erroneously applied to chronic and insidious forms of gout. There is another form of disease to which most of the cases of so-called 'chronic rheumatism' belong, which deserves separate mention.

Osteo-arthritis (chronic rheumatic arthritis and rheumatoid arthritis are among its many other names) is characterised in most cases by a very chronic course, by pain and stiffness in one or more of the joints, with creaking on movement, and by destructive changes of the cartilages of the affected joints, with enlargement of the ends of the bones in their neighbourhood. It is more common in women than in men; most often begins at or after middle life, though occasionally even in childhood; and is apt to affect those who are weakly and who have had a life of hard work with defective nourishment. There is no special liability to affection of the heart as in true rheumatism. In the treatment of this ailment hot baths and douches, particularly with certain mineral waters (e.g. those of Bath, Aix-les-Bains), and a warm dry climate are very valuable; a generous diet is essential. Of drugs, cod-liver oil and arsenic are most often serviceable; but many others, such as sulphur, especially in the colloidal form, fibrolysin, &c., are of use. The exposure of the affected joints in a hot-air bath, or to a powerful galvanic current is often very helpful. Under any treatment, however, complete recovery is exceptional; but the disease, even when severe, does not much shorten life.

Gonorrheal rheumatism is a form of joint-disease closely simulating acute rheumatism which occurs in some cases of Gonorrhea (q.v.). The affection does not, however, fit from joint to joint in the same way, and is not amenable to the same treatment.

Muscular rheumatism is the name usually given to painful affections of the muscles for which no clear cause is discoverable; it usually depends either on localised muscular spasm or imperfect excretion of waste products from the system. Eliminant treatment, by alkalis, purgatives, or diaphoretics, is usually indicated, and pain is relieved by local application of heat, belladonna plasters, &c.

RHEUMATIC DISEASES OF ANIMALS.—These are less common than the corresponding affections of men. Horses are not very liable to acute rheumatism, but suffer from a chronic variety, which occurs especially in conjunction with influenza. When affecting the limbs it often exhibits its characteristic tendency to shift from one part to another. In cattle and sheep rheumatic disorders are more common and acute than in horses. The specific inflammation sometimes involves most of the fibrous and fibro-serous textures throughout the body, inducing general stiffness, constipated bowels, and high fever. This is rheumatic fever—the chine-felon or body-garget of the old farriers. Sometimes the disease mainly affects the larger joints, causing intense pain, lameness, and hard swellings; occasionally it is confined to the feet and fetlocks, when it is recognised as bustian-foul. Cattle and sheep on bleak exposed pastures, and cows turned out of the dairy to feed on strong alluvial grazings are especially subject to rheumatism in its several forms. Amongst dogs rheumatism is known under the name of kennel lameness, and is very troublesome and intractable in low, damp, cold situations. Blood-letting is rarely admissible except in the most acute cases amongst cattle. In all animals a laxative should at once be given, with some saline matters and colchicum, and when the pain and fever are great a little tincture of aconite may be added. For cattle a good combination consists of one ounce of nitre, two drachms of powdered colchicum, and two fluid drachms of the Pharmacopœia tincture of aconite, repeated in water or gruel every three hours: half this dose will suffice for horses. With a simple laxative diet dogs should have a pill night and morning containing five grains of nitre and two of colchicum. Comfortable lodgings, a warm bed, horse-rugs on the body, and bandages on the legs will greatly expedite a cure. In chronic cases, or after the more acute symptoms are subdued, an ounce of oil of turpentine and two drachms each of nitre and powdered colchicum should be given for a cow, half that quantity for a horse, and one-fourth for a sheep. Hartshorn and oil, or other stimulating embrocations, diligently and frequently rubbed in, will often abate the pain and swelling of the affected joints.

Rheydt, a town of Rheinland, 19 miles by rail W. by S. from Düsseldorf, has manufactures of silks, velvets, cottons, machinery, hardware, paper, dyeworks, and breweries. Pop. 43,000.

Rhigas, KONSTANTINOS (1760-98), Greek poet, translator, and agitator, born at Velesinos, organised the revolutionary movement among the Greeks at Vienna, but was betrayed to the Turkish authorities and shot at Belgrade.

Rhin, BAS and HAUT, until 1871 frontier departments of France, corresponded pretty nearly to Lower and Upper Alsace. Since the Treaty of Versailles they have been revived. See ALSACE-LORRAINE; also BELFORT.

Rhine (Ger. *Rhein*, Fr. *Rhin*, Dutch *Rhijn*, Lat. *Rhenus*), in every way one of the most important rivers of Europe. A large number of rivulets, issuing from glaciers, unite to form the young Rhine; but two are recognised as the principal sources—the Nearer and the Farther Rhine. The former emerges on the north-east slope of the Gott-hard knot (7690 feet above sea-level), and only a dozen miles from the cradle of the Rhone, on the other side of the same mountain-knot; the Farther Rhine has its origin on the flank of the Rhein-waldhorn (7270 feet), not far from the Pass of Bernardino. The two mountain-torrents meet at Reichenau, 6 miles SW. of Coire (Chur) in the Grisons canton, after they have descended, the

Nearer Rhine 5767 feet in 28 miles in a north-east direction, the Farther Rhine 5347 feet in 27 miles along a northerly course. At Coire the united stream strikes due north for 45 miles, and, separating the canton of St Gall from Liechtenstein and Vorarlberg, enters its clearing basin, the Lake of Constance (1306 feet above the sea). It leaves this lake at its north-western extremity, a little below Constance, its water a deep transparent green, and flows generally westwards, in three or four wide curves, to Basel, separating Baden on the north from Switzerland on the south. Along this stretch the river (490 feet wide) plunges down the falls of Schaffhausen, nearly 70 feet, in three leaps, and races over narrow rapids at three separate places where the terminations of the Jura Mountains intrude into the bed of the river; from the left it receives the more copious waters of the Swiss Aar. Basel is 280 miles distant from the source of the Nearer Rhine following the windings of the channel, but only 85 miles as the crow flies.

At Basel (742 feet) the river, now 225 yards wide, wheels round to the north, and, traversing an open shallow valley that separates Alsace and the Bavarian Palatinate from Baden, reaches Mainz (50° N. lat.) in Hesse-Darmstadt, north-north-east from Basel. This valley is fenced in by the Black Forest on the east and by the Vosges on the west; in it stand the cities of Müllhausen, Colmar, Strasburg (on the Ill, 2 miles from the Rhine), Germersheim, Speier, Ludwigshafen, and Worms, all on the left side, and Freiburg, Baden, Rastatt, Carlsruhe, Mannheim, Heidelberg, and Darmstadt on the opposite side of the river. Along this section the Rhine splits into many side arms that flow parallel to the main stream, and is studded with green islands. Navigation, however, which begins at Basel (although boats ply for short stretches on the upper waters above that point, even as high as Coire) is facilitated by artificial means, in that the current is made to flow in a carefully-kept, straightened channel. Of the numerous affluents which add their waters to the volume of the Rhine along this section the largest are the Neckar and the Main, both coming from the right, and both navigable; the Ill, which falls into it from the left, is also navigable. A little below Mainz the Rhine (685 yards wide) is turned west by the Taunus range; but at Bingen it forces a passage through, and pursues a north-westerly direction across Rheinland, past Coblenz, Bonn, Cologne, Düsseldorf, Ruhrort, and Wesel as far as the Dutch frontier, which it reaches a little below Emmerich, and opposite Cleves; here it is 1085 yards wide and 36 feet above sea-level. The first half of this portion of the river from Bingen to Bonn is the Rhine of song and legend, the Rhine of romance, the Rhine of German patriotism. Its banks are clothed with vineyards that yield wine esteemed the world over (see below); the rugged and fantastic crags that hem in its channel are crowned by ruined castles; the treasure of the Nibelungs rests at the bottom of the river, but higher up, at Worms; the Bingerloch (see BINGEN) and the Mouse Tower of Bishop Hatto, the fortress of Ehrenbreitstein, the rock of the siren Lorelei, the commanding statue of Germania (the trophy of German victory in 1870), and innumerable other features lend interest to this the middle course of 'Father Rhine,' as his German children call him. It still inspires them as in 1870, when Max Schneckenburger's *Wacht am Rhein* (written in 1840; the music by K. Wilhelm, 1854) was sung by them with the greatest enthusiasm as they poured into France. There is the *Rheinlied*, too, of Nikolaus Becker, with Alfred de Musset's retort, *Nous l'avons eu, votre Rhin allemand* (1841). Between Bingen and Bonn the steep rocky walls

that fence in the river approach so closely together that in many places the road and the railway have to find a way through tunnels. The Nahe enters the Rhine at Bingen, the Moselle at Coblenz; from the opposite (right) side the Lahn enters just above Coblenz. Below Bonn it is joined by the Sieg, Wupper, Ruhr, and Lippe, all from the right.

At Bonn the river enters the plains, and almost immediately after passing the Netherlands frontier its delta begins. The principal arm, carrying two-thirds of the volume, flows under the name of the Waal, and later the Mermede, due west past Nimeguen until it reaches Dordrecht. East of the Biesbosch it picks up the Maas (Meuse) from the left. At Dordrecht the river again divides, one branch, the old Maas, running out to sea; the other, the Noord, going up north-west to Rotterdam, just above which town it is joined by the Lek, another main arm of the deltaic complex, and below which town it once more unites with the Old Maas. The arm that strikes off northward at the point where the delta begins soon divides, sending one branch, the Yssel, due north to the Zuider Zee, which it reaches on the east side near Kampen; the other branch is the Lek, which runs into the Waal-Maas arm above Rotterdam. A thin stream called the 'Winding Rhine' leaves the Lek half-way between Arnhem and Rotterdam; but it again splits at Utrecht into two channels, of which the Old Rhine, a mere ditch, comparatively speaking, manages with the help of a canal and locks to struggle into the North Sea at Katwyk, a little to the north-west of Leyden, while the other channel, the Vecht, flows due north from Utrecht until it enters the Zuider Zee, a short distance from Amsterdam. For considerable distances in these delta regions the rivers are only kept from overflowing the country by artificial banks or dykes.

The area drained by the Rhine is estimated to be 75,773 sq. m., and its total length to be 760 miles, of which 550 in all are navigable. The Rhine-Main-Danube Canal, to carry great ships from the North Sea to the Black Sea, was begun in 1921, the old Ludwigskanal being inadequate. The Rhine and Rhine Canal unites it with the Rhone, and so with the Mediterranean; another canal provides a waterway between it and the Marne, a tributary of the Seine; and yet a fifth unites it with the Zuider Zee at Amsterdam. The fisheries are of considerable importance; salmon, carp, pike, sturgeon, and lampreys—the fish of greatest value—are taken principally near St Goar, between Bingen and Coblenz.

Commercially and historically the Rhine is one of the principal rivers of Europe. It was the Romans' strongest bulwark against the Teutonic invaders. The Romans, and after them the Franks, encouraged commerce to travel up and down its waters, and kept its channel open. Under Charlemagne the ravages caused by the Tentons having broken through the Roman guard along the Rhine and inundated Gaul were rapidly obliterated, and the Rhine valley became the principal focus of civilisation in the early empire. Except between 1697 and 1871, and since 1919, the Rhine was always a German river; at the peace of Ryswick, Alsace-Lorraine was appropriated by France, and the Rhine became part of the dividing line between France and Germany. In 1801 Napoleon incorporated the whole of the left bank with France; in 1815 the arrangement in force before 1801 was restored; and after 1871 the Rhine became once more wholly German; but Alsace-Lorraine was lost by the war of 1914-19. From the days of the Roman supremacy down to the beginning of the 19th century navigation was always more or less hampered by the riparian sovereigns, during the greater part of the time a large number of

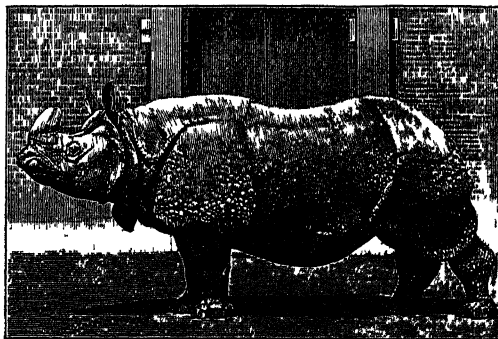
duodecimo princelings, who levied vexatious dues on the shipping that sailed up and down past their towns and territories. From 1803 all the powers concerned, except Holland, abolished most of the shipping dues on their own vessels navigating the Rhine, and Holland followed suit in 1831; but it was not until 1st July 1869 that the river was declared an absolutely free waterway to the ships of all nations. The first steamboat churned up its waters in 1817. There have been various schemes for utilising the mechanical power of the Rhine current by means of turbines and electro-motors. For the political organisation (1805-13) taking its name from the Rhine, see CONFEDERATION OF THE RHINE.

RHINE-WINE indicates, strictly speaking, the wines produced in the Rheingau (q.v.), the most valued and costly being those of Castle Johannisberg, Hochheim (whence the word *Hock*, applied in England promiscuously to all white Rhine wines), Rüdesheim, Steinberg, Gräfenberg, Rauenthal, Marcobrunn, Assmannshausen, and Geisenheim. Except the wine of Assmannshausen (Assmannshäuser), which is red, these wines are of a white or light golden colour, and have an exquisite bouquet and a dry piquant flavour. In a wider sense the term Rhine-wine includes the wines of nearly all the valleys lying contiguous to the Rhine—those of Baden, Alsace, the Moselle, Hesse-Nassau, and the Palatinate.

See the illustrated *Rhine*, by Stieler (trans. 1878); the guide-books of Murray and Baedeker; *Sinrock's Rheinsagen* and *Das malerische und romantische Rheintal*; the history of the river by Mehlis (1876-79); *A Book of the Rhine*, by Baring Gould (1906); *The Rhine, its Valley and History*, by Sir H. J. Mackinder (1908); and *Tausend Jahre deutscher Geschichte und deutscher Kultur am Rhein* (ed. Aloys Schalte, 1925).

Rhinoceros, a genus representing a distinct family of ungulate mammals, contains only five distinct species, unless *R. lasiotis* be recognised. These five species are distributed in the hotter parts of the Old World as follows: Africa contains two forms, which are often called the 'Black' and the 'White' rhinoceros. These terms are, however, very inapt, since both of them are of a grayish black; in colour there is but little difference between *R. sinus* and *R. bicornis*. They may, however, be distinguished by other points—the first species is much larger, and has a flat nose and square upper lip, while *R. bicornis* has the upper lip prolonged so as to enable it to seize and break off branches. Correlated with this structural difference is one of habit; *R. sinus* grazes, while *R. bicornis* feeds chiefly upon shrubs. A number of other species have been stated to occur in Africa, but it appears that these 'species' have been for the most part founded upon unimportant differences in the length of the two horns with which these animals are furnished. In Asia there are at least three well-marked species of rhinoceros. The large one-horned species, *R. unicornis*, occurs only in Nepal, Bhotan, and Assam; it is a very big species. A specimen in the Zoological Society's Gardens measured over 10 feet in length and a little more than 5 feet in height at the shoulder. It has enormous folds of skin, which give it the appearance of being 'armour-plated.' The African species have a smooth, though of course very thick, skin. The second Asiatic rhinoceros is *R. sondaicus*, which is smaller than the last, though also one-horned; it occurs in Java, Burma, and the Sundarbans near Calcutta. The two-horned Asiatic rhinoceros (*R. sumatrensis*) is found in Malacca, and *R. lasiotis*, from Chittagong, eastern Bengal, is hardly separable from it. Rhinoceroses were more abundant in earlier periods of the earth's history than they are at present;

one form (*Aceratherium*) existed without the characteristic horn or horns, while another (*Dicratherium*) had the horns placed side by side instead of following each other. The gigantic Miocene or Oligocene primitive hornless rhinoceros *Baluchitherium*, discovered in 1922, seems to have been the biggest mammal known, some 13 feet high at the shoulders. Its fossil remains are found in Beluchistan, Turkestan, and Mongolia. The animals are now a waning race. Sir Henry Johnston, writing of the white rhinoceros in 1924, says: 'In the course of some eighty years British and Boer "sportsmen" have steadily shot it down, wherever it could be got at, between the South-West Congo frontier, Zululand, and the Zambesi; and again in the equatorial regions of Africa—Uganda and the lands of the Southern Bahr-el-Ghazal and the White Nile—with the result that scarcely more than a hundred examples of this interesting, harmless monster now survive. The greater number of these survivals still live along the south-west limits of the Bahr-al-Ghazal and the adjoining fringe of the Congo basin, under French and Belgian rule. There it was rediscovered by Colonel Roosevelt's expedition. Its numbers in the British Sudan were estimated some five years ago "at between 2000 and 3000." Appar-



Rhinoceros unicornis.

(From a Photograph by Gambler Bolton, F.Z.S.)

ently, after Roosevelt's rediscovery of the animal, the Sudan government of those days had sufficient soul and knowledge to place it on the list of protected beasts. Recently, however, the blood lust seized their officers again, protection was seemingly removed or shootists mocked at the laws, and big-game sportsmen and natives combined have in five years almost exterminated the wonderful beasts. The French and Belgians, unhappily, are not, as nations, nearly so keenly interested in zoology as are we and the Americans; for we combine both the good qualities and the sheer vices of an interest in beasts and birds. Neither the French, therefore, nor the Belgian administrators of the Congo basin have put any effective obstacle in the way of British shootists afflicted with this blood lust. The case of Natal pushes itself into equal prominence with the British misdeeds in the Sudan. Dr Hornaday dwells on the outrages of a Natal "game-butcher"—unhappily with an English surname—who seemingly under a permit of the Natal government, has recently gone into the Zululand Game Reserve and slaughtered four out of the twenty remaining white rhinoceroses. The first rhinoceros seen in Europe since the days of the Roman amphitheatres was an Indian one sent to Emmanuel of Portugal. *Notes and Queries* (January 1912) recorded the presence of one in London in 1684. Accounts as to the character of the rhinoceros differ very pointedly. Some describe them as blundering and very stupid

animals, others as exceptionally fierce and cunning (fiercer than tigers). Perhaps they are sometimes in one humour, sometimes in another. The white rhinoceros is said to be 'perfectly harmless.'

The rhinoceros, with the horse and tapir, forms the Perissodactyl division of the Ungulata (q.v.). The Asiatic rhinoceroses are distinguished from the African forms by the presence throughout life of functional incisor teeth; and in other (osteological) characters the African species are to be contrasted with the Asiatic; in spite of its two horns, *R. sumatrensis* is more closely allied to *R. unicornis* than to *R. bicornis*; even the fossil species are referable for the most part to one or the other group. The Siberian *R. tichorhinus*, of which a specimen, partly preserved through its being frozen, was found by Pallas, belongs to the African group, which is sometimes separated under the generic name of *Atelodus*.

Rhinoplastic Operations. When a portion or the whole of the nose has been destroyed by accident or disease, the deficiency may be restored by a transplantation of skin from an adjoining healthy part. When the whole nose has to be replaced, the following course is usually adopted. A triangular piece of leather or gutta-percha is cut into the shape of the nose, and is extended on the forehead with its base uppermost; its boundaries, when thus flattened, are marked out on the skin with ink. Any remains of the old nose are then pared away, and a deep groove is cut round the margins of the nasal apertures. When the bleeding from these incisions has stopped, the marked portion of the skin of the forehead must be carefully dissected away, till it hangs by a narrow strip between the eyebrows. When the bleeding from the forehead ceases, the flap must be twisted on itself, so that the surface which was originally external may remain external in the new position, and its edges must be fastened with stitches into the grooves prepared for their reception. The nose thus made is to be supported with oiled lint, and well wrapped in flannel to keep up the temperature. When complete adhesion has taken place, the twisted strip of skin may be cut through, or a little slip may be cut out of it, so that the surface may be uniformly smooth. Either at the first operation or subsequently a new columna (the front part of the septum) is usually formed from the skin of the upper lip. When only a part of the nose, as one side only, or the septum, requires to be restored, modifications of the above operation are required, and the skin, instead of being taken from the forehead, is taken from the cheek or the upper lip. This operation is called the *Indian Method*, having been introduced from the East and first successfully performed in Europe by Carpue in 1814. It has almost entirely superseded the *Talia-cotian Operation*, first performed by Tagliacozzi or Taliacotius (1546-99), professor of Anatomy and Surgery at Bologna, and described in his famous work *De Curtorum Chirurgia per Insitionem* (1597). He took the skin for the new nose from the arm of his patient; and there is no reason why the operation which he describes, although inferior in many respects to that at present adopted, should not be successful. The difficulty of keeping the arm sufficiently long in apposition with the face (a period of about twenty days) is the chief objection to his method. The shape of the nose is also changeable at will by injection under the skin of hard paraffin in a melted state, by insertion of a slip of cartilage taken from one of the ribs, and other methods.

Rhizocarps. See WATER-FERNS.

Rhizome, or ROOT-STOCK, is a creeping stem, which may grow just beneath the surface of the

soil or burrow deeply into it. A rhizome may be distinguished from a root, (1) by bearing terminal and other buds, although some roots, such as those of Elm, Poplar, Plum, &c. possess adventitious buds, which send up aerial shoots, often called suckers by gardeners, who detest them, unless they are required to increase the stock; (2) by non-green scale leaves, which are usually very small; (3) by green aerial leaves, or the scars or even the dead remains of such leaves, which sometimes entirely cover the rhizome, as in Wood Rush; green leaves, however, are often on short or long aerial shoots growing from the rhizome, which may also produce the flowers as in Solomon's Seal; such aerial summer shoots leave their dead remains, or their scars on the rhizome; (4) by adventitious roots, which are given off here and there, scantily, as in Bracken, or in great abundance as in Male Fern; but in a few cases roots are absent, the rhizome itself taking the function of a root, as in the Coral-Root Orchid; (5) microscopically, by the absence of the exarch primary wood of roots, as revealed by a transverse section (see ROOT and STEM). In Beet, what the grower calls root is really a combination of root and stem, the lower part deep in the ground being root, and the upper leaf-bearing part, and for several inches down, being stem. The two parts differ not only microscopically, but also in the fact that the valuable sugar is stored chiefly in the stem. Hence those who raise new varieties of these plants endeavour to increase the stem portion by selection and other devices.

The functions of rhizomes, of great importance to many plants, are (1) to perennate the plant over the unfavourable season; (2) to increase and spread the plant by vegetative propagation; (3) to form dense extensive associations of one kind of plant, where the environment is suitable, as in reeds of a swamp, or to produce more or less isolated clumps of plants, as in many tufted sedges, grasses, &c.; (4) to bind loose soil such as sand or mud, and thus provide for the plant's future; (5) to ensure the succession of the plant in localities where seasons or other ecological factors favourable to seed production occur only now and again. It would appear that the vegetative and sex reproductive methods are reciprocal. Thus the common Lesser Celandine growing on a well-drained sunny bank produces a fair abundance of seed, and but few reproductive tubers, whereas in a damp, shady position tubers are abundant and seeds rare.

In autumn the aerial portions of the plant may wither, but the rhizome continues to live either in a condition of latent life or in a state of slow growth preparing its buds to push above ground early in spring. Rhizomes are usually well stored with reserve food, such as starch or sugar and protein, for use of the growing parts, and it is from this stored energy that slow winter growth below ground, and rapid spring growth above are provided for. The stored food is therefore more abundant in autumn than at the maximum of spring growth.

Rhizomes commonly burrow in a direction more or less horizontal with the surface of the soil, in which case the upper and lower sides may differ in form, so that a typical rhizome may be considered as a dorsiventral organ of the plant; it is also endowed with polarity. When, however, rhizomes grow more or less vertically, as in many ferns, &c., they have a radial symmetry similar to ordinary stems. When rhizomes branch, as they frequently do, these, like the main axis, also produce apical and lateral buds, which sooner or later grow into aerial shoots. Any portion of a rhizome, or its branch, bearing an evident, or a latent and therefore inconspicuous bud, may reproduce the parent plant; and such portions of rhizomes can be cut off and set in the soil for raising new plants of

exactly the same kind. This method is familiar to gardeners. Indeed, in the case of many obnoxious weeds, as well as numerous desirable garden plants like *Tritonia*, *Epilobium*, *Mint*, &c., this plan for rapid increase is but too well known. Hence arises the difficulty in keeping down, or within the confines of a border, weeds like Couch-grass, Colts-foot, Bracken, Corn-thistle, Bishop-weed, Bind-weed, Stinging-nettle, Horse-tail, Butter-bur, Creeping-buttercup, &c., and the garden plants mentioned above, along with hundreds of other examples. Almost every scrap of the rhizome of such plants broken off and left in the ground speedily produces another plant. Dandelion, Plantain, and Dock are pests of a similar class, the vitality of whose more or less vertical rhizomes on lawns is well known. The power of reproduction exhibited by such weeds is due to the nutrient substances stored in the rhizome, which feed the incipient and latent buds and root origins. From the practical consideration of many farm and garden crops weeds of the class mentioned can be attacked only in winter, which is just the season when their rhizomes contain the largest supply of stored food, and are therefore more likely to reproduce copiously from broken bits than would be the case at the flowering period, when the rhizomes would be partially depleted of food.

In many plants, as in some common ferns, the rhizome dies gradually behind as the apex grows in front. When rhizomes of this class produce lateral branches, these become liberated in time by the advancing decay of the main axis, and spread the plant to a small extent in all directions. This is illustrated by the great clumps of Male Fern observable in old woods and gardens. In this case, however, the young plants arise too close to the original rhizome; and as each produces a vast quantity of wiry roots which push the soil from the older central rhizomes, these consequently tend to become starved. In this way a vital barrier terminates the existence of that which is theoretically immortal.

Many rhizomes, particularly of Monocotyledons, exhibit false or sympodial branching (see *BRANCH*), as beautifully shown in Solomon's Seal. Others, more rarely, have the axis on the monopodial plan, as the Primrose. The most simple types of rhizome being elongated and narrowly cylindrical, correspond more or less closely with the usual aerial stems of plants. Sometimes the elongating energy is suppressed, and a very dwarf stem results, as in Primrose and Cyclamen. In the last, while vertical extension is almost completely suppressed, a lateral growth produces the tuber-like axis. In other cases a similar mode of growth occurring here and there along a narrow elongated axis, the vertical suppression usually including several internodes, results in a tuber such as Potato and Jerusalem Artichoke. When leaves or scale-leaves arise from the base of a tuber and enclose it within their scarious bases, a corm results, as in *Crocus*, *Gladiolus*, &c. If the energy of the axis is suppressed to a considerable extent laterally as well as vertically, and this dwarf, flattened stem or rhizome is surrounded and partially enclosed by fleshy scale-leaves, or the fleshy bases of former aerial leaves, or a combination of both kinds, a bulb results, as respectively in Tulip, Daffodil, and Hyacinth. If the individual fleshy leaves are very wide, and encircle the dwarf stem so that when a thin transverse slice is cut they fall away in rings, as in the kinds just mentioned, to which may be added the familiar Onion, then the bulb is said to be tunicated or concentric. On the other hand, if the fleshy leaves are comparatively narrow and cover the axis by overlapping one another like the tiles on a roof, then a scaly or imbricated bulb results, as in Lily. Transitional forms occur between these common definite examples. Corms and bulbs, then,

are in reality dwarf rhizomes with large, modified, subterranean buds which, indeed, often form the bulk of the plant in the resting stage. The fleshy leaves serve as storage organs for reserve food instead of the stem as in ordinary rhizomes. Tubers are akin to rhizomes on the one hand, and to corms or 'solid bulbs' on the other hand, while the latter approach the more highly developed scaly and tunicated bulbs.

From the fact that certain kinds of fungi are frequently found in intimate contact or even within the tissues of some tubers, corms, and bulbs, the idea has been suggested by various botanists that tuberisation is due to the stimulating effect of such fungi, which accelerate cell-increase and the accumulation of reserve food substances. Should the fungus-infection hypothesis of tuberisation be ultimately confirmed, then tubers, corms, and bulbs will have to be classified along with galls. The tuberisation of rhizomes generally is favoured by darkness and moderate dryness of soil. Hence the 'earthing up' of potatoes.

The rhizomes of *Polygala polygama*, and a few other plants are very remarkable in that they produce cleistogamous flowers (see *CLEISTOGAMY*) underground, which pollinate and ripen seed entirely below the surface.

Dry periods present great difficulties to plants (see *ECOLOGY*). It is interesting to compare the similar effect on bulbous plants of the diverse climates of the open plains of South Africa and our native deciduous woods. In South Africa the long dry summer establishes a condition of physical drought for the bulbous plants which are then in a dormant or semi-dormant condition below the soil-surface. When the damp season returns the plants are stimulated to activity, and the barren ground becomes gay with flowers. In our woods the trees absorb all available water from the upper layer of soil in early summer, so that bulbous plants like Daffodil, Wood Hyacinth, and Garlic are starved of water, and their aerial parts complete their functions and die down; the leaves of the trees, moreover, render the environment untenable by shade. In winter the soil is too cold, although rarely frozen to any depth, because the trees check the radiation of heat from the earth through the light humus loam. In early spring the sun warms the light, damp soil through the leafless trees, which also screen off cold winds; the absorptive power of the tree roots is almost nil, and the bulbous and rhizomatous plants have their one chance of the year. Their leaves and flowers then make the woods gay with colour until the roots and leaves of their giant neighbours once more initiate the period of repose.

The underground parts of plants discussed herein are, on account of their storing habits, often of great use to man.

See *BULB*, *CORM*, *TUBER*, *ROOT*, *STEM*; T. Irmisch, *Zur Morphologie der monokotyliischen Knollen- und Zwiebelgewächse*, and other works of this author; Kerner and Oliver, *Natural History of Plants*; papers by Maige (1900), Rimbach (1900-1902), Lidforss (1903), Massart (1903), Forss (1903), Raunkiaer (1904), Robertson (1906), Sperlich (1906), François (1908), Blodgett (1910); and all the large text-books on general botany, horticulture, &c.

Rhizo'poda (Gr. *rhizon*, 'a root,' and *podes*, 'feet'), a division of the Protozoa, in which the amoeboid phase of cell-life is predominant, the living matter flowing out in changeable processes or 'pseudopodia.' Some authorities include within the term (a) the Lobosa, such as *Amoeba* (q.v.), (b) the Filosa, such as *Euglypha* and *Gromia*, (c) the Foraminifera (q.v.), (d) the Heliozoa or Sun-animalcules, and (e) the Radiolaria (q.v.); others only (a), (b), and (c); others only (a) and (b).

Rhode Island, smallest of the United States, and one of the original thirteen of the Union. The

state takes its name from the *island* of Rhode Island, or Aquidneck, in Narragansett Bay (a beautiful islet 15 miles long by 3 wide). Of the *state* the extreme length from north to south is $47\frac{1}{2}$ miles, and its average breadth 35 miles; land area, 1033 sq. m. Rhode Island has thus a land surface only about $\frac{1}{25}$ th as great as that of Texas, the largest state; but, while it ranks only thirty-eighth among the forty-eight states in order of population, in density of population (566 per sq. m.) it holds the first place. Its name is referred by some to a supposed resemblance of the island of Rhode Island to Rhodes in the Mediterranean, while by others it is considered to be a corruption of *Roodt Eylandt* ('Red Island'), a name bestowed upon this island by the early Dutch.

There are no mountains in the state, but the surface is considerably diversified. The northern and eastern sections are hilly, and the land slopes toward a level region in the south. The most important elevations are Woonsocket Hill, Mount Hope, Diamond Hill, and Hopkins Hill. The coast along the Atlantic Ocean measures about 45 miles, but Narragansett Bay, which penetrates inland some 30 miles, affords with its various inlets about 350 miles of shore washed by tide-water. The southern coast west of Point Judith is low and sandy, with numerous fine beaches, and many marshes and ponds of salt water. To the west the shores are formed by high rocky cliffs interspersed with beaches of sand. Newport, Narragansett Pier, and Watch Hill, on the ocean coast, are among the most famous seaside resorts of the country; and Block Island, about 10 miles SW. of Point Judith, is also a favourite watering-place.

The western part of the state is marked geologically by the Archæan formation which is characteristic of much of New England, but an extensive coal-bearing area of the Carboniferous period stretches under the bay across the eastern part of the state into Massachusetts. It is the most eastern bed of anthracite in the United States, but thus far the coal which has been mined has been of inferior quality. There are deposits of iron ore, and excellent limestones and granite. Traces of the terminal moraine of the glacial period are visible in the state, and in many places the soil is stony or rocky, though in some localities it is moderately fertile. Agriculture, however, except in the way of market-gardening, is by no means a leading occupation.

Rhode Island enjoys a maritime climate, milder and more equable than that of other portions of New England. The rivers of the state are of little importance for navigation, but are of great value in furnishing water-power, and have played a prominent part in developing the industries of the state. The principal rivers are the Seekonk, navigable to Pawtucket, the Woonasquatucket, the Pawtuxet, and the Pawcatuck.

Newport has one of the finest harbours in the world, and the bay affords an extensive area of safe anchorage, with excellent ports at Bristol, Warren, and Providence. Formerly these places enjoyed a large foreign commerce, which finally disappeared with the war of 1812, and, though a considerable coasting trade is still carried on, commerce from that time ceased to be a prominent industry. It was replaced by manufacturing, which has ever since been the characteristic occupation of the people. The cotton manufacturing industry of the United States had its birth in Rhode Island, and dates from 1790. Cotton manufacturing, with dyeing, bleaching, and calico-printing, is followed in importance by the manufacture of woollen and iron goods, jewellery, rubber and leather goods. The principal towns

are Providence, the capital (237,595); Pawtucket (64,248); Woonsocket (43,496); Newport (30,255), till 1900 one of the two capitals of the state; and Central Falls (24,174).—The Northmen are supposed to have visited Rhode Island in the 10th century; and the 'Old Stone Mill' at Newport (q.v.) has been claimed as their work. The first permanent settlement was made at Providence by Roger Williams (q.v.) in 1636. Rhode Island was the last (1790) of the original thirteen states to ratify the constitution. In the war of the revolution, in that of 1812, and in the civil war of 1861-65 she took an active part. Pop. (1730) 17,935; (1830) 97,199; (1880) 276,531; (1900) 428,556; (1920) 604,397.

Rhodes, an island of the Mediterranean belonging to Italy, once a famous Greek state, lies 12 miles distant off the south-west coast of Asia Minor. It is 49 miles long and 21 broad, and is traversed by a chain of mountains reaching a height of 4070 feet. The soil is on the whole fertile, but the land has never been fully developed; fruit and vegetables are exported. Pop. 36,500.

The first historic inhabitants of ancient *Rhodos* were Dorian Greeks from Argos. Situated between the three ancient continents, the Rhodians early became very prosperous and affluent, and planted numerous colonies not only on the neighbouring shores, but also on the coasts of Italy, Sicily, and Spain. The island submitted to the Persians in 490 B.C., but the Athenian supremacy soon took the place of the Persian. The internecine struggle between the oligarchical party (backed by Sparta) and the democratic (supported by Athens) went on until Rhodes submitted to Alexander of Macedon in 332 B.C.; but after his death the Rhodians revolted again. Then began their most prosperous period; they became the first naval power in the *Ægean*, their ships being well built, and always splendidly manned and manoeuvred. As allies of the Romans, they opposed the Macedonians and Antiochus of Syria; and they won great glory by beating off Mithridates in 88 B.C. The Rhodians finally sided with Cæsar; but, venturing to oppose Cassius, the city was plundered by him (43 B.C.), and her ships all carried off or destroyed. This struck a fatal blow at her naval power. Under Vespasian Rhodes was made a Roman province; and in the 7th century it was captured by the Saracens and held for six years. As part of the Byzantine empire again, it was, in the Crusades, a convenient stopping-place for the Christian fleets. In the 13th century it was held by the Venetians and by the Genoese, who were turned out by the Byzantines. In 1309, after a three years' siege, the city fell into the hands of the Knights Hospitallers (q.v.) of St John, who made it their headquarters. The Turks besieged them there in 1480, and again in 1522-23; on both occasions there was terrible fighting, the Turkish losses being 25,000 and 90,000 to 100,000 men during the two sieges respectively. The Knights, who under their grand-master D'Aubusson (q.v.) beat off the Turks in the terrible siege of 1480, were compelled, in spite of their valour and the skill of their grand-master, De Lisle Adam, to capitulate on honourable terms (after the Turks had lost some 100,000 men) in 1523. The island remained Turkish up to the Libyan war in 1912, when it was pledged with the Dodecanese (q.v.) to Italy, which has held it ever since. The Italian occupation is unpopular with the inhabitants, who are mainly Greeks.

The city stood at the northern extremity of the island, on the slopes of a natural amphitheatre, and was built (404 B.C.) on a regular plan and strongly fortified. At the entrance of one of its two excellent harbours stood the gigantic statue of Helios, the Colossus (q.v.). Besides this statue,

one of the seven wonders of the ancient world, 3000 others, of which 100 were colossal, adorned the city, even in the 1st century A.D. The city suffered severely from earthquakes in 227 B.C. (when the Colossus was thrown down), 157 A.D., 515, 1364, 1481, 1851, 1856, and 1863. The city was famous for the number and excellence of its paintings, sculptures, and statues, the latter including the Laocoon (q.v.) and the Farnese Bull. Parrhasius and Protogenes were amongst its painters, and its sculptors, poets, rhetoricians, and athletes were well known throughout the Greek world. The first meridian of ancient geographers passed through Rhodes. The existing city dates for the most part from the period of the Knights; notable buildings being the church of St John, the Knight's hospital, and the grand-master's palace. The city walls still stand. Rhodes is the seat of a Greek archbishop. Pop. 10,000. 'Rhodian Law' was a code compiled by the ancient Rhodians while they held the sovereignty of the sea. See Belabre, *Rhodes of the Knights* (1909); Skevos Zervos, *Rhodes, Capitale du Dodécanèse* (Paris, 1920); and M. D. Volonakis, *The Island of Rhodes and her Eleven Sisters* (1922).

Rhodes, the RT. HON. CECIL JOHN, statesman, was born 5th July 1853, the fifth son of the vicar of Bishop-Stortford in Hertfordshire, and after attending the local grammar-school was sent for his health to Natal, where his brother was a planter. He subsequently went to the Kimberley diamond diggings; there he soon became conspicuous and amassed a fortune. He came back to England and entered at Oriel College, Oxford, and though his residence was cut short by ill-health he ultimately took his degree. He entered the Cape House of Assembly as member for Barkly. In 1884 General Gordon asked him to go with him to Khartum as secretary; but Rhodes had just taken office in the Cape ministry. He sent £10,000 to Mr Parnell to forward the cause of Irish Home Rule. In 1890-94 he was prime-minister of Cape Colony; but even before this he had become the ruling spirit in extensions of British territory, as in securing the charter for the British South Africa Company (see MATABELELAND). He it was mainly who brought it about that Bechuanaland remained a British possession, instead of falling to the Boers. And Rhodesia (q.v.) has not unnaturally superseded Zambesia as the name of a vast area now British, north and south of the Zambezi, which he had done much to develop. For the Jameson raid into the Transvaal, which he was believed to have prompted, see JAMESON (L. S.). From 1898 on he strenuously promoted an African Continental telegraph and a 'Cape to Cairo' railway. He was in Kimberley during the siege by the Boers. He died 26th March 1902, and was buried in the Matoppo Hills. By his will he founded, out of his vast fortune, 60 scholarships for colonials, tenable at Oxford for three years, besides foundations of the same kind for Americans and Germans. In 1916, the German scholarships were by Act of Parliament distributed among the dominions. There are Lives by Sir Lewis Michell (1910), Sir T. E. Fuller (1910), P. Jourdan (1910), and Basil Williams (1921), and a collection of his speeches (1890); see also *The Rhodes Scholarships*, by S. R. Parkin (1913), and the article on RHODESIA.

Rhodesia, named in 1895 after Cecil Rhodes (q.v.), is a vast plateau bounded by the Transvaal, Bechuanaland, Angola, Belgian Congo, Tanganyika Territory, Nyasaland, and Portuguese East Africa. It is divided by the river Zambezi (q.v.) into two unequal divisions. While the interests of Southern Rhodesia are similar to those of

South Africa, Northern Rhodesia is geographically, climatically, and in its vegetation part of Central Africa.

Southern Rhodesia is much the more developed of the two regions. Consisting of Mashonaland (q.v.) and Matabeleland (q.v.), it has an area of some 150,000 sq. m., with a white population of 34,000 (90 per cent. English-speaking) and a native population estimated at about 800,000. Almost half the country is situated between 3000 and 4000 feet above sea-level, and about a fifth between 4000 and 5000 feet. The mean annual temperature ranges from 75° F. to 70° in the lower regions, and from 70° F. to 65° in the higher. The mean annual rainfall is 28 inches. The country is healthy, malaria and blackwater fever not being prevalent. The rivers are not navigable, except for native craft. Guinea-fowl, partridge, sable and roan antelopes, wildebeest, and zebra are plentiful. The country is wide and undulating, with broken ranges of hills covered with small timber, and is very suitable for agriculture and ranching. Since 1923 (see *History*) the government has been vested in a governor, an executive council, and a legislature. The seat of government is Salisbury (white pop. 6500), the capital of Mashonaland. There is a High Court with civil and criminal jurisdiction, also magistrates' courts and municipalities at Salisbury and Bulawayo (chief town of Matabeleland, white pop. 7400). There are great gold-mining possibilities, but the modern mines have been developed mostly on the site of ancient workings (see MINING). The total output of gold from 1890 to 1924 was worth 60½ millions of pounds. Other minerals are coal, chrome ore, asbestos, and copper. Maize is the staple crop, but tobacco, and fruit-trees, especially oranges and lemons, are very important, as is also cattle-rearing. The natives are taking rapidly to agriculture, and areas amounting to a quarter of the whole country are reserved for them. The imports are chiefly machinery and manufactured goods: of exports, one-half is accounted for by gold. The trade is principally with Great Britain. In 1906 Alfred Beit bequeathed £200,000 for educational, public, and charitable purposes. Rhodesia sends annually three Rhodes scholars to Oxford.

Railways.—The total mileage of the Rhodesian railway system is 2468 miles, of which 1052 are situated in Southern Rhodesia. The system extends from Vryburg in the Union of South Africa through Bulawayo, across the Zambezi at the Victoria Falls to the Congo frontier, and from Bulawayo *via* Salisbury to the port of Beira in Portuguese East Africa. The bridging of the river Limpopo at Messina, bringing Rhodesia into direct communication with North Transvaal and Lourenço Marques, and the extension of the line from Salisbury across the Zambezi to Kafue, have been much discussed.

Northern Rhodesia has an area of some 300,000 sq. m., with a white population of 3700 and a native population estimated at about 1,000,000. The region west of the railway is known as Barotseland (q.v.). Except for the railway strip Northern Rhodesia is really a native reserve, and native rights are strictly safeguarded; it is practically all over 4000 feet above sea-level, and there are numerous belts of tsetse fly. Big game is abundant, elephants, hippopotami, lions, hyenas, crocodiles, &c. Much of the country is dense bush, and in the north-east there are vast swamps with a purely tropical climate. Since 1924 it has been a British protectorate (see *History*) with the capital at Livingstone. The country is very undeveloped, though there is a certain amount of sheep-farming, a trade in ivory, and in the region of the railway there are lead mines.

History.—For 19th-century history, see BAROTSE, MASHONALAND, MATABELELAND. In this period Rhodesia was almost a sealed book to all but the most adventurous of sportsmen, and missionaries like Moffat and Livingstone. From 1889 to 1923 Rhodesia was under the administration of the British South Africa Company, founded by Cecil Rhodes to keep the hinterland of South Africa British. The company was incorporated by Royal Charter, and on the whole the administration was successful. Slavery was abolished, the sale of spirits to the natives prohibited, railways were built (the Zambezi was bridged in 1904, and the Congo reached in 1909), and trade, agriculture, and mining encouraged. The Matabele Wars (1893 and 1896), a terrible epidemic of rinderpest, the Jameson Raid (see JAMESON, SIR L. S.), and the Boer War (1899–1901) all seriously retarded the development of the country. In 1898 the Secretary of State nominated a resident commissioner in Southern Rhodesia; other orders-in-council appointed a Secretary for Native Affairs besides two chief Native Commissioners, and other officials and a legislative council. In 1906 the chartered company might have paid a dividend (for the first time), but chose instead to divide the balance-sheet into two parts, one to be devoted to administrative and the other to commercial purposes. Meanwhile among the Rhodesian settlers a feeling of opposition to the company was steadily growing. The company had secured mining and other monopolies, and had responsibilities to its shareholders; a certain amount of land was locked-up by absentee landlords, and finally the country had no real control over its own finance, being unable to issue loans for public works. The agitation for self-government was shelved during the Great War, when 40 per cent. of the white adult population went on active service (a larger percentage than any other part of the empire), but in 1922 a referendum was taken in Southern Rhodesia, the alternatives being responsible independent government, or absorption, under admittedly liberal terms, into the Union of South Africa as a fifth province (strongly advocated by General Smuts, then Premier of the Union). Out of an electorate of over 18,000, 5989 voted for the Union and 8774 for responsible government, and in 1923 Southern Rhodesia emerged from the tutelage of the company. (It should be remembered that amalgamation with the south would imply a loss in individuality, as the Dutch element in Rhodesia is exceedingly weak.) The company retained the mineral rights, the control of the railways (though this will doubtless be modified), and was considered entitled to payment of its administrative deficits—estimated at 5 millions sterling, to be defrayed by the sale of unalienated crown lands. In 1924 Northern Rhodesia was taken over from the company and made a British protectorate.

Rhodesia has a great future before it, but much capital is required for its development, with irrigation schemes, land settlement, and railway construction.

See the bibliographies attached to articles on RHODES, SOUTH AFRICA (UNION OF), and NYASALAND; works by Livingstone, Manch (1874), and Selous (1881, 1893, 1897); H. Hensman, *History of Rhodesia* (1900); P. F. Hone, *Southern Rhodesia* (1909); A. Darter, *The Pioneers of Mashonaland* (1914); E. T. Jollie, *The Real Rhodesia* (1924); H. M. Hole, *The Making of Rhodesia* (1926); also A. S. and G. G. Brown's annual *Guide to South and East Africa*; the *Colonial Office List*; and the official *Yearbook*.

Rhodium (sym. Rh; atom. number 45; at. wt. 102.9; sp. gr. 12.1) is a metal of the platinum group. It is a white, very hard metal, resembling aluminium rather than silver. It fuses less easily than platinum. It is ductile and malleable when

pure and after fusion, and insoluble in all acids; but when alloyed in small quantity with platinum, copper, bismuth, and lead it dissolves with them in *aqua regia*. It usually forms about one-half per cent. of the ore of platinum, from which it is extracted by a somewhat complicated process. Three oxides, two sulphides, and a chloride of rhodium have been obtained and examined by chemists. The chloride unites with several soluble chlorides to form crystallisable double salts, which are of a rose colour (whence the name rhodium, from the Gr. *rhodon*, 'a rose'). The metal was discovered in 1803 by Wollaston.

Rhododendron (Gr., 'rose-tree'), a genus of trees and shrubs of the family Ericaceae, having ten stamens, a very small calyx, a bell-shaped or somewhat funnel-shaped corolla, and a capsule splitting up through the dissepiments. The buds are scaly and conical. The species are numerous; they have evergreen leaves, and many of them are of great beauty both in foliage and in flowers. A few species are natives of continental Europe and of Siberia; but the greater number belong to the temperate parts of North America, and to the mountains of India, Tibet, and China. *R. maximum*, so designated when the far larger Indian species were unknown, is common in Britain as an ornamental shrub. It is a large shrub or small tree, which forms impenetrable thickets on many parts of the Alleghany Mountains, and has a magnificent appearance when in flower. The leaves are large, oblong, acute, stalked, leathery, dark green and shining above, rusty brown beneath. The flowers are large, in umbellate corymbs, varying in colour from pale carmine to lilac. This species is quite hardy in Britain; as is also *R. ponticum*, a yellow-flowered species, with narrower and more pointed leaves, which are of the same colour on both sides. It was known until recently from southern Portugal and the Caucasus, the distance being to some extent bridged over by interglacial finds of this plant near Lugano, and Hötting in Tirol. But habitats have been found in Bulgaria, in Northern Volhynia, and in Poland near the Vistula and the river San. *R. ponticum* is the plant responsible for the mishap to Xenophon's troops (*Anabasis* iv. 8). *R. catawbiense*, a native of the southern parts of the Alleghanies, with large purple flowers; *R. caucasicum*, whose name indicates its origin; and *R. arboreum*, a



Rhododendron arboreum.

native of Nepal, with very dense heads of large scarlet flowers, and leaves 4–6 inches long, attaining in its native country a height of 30 or 40 feet, are also fine species, and well known. Most of the extremely numerous varieties now common in our gardens and shrubberies have been produced from

them by hybridising or otherwise. Many splendid species of rhododendron were discovered in the Himalayas, the Khasia Hills, and other mountainous parts of India, by Hooker and others; and many of them have been introduced into cultivation in Europe. *R. Falconeri* is described as in foliage the most superb of all, the leaves being 18 or 19 inches long. It is a tree 30–50 feet high, with leaves only at the extremities of the branches. It grows in eastern Nepal at an altitude of 10,000 feet. *R. grande* has flowers $4\frac{1}{2}$ inches long, and equally broad, clustered, and very beautiful. *R. Maddeni*, *R. Griffithianum*, *R. Edgeworthii*, and others have white flowers. *R. Dalhousiae* is remarkable as an epiphyte, growing on magnolias, laurels, and oaks. It is a slender shrub, bearing from three to six white lemon-scented bells, $4\frac{1}{2}$ inches long, at the end of each branch. *R. Nuttallii* has fragrant white flowers, said to be larger than those of any other rhododendron. All these belong to the Himalayas. In more southern latitudes, as on the Neilgherry Hills and on the mountains of Ceylon, *R. campanulatum* prevails, a timber-tree 50 to 70 feet high, every branch covered with a blaze of crimson flowers. *R. Keiskei* and *R. cinnabarinum*, natives of the north of India, have flowers with nearly tubular corolla. *R. ferrugineum* and *R. hirsutum* are small species, shrubs from 1 to 3 feet in height, natives of the Alps, and among the finest ornaments of alpine scenery. They are called *Alpenrose* (Alpine Rose) by the Germans. They have small carmine-coloured flowers in umbellate clusters. The mountain-slopes glow with their blossoms in July and August. The former grows only on a siliceous, the latter on a calcareous, substratum. In districts where both kinds of soil occur the two species have formed a constant hybrid, *R. intermedium*. The flora of the Himalayas contains a number of similar small species. *R. Anthopogon* and *R. setosum*, dwarf shrubs with strongly-scented leaves, clothe the mountains in eastern Nepal, at an elevation of 12,000 feet and upwards, with a green mantle, brilliant with flowers in summer. *R. nivale* is the most alpine of woody plants, spreading its small woody branches close to the ground at an elevation of 17,000 feet in Sikkim. *R. leoponicum*, a procumbent shrub, with small flowers, grows as far north as human settlements have reached in Europe, Asia, and America. Rhododendron is in the East as polymorphous a genus as *Rubus* in the West. The Tibetan region alone boasts 130 species in its lofty ranges, with a large number most likely still awaiting discovery. Azalea (q.v.), formerly regarded as a genus, is now included in Rhododendron. See Millais, *Rhododendrons* (1917–24), and a book by F. K. Ward (1926).

Rhodope, the ancient name of a mountain-chain (7474 feet) extending along the borders of Macedonia and Thrace. The Turks call it *Dospad Yailasi*, the Bulgarians *Despoto Dag*, both titles having reference to the numerous (Greek) monasteries that stud its sides. Of these the most famous is the vast fortress-monastery of Rilo, in the north-west of the range, standing on its southern side in the midst of magnificent pine forests. Rilo has long been the focus of the Bulgarian church and of Bulgarian nationality. Founded in the 10th century, the monastery was built mainly in the 14th century, being destroyed in 1833, and reconstructed on the old plans.

Rhondda, an urban district (1894) and two-member parliamentary borough (pop. 162,729) of Glamorganshire.—The Rhondda Valley, named from a tributary of the Taff, is a great centre of coal-mining and is nevertheless still famous for its fine scenery.

Rhone (Lat. *Rhodanus*), the only important

French river which falls into the Mediterranean, takes its rise in the Swiss Alps, on the western side of Mount St Gothard, at an altitude of 5752 feet, and not far from the sources of the Rhine. Its entire length, from its source to its mouth in the Gulf of Lions, is 504 miles, and the area of its river-basin 38,170 sq. m. It first runs in a south-westerly direction through the canton of Valais, along a narrow valley between the Bernese and the Pennine divisions of the Alps, until near Martigny it takes a sudden turn to the north and pours its waters into the Lake of Geneva (q.v.). It issues from the lake at its southern extremity, proceeding west, and then forces a passage through the Jura. The municipality of Geneva has taken advantage of the strong and steady current of the river where, passing through the city, it is divided by an island into two arms, to utilise it for industrial purposes. Formerly the river used to disappear for some distance near Fort l'Écluse into the subterranean channel *La Perte du Rhône*; but the vault or covering of the gorge into which it plunged has now been blasted away. At St Genis the Rhone turns back suddenly to the north-west, and then once more flows westward through a more level country as far as Lyons, where it is joined by its largest tributary, the Saône (283 miles long), from the north. From Lyons it follows a southern direction past Vienne, Valence, Montélimart, Avignon, and Arles, where begins its delta, embraced between two main arms, the Greater and the Lesser Rhone. Its most important affluents are, on the right, the Ain, Saône, Ardèche, and Gard; on the left, the Arve, Isère, Drôme, and Durance. From Lyons southward the Rhone is easily navigable for good-sized vessels; but the up-navigation, owing to the rapidity of the current and the sudden shifting of sandbanks, is attended with considerable difficulty, and is at times almost impracticable. A great scheme for utilising the whole course of the river through France for navigation, irrigation, and electric power was passed by the legislature in 1921; but for the uppermost part the maintenance of the level of the Lake of Geneva remained a matter for negotiation with Switzerland. On account of these and other difficulties, especially near the mouths of the river, communication with the Mediterranean is in great part dependent upon canals. Canals likewise connect the Rhone with the Rhine by the Saône, with the Seine, the Loire, and the Garonne.

Rhône, a department of France, part of the former Lyonnais, has an area of 1077 sq. m. and a pop. (1926) of 993,915 (741,470 in 1881). It lies almost wholly in the basin of the Rhone and the Saône, its eastern boundary being formed by these rivers. The surface is almost entirely hilly, being broken up in all directions by low spurs of the Cevennes. Corn, potatoes, wine, and fruits are the principal products. The department is industrially one of the most important in France; all the branches are carried on at Lyons (q.v.), its capital. The arrondissements are Lyons and Villefranche. See also BOUCHES-DU-RHÔNE.

Rhubarb (Low Lat. *rheubarbarum*, from Gr. *rhêon barbaron*, literally 'barbarian Rheum'; *rhêon* is an adjective from *Rha*, 'the plant found near the river Rha'—i.e. the Volga; the botanical name being simply *Rheum*), a genus of plants of the Polygonaceæ, closely allied to *Rumex* (dock and sorrel), from which it differs in having nine stamens, three shield-like stigmas, and a three-winged achenium. The species, about twenty, are large herbaceous plants, natives of the central regions of Asia, with strong, branching, almost fleshy roots; erect, thick, branching stems, sometimes 6 or 8 feet high; the stems and branches

whilst in the bud covered with large membranous sheaths. The leaves are large, stalked, entire or lobed; the flowers are small, whitish or red, generally very numerous, in large loose panicles of many-flowered clusters. The roots are medicinal. The leaf-stalks contain an agreeable mixture of citric and malic acids. The kinds cultivated for tarts and the like, *R. undulatum*, *R. Rhaponticum*, and *R. hybridum*, with endless varieties produced by the art of the gardener, all have broad, heart-shaped leaves, and the leaf-stalks flattened and grooved on the upper side. The leaf-stalks are often of a reddish colour, which in some of the finest varieties pervades the whole flesh.



Rhubarb (*Rheum officinale*).

Rhubarb is forced in winter and early spring by being placed in pots within houses, or by having pots inverted over it, and dung and straw heaped around; and forced rhubarb is more tender and delicate than that which grows in open air. The stalks when blanched are much less harsh in taste and require less sugar. The well-known medicinal *R. officinale* differs considerably in appearance from the kinds preferred in kitchen-gardens; the petioles are nearly round, and the under side of the leaf is covered with small, erect hairs.

Chemically, rhubarb consists of mucilage, oxalate of lime, an albuminoid containing nitrogen and sulphur, crystalline resins, tannin, gallic acid, sugar, chrysophane (decomposable into chrysophanic acid and glucose), rheotannic acid, and emodin.

Rhubarb may be briefly described as a cathartic, an astringent, and a tonic. As a cathartic it chiefly operates by increasing the muscular action of the intestines; and when the cathartic action is over there is generally more or less constipation. Rhubarb is one of the best aperients for general use in infancy, in consequence of the certainty of its action, and of its tonic and astringent properties, which are of much importance in the treatment of many infantile diseases attended with imperfect digestion and irritation of the intestinal canal. In adults it is serviceable in chronic diarrhoea and dysentery, when it is expedient to clean out the bowels. It is also a useful aperient in convalescence from exhausting disease, as being free from the risk of overacting; and, for the same reason, it is a useful medicine for persons who are constitutionally liable to over-purgation from trivial causes.

Rhuddlan, a town of Flintshire, North Wales, on the Clwyd, 3 miles SSE. of Rhyl. Its ruined castle, dating from 1015, and dismantled after its capture by the Roundheads in 1646, was the scene

of the betrayal of Richard II. by Percy (1399); at the marsh of Morfa Rhuddlan, across the river, Offa defeated Caradoc (795). With Flint, &c., Rhuddlan till 1918 returned a member to parliament.

Rhus. See SUMACH.

Rhyl, a watering-place of Flintshire, North Wales, at the mouth of the Clwyd, 30 miles NW. of Chester. A mere fishing-village so late as 1830, it has fine sands, and it commands good views of the Snowdonian mountains. Pop. 13,400.

Rhyme, or RIME (not from O.E. *rīm*, 'number,' but O.Fr. *rime*, from Gr. *rhythmos*), is the most prominent mark of versification in all the modern Germanic and Romance tongues—viz. the recurrence of similar sounds at certain intervals. As there may be various degrees and kinds of resemblance between two syllables, there are different kinds of rime. When words begin with the same consonant we have *Alliteration* (q.v.), which was the prevalent form of rime in the earlier Teutonic poetry, as in Old English. In Spanish and Portuguese we find employed a peculiar kind of rime called *Assonance*, consisting in the coincidence of the vowels of the corresponding syllables without regard to the consonants; this accords well with the character of these languages, which abound in full-toned vowels, but is ineffective in English and other languages in which consonants predominate. In its more usual sense, however, rime denotes correspondence in the final syllables of words, and is chiefly used to mark the ends of the lines in poetry. Complete identity in all the parts of the syllables beginning with the same consonants constitutes what the French call *rich rime*, as in *modèle, fidèle; beauté, santé*. They designate as *poor rimes* most of such rimes as English verse allows—collocations of similar syllables beginning with different consonants, as *page* and *rage*, *nut* and *instruit*. Undoubtedly one of the delights of rime is expectance, but that of uniformity in variety, rather than of monotonous and absolute uniformity. Although such rimes are not only allowed but sought after in French, in English they are deservedly considered faulty, or rather as not true rimes at all. No one thinks of making *deplore* rime with *explore*. Riming syllables in English must agree in so far, and differ in so far: *the vowel and what follows it—if anything follow it—must be the same in both; the articulation before the vowel must be different*. Thus, mark rimes with *lark*, *bark*, *ark*, but not with *remark*. In the case of *mark* and *ark* the absence of any initial articulation in the latter of the two makes the necessary difference. As an example of rime where nothing follows the vowel we may take *be-low*, which rimes with *fore-go*, or with *Of* but not with *lo*. To make a perfect rime it is necessary, besides, that the syllables be both accented; *free* and *merrily* can hardly be said to rime. It is almost needless to remark that rime depends on the sound, and not on the spelling. *Plough* and *enough* do not make a rime, nor *ease* and *decease*.

Such words as *roaring*, *de-ploring*, form *double* rimes; and *un-fortunate*, *im-portunate*, *triple* rimes. In double or triple rimes the first syllable must be accented, and the others ought to be unaccented, and to be completely identical. In the sacred Latin hymns of the middle ages the rimes are all double or triple. This was a necessity of the Latin language, in which the inflectional terminations are without accent, which throws the accent in most cases on the syllable next the last—*do-ctorum*, *vi-rorum*; *sup-plexia*, *con-vicia*. Although rimes occur chiefly between the end-syllables of different lines,

they are not unfrequently used within the same line, especially in popular poetry :

And then to see how ye're negleckit,
How *huff'd*, and *cuff'd*, and disrespeckit.
And ice mast-high came floating by.

When two successive lines rime they form a *couplet*; three form a *triplet*. Often the lines rime alternately or at greater intervals, forming groups of four (*quatrains*) or more. A group of lines embracing all the varieties of metre and combinations of rime that occur in the piece forms a section called a *stave*, or *stanza*, often, but improperly, a *verse*. In the days of elaborate Acrostics (q.v.), verses constructed in shapes, and other conceits, it was the fashion to interlace rimes in highly artificial systems; the chief complex arrangements now current in English are the various forms of the sonnet, and the Spenserian stanza. Tennyson accustomed the English ear to a quatrain in which, instead of alternate rimes, the first line rimes with the fourth, and the second with the third.

It is a mistake to suppose that rime is a mere ornament to versification. Besides being in itself a pleasing musical accord, it serves to mark the endings of the lines and other sections of the metre, and thus renders the rhythm more distinct and appreciable than the accents alone can do. So much is this the case that in French, in which the accents are but feeble, metre without rime is so undistinguishable from prose that blank verse has never obtained a footing, notwithstanding the war once waged by French scholars against rimed versification. 'The advantages of rime,' says Guest, 'have been felt so strongly that no people have ever adopted an accentual rhythm without also adopting rime.' The Greek and Latin metres of the classic period, depending upon time or quantity, and not upon accent, were able to dispense with the accessory of rime; but, as has been well observed by French (*Introduction to Sacred Latin Poetry*), even 'the prosodic poetry of Greece and Rome was equally obliged to mark this (the division into sections or verses), though it did it in another way. Thus, had dactyls and spondees been allowed to be promiscuously used throughout the hexameter line, no satisfying token would have reached the ear to indicate the close of the verse; and if the hearer had once missed the termination of the line it would have been almost impossible for him to recover it. But the fixed dactyl and spondee at the end of the line answer the same purpose of strongly marking the close as does the rime in the accentuated verse; and in other metres, in like manner, licenses permitted in the beginning of the line are excluded at its close, the motives for this greater strictness being the same.' It is chiefly, perhaps, from failing to satisfy this necessary condition that modern unrimed verse is found unsatisfactory, at least for popular poetry; and it may be doubted whether it is not owing to the classical prejudices of scholars that our common English blank verse got or maintained the hold it has.

The objection that rime was 'the invention of a barbarous age, to set off wretched matter and lame metre,' rests mainly on ignorance of its real history. It cannot be considered as the exclusive invention of any particular people or age. It is something human, and universal as poetry or music—the result of the instinctive craving for well-marked recurrence and accord. The oldest poems of the Chinese, Indians, and Arabs are rimed; so are those of the Irish and Welsh. In the few fragments of the earliest Latin poetry that are extant, in which the metre was of an accentual, not quantitative kind, there is a manifest tendency to ter-

minations of similar sound. This native tendency was overlaid for a time by the importation from Greece of the quantitative metres; yet even under the dominance of this exotic system riming verses were not altogether unknown; Ovid especially shows a liking for them :

Quot oculum stellas, tot habet tua Roma puellas;

and in the decline of classicality they become more common. At last, when learning began to decay under the irruptions of the northern nations, and a knowledge of the quantity of words—a thing in a great measure arbitrary, and requiring to be learned—to be lost, the native and more natural property of accent gradually reappeared as the ruling principle of Latin rhythm, and along with it the tendency to rime. It was in this new vehicle that the early Christian poets sought to convey their new ideas and aspirations. The rimes were at first often rude, and not sustained throughout, as if lighted upon by chance. Distinct traces of the adoption of rime are to be seen as early as the hymns of Hilary (died 368), and the system attained its greatest perfection in the 12th and 13th centuries. In refutation of the common opinion that the Latin hymnologists of the middle ages borrowed the art of rime from the Teutonic nations, Dr Guest brings the conclusive fact that no poem exists written in a Teutonic dialect with final rime before Otfried's *Evangelii*, which was written in Frankish about 870. Alliteration had previously been the guiding principle of Teutonic rhythms; but after a struggle, longer protracted in England than on the Continent, it was superseded by end-rimes.

Rhymer. See THOMAS THE RHYMER.

Rhymney, a town of Monmouthshire, on the river Rhymney, 2½ miles W. of Tredegar. Pop. 11,700.

Rhynchocephalia. See SPHENODON.

Rhynchonella. See BRACHIOPODA.

Rhynchophora. See WEEVIL.

Rhynchos. See SKIMMER.

Rhyniaceæ, a family of primitive pteridophytes included (along with Asteroxylon and Psilophyton) in the class Psilophytales; very simple land plants, found in a chert of Old Red Sandstone age at Rhyndie in Aberdeenshire. The plants were fossilised where they grew, and the details of their structure so beautifully preserved that they almost equal living material. *Rhynia major* and *R. Gwynne-Vaughani* were rootless, leafless plants with rhizome and aerial stem, both branched and traversed by an extremely simple vascular strand, the rhizome having absorbent hairs and the vertical stem a few stomata. *Hornea Lymieri* differs in having a tuberous rhizome. The sporangia of the Rhyniaceæ are modified ends of branches. In *Hornea* there is a central columella suggestive of mosses. The sporangium may even share in the branching of the stem.

Rhyolite. See LIPARITE.

Rhŷs, SIR JOHN (1840–1915), born near Ponterwyd in Cardiganshire, served a pupil-teacher's apprenticeship, and after the course at Bangor Normal College kept a school in Anglesey down to the end of 1865, when he entered Jesus College, Oxford. He was elected to a fellowship at Merton in 1869, and next continued his studies at the Sorbonne, Heidelberg, Leipzig, and Göttingen, returning in 1871 to become inspector of schools for Flint and Denbigh. In 1877 he was appointed professor of Celtic in the University of Oxford, in 1881 was elected a fellow, and in 1895 principal, of Jesus College. His *Lectures on Welsh Philology* (1877) and *Celtic Britain* (1882) confirmed a reputation already gained by contributions to

Kuhn's *Beiträge zur vergl. Sprachforschung*, the *Revue Celtique*, and the *Archæologia Cambrensis*. He gave the Hibbert Lectures on *Celtic Heathendom* in 1886, and in 1889 the Rhind Lectures at Edinburgh. He wrote also *Studies on the Arthurian Legend* (1891), and *Celtic Folklore* (1901), and, with Brynmor-Jones, *The Welsh People* (1900; new ed. 1913).

Rhythm may be defined as measured or timed movements, regulated succession. In order that a number of parts may constitute a pleasing whole, a certain relation or proportion must be felt to pervade them, and this exemplified in the arrangement of matter into visible objects, as in sculpture, architecture, and other plastic arts, produces a rhythm which is usually called *symmetry*. Rhythm applied to the movements of the body produces the *dance*. 'The rhythmical arrangement of sounds not articulated produces *music*, while from the like arrangement of articulate sounds we get the cadences of *prose*, and the measures of *verse*. Verse may be defined as a succession of articulate sounds, regulated by a rhythm so definite that we can readily foresee the results which follow from its application. Rhythm is also met with in prose; but in the latter its range is so wide that we never can anticipate its flow, while the pleasure we derive from verse is founded on this very anticipation.'

The rhythm of verse is marked in various ways. In Greek and Latin, during their classic periods, *quantity*, or the regulated succession of long and short syllables, was the distinguishing mark of verse. In the languages descended from these the rhythm depends upon *accent*. The recurrence of similar sounds, or rime, is also used, along with accent, to render certain points of the rhythm more distinct, as well as to embellish it. See **METRE**, **RHYME**; Saintsbury, *History of English Prose Rhythm* (1912); William Thomson, *The Rhythm of Speech* (1923).

Rhytina, a genus of Sirenia, akin to the dugong and manatee, of which only one species has been made known—the *Rhytina stelleri*, discovered by Behring and the naturalist Steller when they were wrecked on Behring Island in 1741, and described very fully by Steller. At that date they were extremely plentiful in this part of the northern Pacific, but were soon almost extirpated by the Russian hunters and traders. Nordenskiöld's inquiries led him to believe that individuals were seen till the middle of the 19th century. The species was distinguished by its large size, sluggishness, and its having horny plates in place of teeth. The skin was rough and hairless. The *Vega* expedition brought home many skeletons.

Riad. See **WANHABIS**.

Riazan, a town of Russia and capital of a government, stands near the right bank of the Oka, 115 miles by rail S.E. of Moscow. A straggling, ill-built town of wooden houses, it sends wheat to Moscow. Pop. 41,500.

Ribalta, FRANCISCO (1550–1628), and JUAN (1597–1628), painters of the school of Valencia.

Ribble. See **PRESTON**.

Ribbon, Riband, or **RIBBAND** (a Celtic word). In Coventry the ribbon industry was started by Bird at the beginning of the 18th century. Coventry was at that time a city of 12,817 inhabitants. The population increased with the progress of the ribbon industry, until in 1861 it was 41,638. In 1860 there were 8886 looms; but the great competition of Basel and St Etienne then soon ruined the production of Coventry, for at these old centres labour was then much cheaper, the hours of work longer, and taste and style superior, particularly at St Etienne. Crefeld, Moscow, and especially

Paterson in New Jersey, are also manufacturing centres. See **SILK**, **WEAVING**.

Ribbon-fish, a name given to some members of a peculiar family (Trachypteridae) of bony fishes in the sub-order Acanthopterygii. They are abyssal or sometimes pelagic fishes. The body is much compressed and elongate; there is a continuous dorsal fin all along the back; the scales are minute or absent; the colour is silvery; the mouth is very protractile. The northern Ribbon-fish or Deal-fish (q.v.) (*Trachypterus arcticus*) may be 8 feet long or more; the Oarfish (*Regalecus glesne*) may be over 20 feet long. Both may have given rise to sea-serpent stories.

Ribeauville (Ger. *Rappoltsweiler*), a town in Upper Alsace (department of Haut Rhin), pleasantly situated amid vineyards at the west foot of the Vosges, 33 miles SSW. of Strasburg. Excellent wines are made; cotton and calico goods are manufactured. Pop. 5000.

Ribera, JUSEPE, called SPAGNOLETTO ('Little Spaniard'), was born at Jativa, near Valencia, on 12th January 1588, and died at Naples in 1656. He studied a few years with Francisco Ribalta at Valencia, then crossed the sea and continued his studies in Rome, Parma, and Modena. He settled in Naples, where he adopted the boldness of Caravaggio's style, and became the ablest painter among the *naturalisti*, or artists whose treatment of subjects was based on a vigorous, but generally coarse, representation of nature, in opposition to that formed on the study of conventional or academic rules. He attracted the attention of the viceroy, became court-painter, and was elected member of the Academy of St Luke at Rome in 1630. His realism is forcible and generally gloomy: he delighted to represent horrible and gruesome subjects, such as the martyrdoms of SS. Bartholomew, Januarius, and Lawrence, 'Prometheus,' &c. Salvator Rosa and Giordano were his most distinguished pupils. He executed several etchings marked by force and freedom.

Ribes (from Arab. *ribaz*), a genus of shrubs of the Saxifragaceæ (sub-family Ribesioideæ), familiar examples of which are the Gooseberry and the Currant of gardens. The species are chiefly natives of the temperate and colder regions of the northern hemisphere; some are found at high elevations in tropical America and on the Pacific coast, from California to Chile. They are found also on the mountains of Northern India, in the colder regions of Africa and Europe, but western America is the home of the largest number of the species. They are twiggy shrubs, often, as in the Gooseberry (*R. Grossularia* and *R. speciosum*), armed with spines, clothed with deciduous alternate leaves, usually palmately lobed. The flowers are axillary in racemes, rarely solitary—small but often showy in the mass, as in *R. speciosum* and *R. sanguineum*. The calyx is the most conspicuous organ of the flower. It is persistent or adheres to the fruit after it is ripe, a feature very familiar in the gooseberry. The fruit is a berry, not in all species succulent, as it is in the gooseberry, currant, and others, but sometimes, as in *R. sanguineum*, almost entirely pulpless when ripe. The most important product of the genus is the fruit, which consists of sweet mucilage mixed with malic and nitric acids along with an astringent substance. See **CURRENT**, **GOOSEBERRY**.

Rib-grass. See **PLANTAIN**.

Ribs are elastic arches of bone, which, with the vertebral column behind, and the sternum or breast-bone in front, constitute the osseous part of the walls of the chest. In man there are twelve ribs on each side. The first seven are more directly connected through intervening cartilages with the

sternum than the remainder, and hence they are termed *vertebro-sternal* or *true ribs*; while the other five are known as *false ribs*, and the last two of these, from being quite free at their anterior extremities, are termed *floating ribs*. A glance at a skeleton, or at a plate representing the articulated

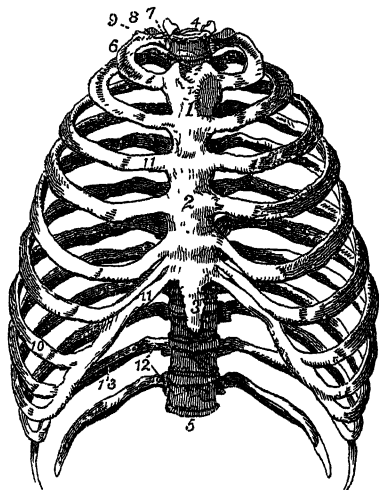


Fig. 1.—The Ribs, *in situ* :

1 and 2 are the upper and the middle parts of the sternum or breast-bone; 3, its ensiform cartilage; 4, the first dorsal, and 5 the last (or twelfth) dorsal vertebra; 6, the first rib; 7, its head; 8, its neck, resting against the transverse process of the first dorsal vertebra; 9, its tubercle; 10, the seventh or last true rib; 11, the costal cartilages of the true ribs; 12, the last two false ribs or floating ribs.

bones, will show that the ribs vary very considerably both in their direction and size. The upper ribs are nearly horizontal, but the others lie with the anterior extremity lower than the posterior; this obliquity increasing to the ninth rib, and then slightly decreasing. They increase in length from the first to the eighth, and then again diminish. The spaces between the ribs are termed the *intercostal spaces*. On examining a rib taken from about the middle of the series we find that it presents two extremities (a posterior or vertebral, and an anterior or sternal), and an intervening portion, termed the body or shaft. The posterior extremity presents a head, a neck, and a tuberosity. The head is marked by two concave articular surfaces divided by a ridge, the lower facet being the larger. These surfaces fit into the cavity formed by the junction of two contiguous dorsal vertebrae, and the ridge serves for the attachment of a ligament. The neck is a flattened portion proceeding from the head; it is about an inch long, and terminates at an eminence termed the tuberosity or tubercle, from whence the shaft commences. On the lower and inner part of this tubercle is a small oval surface, which articulates (as shown in fig. 2) with a corresponding surface on the upper part of the transverse process of the lower of the two vertebrae with which the head is connected. The shaft presents an external convex and an internal concave surface. A little external to the tubercle the rib is bent to form the angle, from which point the rib passes forwards and outwards, ultimately curving inwards to join its costal cartilage. The upper border of the rib is thick and rounded, while the lower border is marked by a deep groove, which lodges the intercostal vessels and nerve.

The ribs of Mammals are mostly connected, as in

man, with the bodies of two vertebrae, and with the transverse processes of the posterior one. In the Monotremata, however, they articulate with the vertebral bodies only; while in the Cetacea the posterior ribs hang down from the transverse processes alone. Their number on each side corresponds with that of the dorsal vertebrae. The greatest number, twenty-three, occurs in the two-toed sloth, while in the Chiroptera eleven is the ordinary number. In Birds each rib articulates by means of a small head with the body of a single vertebra near its anterior border, and with the corresponding transverse process by means of the tubercle. Moreover, each rib possesses a 'diverging appendage,' which projects backwards over the next rib, so as to increase the consolidation of the

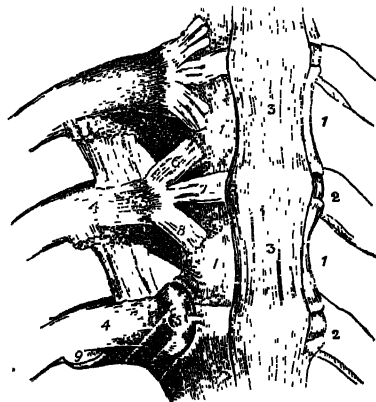


Fig. 2.—A Front View of the Articulations of the Ribs with the Spinal Column :

1, 1, dorsal vertebrae; 2, 2, intervertebral cartilages; 3, 3, anterior common ligament; 4, neck, and 5, head of rib; 6, 7, 8, flat bundles of ligamentous fibres (removed in the lowest rib, shown in the figure); 9, articulation between the tubercle of the ribs and the transverse vertebral process.

thoracic framework, necessary for flying. The dorsal vertebrae here never exceed eleven, and are commonly seven or eight in number, and the ribs proceeding from them are connected with the sternum not by cartilage, as in mammals, but by true osseous sternal ribs, which are regularly articulated at one end with the sternum, and at the other with the termination of the spinal ribs. In the Chelonian Reptiles the ribs (as well as the vertebra and the sternum) deviate remarkably from the normal type, the lateral parts of the carapace consisting mainly of ankylosed ribs united by dermal plates. In the Crocodiles there are only twelve pair of true or dorsal ribs; while in the other Saurians, and in the Ophidians, the ribs are usually very numerous. In the Frogs there are no true ribs, the reason probably being that any bony element in their thoracic walls would interfere with the enormous thoraco-abdominal enlargement which these animals periodically undergo at the breeding period.

In the language of the comparative anatomist, a rib is to be regarded as a *Pleurapophysis*—one of the elements of a typical vertebra (see SPINAL COLUMN).

Fracture of the Ribs is a very common surgical accident, resulting from blows or falls upon the chest. Ribs may, moreover, be broken by mere pressure, as when persons are severely crushed in a crowd; and instances are on record in which, in the case of aged persons, the ribs have been actually fractured in violent coughing. The treatment consists in the application of a broad flannel roller round the chest, so tightly as to prevent, as far as possible, all movement of the

ribs, and to render the respiration abdominal rather than thoracic. The bandage must be prevented from falling by the addition of shoulder-straps; and in order to prevent the shoulder-blade from moving, and thus disturbing the broken ribs, some surgeons confine the arms to the side of the body. If one or both of the extremities of the fractured rib should perforate both layers of the pleura and wound the lung, or in rare cases when only the parietal layer of the pleura is injured, if the skin is also perforated, air may escape in the act of inspiration from the lung or from the exterior into the pleural cavity, and thence through the wound in the costal pleura into the cellular or areolar tissue of the trunk, giving rise to Emphysema (q.v.), in the form of a soft puffy swelling that crepitates and yields on pressure.

Ricardo, DAVID, an eminent political economist, was born in London, 19th April 1772. His father was a Jew, a member of the Stock Exchange, and brought up his son to the same business. An alienation took place between them, when in 1793 young Ricardo married out of the Jewish persuasion and conformed to the Christian religion. He continued, however, to follow his father's profession with such success that at a very early age he realised a large fortune, while preserving an honourable reputation throughout his career in business.

In 1799 Ricardo had his interest in political economy awakened by the perusal of Smith's *Wealth of Nations*. His experience had well fitted him for the treatment of the special class of economic questions connected with banking and finance, and it was in the discussion of them that he first made his mark. In 1809 he brought out a pamphlet entitled *The High Price of Bullion a Proof of the Depreciation of Bank-notes*. As the title indicates, it was an argument in favour of a metallic basis. Other successful pamphlets followed. In 1817 appeared the work on which his reputation as an economist chiefly rests, *On the Principles of Political Economy and Taxation*. It is not a complete treatise on political economy, but may be described as a discussion of some of the principal factors of the science, such as value, wages, rent, &c. Ricardo is the conspicuous example of the abstract method of political economy. He was very deficient in the philosophic and historical training necessary for the wider investigation of economics. He approached the subject as a member of the Stock Exchange; and the economic conditions which he contemplated were those prevalent in his own day in England and in countries similarly situated, and particularly in the city of London. The main gist of his work is to embody economic principles in formulas, which for the most part have a general validity relative to the limited conditions which he thus recognised. His theories of Rent (q.v.) and of Wages (q.v.) have a general truth when regarded in this way; but when considered from a wider historical and philosophic standpoint they shrink greatly in significance. His theory of Value (q.v.) is still more defective.

In 1819 Ricardo entered parliament as member for Portarlington, and retained his seat till his death at Gatcomb Park, Gloucestershire, on 11th September 1823. He was too diffident to be an effective speaker, but his speeches, especially on matters of trade and finance, which he had made particularly his own, always commanded respect, and had a very considerable influence. Personally he was highly esteemed. His method in political economy is now almost universally abandoned. Even the strongest supporters of the traditional doctrines acknowledge that the value of his formulas has been greatly overrated, and that they

must undergo continual limitation, modification, and correction in the light of experience and of historic conditions. Yet his theories are eminently worthy of study, both as a phase in the development of economic science, and as illustrating a stage in the development of economic facts. The collected works of Ricardo were edited by McCulloch (1846), and collections of his letters were published in 1887, 1895, and 1899. See J. H. Hollander, *Ricardo, A Centenary Estimate* (1910).

Ricasoli, BARON BETTINO, Italian statesman, was born at Florence, 9th March 1809, and studied at Pisa and Florence. He was one of the best agriculturists in Italy, wrote books on the cultivation of the vine, the olive, and the mulberry, and for ten years worked successfully at the drainage of the Tuscan Maremma (q.v.). In 1859 he took a prominent part in opposing the government of the grand-duke (see ITALY), and when the latter fled Ricasoli was made dictator of Tuscany. He laboured with great energy for the unity of Italy, and when that end was accomplished was by Victor Emmanuel appointed governor-general of Tuscany. On the death of Cavour (1861) he was called to the head of the ministry; but his government was undermined by Rattazzi, and he resigned in March 1862. Ricasoli returned to power in June 1866, but was again obliged to retire in April of the following year. At the same time he withdrew altogether from public life; he died in Rome, 23d October 1880. Ten volumes of his letters and papers were published in 1886-94. See *Life by Gotti* (1894), and a study by Hancock (1926).

Ricci, MATTEO, founder of the Jesuit missions in China, was born at Macerata, 6th October 1552, studied at Rome, and in 1583 obtained leave to settle at Chow-king. He made his headquarters at Nanking, but was ultimately allowed to remove to Peking, where he built a church. He so mastered Chinese as to write dialogues and other treatises which received much commendation from the Chinese literati, and met with extraordinary success as a missionary. At his death, 11th May 1610, he was universally mourned. See JESUITS.

Riccia. See LIVERWORTS.

Riccio, or RIZZIO, DAVID. See MARY (QUEEN OF SCOTS).

Rice (*Oryza*), a genus of grasses, having panicles of one-flowered spikelets, with two very small pointed glumes, the florets compressed, the palea strongly nerved, awned or awnless, six stamens, and two feathery stigmas. The only important species is Common Rice (*O. sativa*), one of the most useful and extensively cultivated of all grains, supplying the principal food of nearly one-third of the human race. It seems to be originally a native of the East Indies, but is now cultivated in all quarters of the globe, and almost wherever the conditions of warmth and moisture are suitable. It is adapted to tropical and sub-tropical climates, rather to the latter than the former. Rice is an annual, varying from 1 to 6 feet in height. There are many other distinguishing characters of the varieties in cultivation, some having long awns and some being awnless, some when ripe having the chaff (*palea*) yellow, white, red, black, &c. The seed or grain of rice grows on little separate stalks springing from the main stalk; and the whole appearance of the plant, when the grain is ripe, may be said to be intermediate between that of barley and of oats. Rice requires a moist soil, sometimes flooded. In some parts of the East canals are carried along the sides of hills for the irrigation of land for the cultivation of rice. In South Carolina rice is sown in rows in the bottom of trenches, which are about 18 inches apart; the trenches are filled with water to the depth of several

inches, till the seeds germinate; then the water is drawn off, and afterwards the fields are again flooded for rather more than a fortnight to kill weeds. They are flooded again when the grain is near ripening. Marshy situations, where there is always the same abundance of water, are not so suitable for rice as those in which the supply of water is regulated according to the season and the growth of the plant. In Europe the cultivation of rice is carried on in the plains of Lombardy and in Valencia in Spain. The introduction of rice into the United States took place only about the middle or close of the 17th century, and now more than half the crop comes from Louisiana. The chief rice-producing countries in the world are India and China. Japan comes third. Rice is also extensively grown in Indo-China, Java, Siam, Egypt, and Brazil.

The wild rice, plentiful in the marshy tropical countries of southern Asia as well as in northern Australia, is without doubt the plant from which all our forms of cultivated rice have been derived. Most modern authorities regard India as the first home of rice, though some say it was originally derived from China. It has been cultivated in India from time immemorial. There are as many as 1300 names of rice, and, though very many of these are merely local

synonyms, a large number unquestionably correspond to intrinsic and seasonal distinctions. The obvious differences in the grain itself are indeed very remarkable. In colour the specimens range from a bright golden hue through almost every gradation of tint to black; and in regard to size also they vary greatly. But all these forms of rice are referable to a very few well-marked and constant varieties of *O. sativa*, the result of seminal variation commonly observed in plants that have been long brought under cultivation. Rice in the husk is called *Paddy* in India.

Rice is husked, quickly dried, and usually polished before being brought to market. Polishing, however, deprives it of a valuable vitamin (see *BERIBERI*, *VITAMINS*). Special milling machinery is required for removing the inner skin of the rice grain, and a large quantity of the grain is badly broken in the process, being saleable only as broken rice or rice-flour. Good Indian rice has the following composition: Moisture, 13.50 per cent.; nitrogenous matter, 7.41; starch, 78.10; fatty or oily matter, 0.40; ash, 0.59. Rice contains a smaller amount of nitrogenous elements than any other grain (wheat having as much as 22 per cent.); it is also deficient in fatty matter, and if taken by itself is less nutritious than other grain-food (see *FOOD*); but combined with fatty nitrogenous substances it is a valuable food-stuff. It is believed to furnish more food for man than any other grain, especially in Chinese regions; but it is not, as is commonly supposed, the chief food-supply of India, where, save in certain favoured areas, millet is the principal food-stuff. Owing to the small quantity of gluten which it contains, it is capable by itself only of an imperfect fermentation, and is unfit for being baked into bread. It is, however, in many countries subjected to fermentation by

help of added ferments of various kinds. The beer made from rice by the Japanese is called *Saki*, and is in general use among them. Several kinds of *Rice wine* are made by the Chinese and Japanese, some of them highly esteemed and very intoxicating; spirit is distilled from the lees. Some of the common Arrack (q.v.) of the East is made from rice; and rice is also largely employed by distillers in Britain.

Rice Starch is made in considerable quantity in Britain, and is used in laundries and muslin manufactories. It has one-fourth more starch in its composition than wheat, hence the preference given to it by starch makers, both from its cheapness and larger yield. The straw of rice is used to make straw-plait for hats and the straw shoes of Japan. The refuse of rice, which remains when it is cleaned for the market, and consists of the husk, broken grains, and dust, is valuable as food for cattle. It is known as *Rice-meal* and *Rice-dust*.

Canada Rice (*Zizania aquatica*), the Wild Rice or Indian Rice of North America, is a species of grass quite different from the true rice, and of a different genus. It is common in North America, and particularly abundant in the north-western parts, growing in miry places or shallow water, often on the margins of lakes. It has a culm 7 to 8 feet high, with broad diffuse leaves, and a large terminal panicle of male flowers, with a spike of female flowers at the summit. The flowers have six stamens. The seeds are about half an inch long, slender, farinaceous, affording very good meal, and are much used by the Indians where the plant abounds.

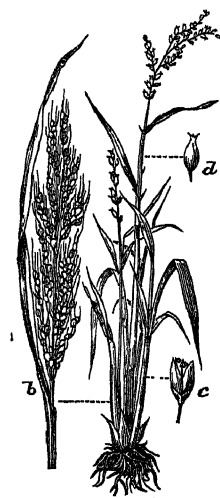
Rice, JAMES, novelist, for nine years collaborator with Sir Walter Besant (q.v.), was born at Northampton in 1843, studied at Cambridge, drifted from law into literature, and became proprietor and editor of *Once a Week*. He died in London, 25th April 1882.

Rice-bird, a name given to the Bob-o-link (q.v.), as also to a popular cage-bird, the so-called Java Sparrow (*Padda oryzivora*), really a kind of finch.

Rice-paper, a paper made in China with layers of *Fatsia* (*Aralia papyrifera*, a tree peculiar to the island of Formosa). The pith is sometimes 1 to 1½ inch in diameter. By carefully cutting this pith spirally with a very sharp knife it is opened out into a sheet of snowy whiteness. When the curl has been removed by weighting, or by flattening in a press, it is ready for use. It is chiefly employed for making coloured drawings on. When dyed it can be made into the most perfect artificial flowers. Another kind is made from the pure white root of the leguminous plant *Eschynomene paludosa*. But the so-called 'rice-paper' used for cigarettes is made from linen trimmings.

Rich, EDMUND. See EDMUND (St).

Richard I., king of England, surnamed *Cœur de Lion*, was the third son of King Henry II. and his wife Eleanor of Aquitaine. He was born on 8th September 1157, either at Oxford or at Woodstock, but was brought up amongst the knights and troubadours of Poitou, in Aquitaine, with which duchy, his mother's patrimony, he was whilst still a child invested by his father. In England Richard did not spend in all his life a full twelvemonth; after he became king he spent only twenty-six weeks in his kingdom, seventeen weeks when he landed to take the crown and to go through the coronation ceremony at Westminster, and nine weeks when he came back from his imprisonment. It may indeed reasonably be doubted whether he could speak English. A favourite of his unprincipled mother, he was in-



Rice (*Oryza sativa*):
b, a panicle in seed; c, a flower; d, a seed.

duced by her to join his brothers Henry and Geoffrey in their rebellion (1173) against their father (see HENRY II.). Henry II. had his eldest son, Prince Henry, crowned king as his successor during his own lifetime; and in 1183 he ordered that his younger brothers should do homage to him. Richard obeyed with the greatest reluctance; thereupon the ungrateful Prince Henry at once picked a quarrel with him, and marched an army into his duchy of Aquitaine. King Henry hastened to the assistance of the young duke, whilst the other brother Geoffrey sided with the prince. But the sudden sickness and death of the ingrate put an end to the quarrel. In the spring of 1189 Richard was in his turn in arms against his father. Philip of France, the pertinacious foe of King Henry, mingled in the strife; and eventually Richard joined forces with his father's enemy, did homage to him, and took the field against the old king. A reconciliation was rendered more difficult because of Richard's jealousy of John, his father's favourite.

Richard became king of England, Duke of Normandy, and Count of Anjou on 5th July 1189, and was crowned king of England on 3d September following. But he had already taken the vows of the crusader; and, besides his coronation, he had another object in coming to England: he wanted to raise funds for his crusade. He effected this latter purpose in a brief space of time by selling whatever he could get a purchaser for. About midsummer 1190 he met Philip of France at the rendezvous, Vezelay in France; but from Lyons he made his way by a different route from Philip to Messina in Sicily. Both kings spent the winter at that city, and their mutual jealousy came within a hair's-breadth of a rupture. The throne of Sicily had just been seized by the Norman Tancred, an illegitimate son of King Roger, though the lawful heir was Henry of Hohenstaufen, son of Frederick Barbarossa, and afterwards the Emperor Henry VI. Moreover, Tancred detained in custody Johanna, widow of the late king (William the Good) and sister of Richard I., together with her very large dowry. But he made his peace with Richard by giving up to him his sister and her possessions, and by betrothing his little daughter to the boy Arthur (son of Richard's dead brother Geoffrey), whom Richard now declared to be his heir. On his way to Palestine in the spring of 1191, part of the fleet of the English king was driven on to the island of Cyprus, and the crews were most inhospitably treated by the reigning sovereign, Isaac Comnenus, a nephew of the emperor of Byzantium, who had revolted from his liege lord. Richard sailed back from Rhodes, routed Isaac in battle, deposed him, and gave his crown to Guy of Lusignan. In Cyprus, too, he married Berengaria of Navarre, whom his mother had brought to him at Messina. At last, on 8th June, the English king landed near Acre, and shortly afterwards that stronghold surrendered, the siege having lasted two years. Richard took his full share of the jealousies, animosities, and disagreements, though not of the treacheries, that made the Christian crusading host a hotbed of commotion. The glorious exploits of Richard the Lion-hearted—his march to Joppa along the seashore, his approach upon Jerusalem at Christmas, his capture of the fortresses in the south of Palestine, his second advance in the summer of 1192 on Jerusalem (the city he never beheld), and his relief of Joppa—made his name ring throughout the East and excited the wonder and admiration of Christendom, but brought no real advantage to the crusading cause. Richard in September concluded a peace with Saladin for three years, three months, and three days, and in his impulsive, impatient way started off home

alone, without waiting for his army and fleet. A storm shipwrecked him near the north end of the Adriatic. In disguise he began to make his way through the dominions of his bitter enemy, the Archduke of Austria. He was recognised, seized, and handed over to the Emperor Henry VI. (March 1193). The emperor demanded a heavy ransom for his release, but promised to give him the kingdom of Arles in addition to his liberty. Richard's loyal subjects raised the money; and greatly to the chagrin of Philip of France and Richard's brother John, the captive king returned home (13th March 1194). In England in the meantime Longchamp (q.v.) had made himself so unpopular that Richard had been obliged to supersede him, appointing in his place Walter of Coutances, Archbishop of Rouen. It was John, however, who exercised the greatest power in the realm. And although he used his utmost endeavours to prevent Richard's return from his captivity, yet Richard generously forgave him. After distributing judicious rewards and punishments, raising what money he could, making arrangements for the governance of the kingdom, and being crowned again—the emperor is said to have forced his captive to resign his crown and take it back as a fief of the empire—Richard proceeded to France, and spent the rest of his life there, warring against Philip. England was governed in his absence by Hubert Walter, Archbishop of Canterbury, who by the measures he took to raise the vast sums demanded by his master trained the English people in habits of self-government. The most important constitutional advances made under Hubert's rule were the formulation of the methods for electing the county grand juries and an arrangement for keeping the pleas of the crown by officers who may be regarded as the forerunners of the modern coroner. Richard was shot, on 7th April 1199, by an archer of the Viscount of Limoges, whilst besieging that nobleman's castle of Chalus-Chabrol, and was buried in the abbey church of Fontevraud.

Richard cannot be called a good king; his only thought of his subjects was how to get money from them. He was not a faithful husband; he was an undutiful son. Yet, on the other hand, he treated his perfidious brother John in the most forgiving spirit, and was not incapable of noble and generous acts. His impulsive, hot-headed temperament made him at times cruel, but never vindictive. He was an adventurer, with a passionate love for contention and strife; he fought for warlike glory, not for victory or real advantage; he had all the personal courage and self-confidence of the born warrior; and a very large share of that careless indifference or magnanimity that is frequently associated with a bold and self-reliant character. In matters of dress and ceremony he loved magnificence, and was both ostentatious and extravagant. In person he was tall and ruddy, exceptionally strong, skilful in the use of his weapons. He was also something of a poet.

See BLONDEL; Stubbs, *Constitutional History* (vol. i., 1897); Ramsay, *Angevin Empire* (1903); Cartellieri, *Philipp II. August* (1910); Miss Norgate, *Richard the Lion Heart* (1924). Richard is the hero of Scott's *Talisman*, and figures also largely in *Ivanhoe*. In a vigorous but coarse-grained Middle English romance (ed. Brunner; Vienna, 1913), he becomes a cannibal of preternatural parentage.

Richard II., king of England, the son of the Black Prince and Joanna of Kent, was born at Bordeaux on 6th January 1367, was acknowledged by parliament heir to the crown on the death of his father in 1376, and succeeded his grandfather, Edward III., on 21st June 1377. The government was entrusted to a council of twelve, from which the king's uncles, John of Gaunt, Duke of Lan-

caster, Edmund, Earl of Cambridge, and Thomas, Earl of Buckingham (afterwards Duke of Gloucester), were excluded. Nevertheless the central figure during the early years of this reign, as he had been during the last years of the preceding reign, was John of Gaunt, whose overreaching ambition and inability were a fruitful source of disquietude. He was on bad terms with the clergy and with the Londoners, and was viewed with great suspicion by the king and the commons; yet he was the most powerful man in the kingdom, having at his back the nobles and to some extent the Lollards. War was going on with France, but in a very weak and desultory fashion; the French ravaged the south coast at the time of Edward III.'s death, and truces were constantly being made for short durations. But this war cost money; so too did the extravagance of the court; and more was absorbed or wasted by the government, for which John of Gaunt was held by the nation at large to be mainly responsible. Consequently taxation was heavy. The imposition of a graduated poll-tax in 1380 provoked popular risings, directed principally against the gentry and landholders, in nearly all parts of the kingdom, at Whitsuntide in the following year. The insurgents destroyed the parks, attacked the manor houses, burned the court-rolls, and massacred the lawyers who had charge of them. The men of Essex and Kent, to the number of 100,000, marched upon London. The former body, whom the king met at Mile End on 14th June, consented to return home when the young monarch assured them he would grant their requests, and take measures to liberate the villeins from bondage and to commute their personal services into fixed money rents. The men of Kent, after destroying the Savoy (the Duke of Lancaster's palace), burning Temple Bar, opening the prisons, and breaking into the Tower and slaying the Archbishop of Canterbury, met the king at Smithfield (15th). During the negotiations, William Walworth, the mayor of London, struck down Wat Tyler (q.v.), the leader of the insurgents. The king immediately rode amongst them, exclaiming he would be their leader, and granted them the concessions they asked. The risings in the other counties speedily collapsed when the people learned what the king had done; but during the autumn severe punishment overtook them. Seven thousand in all are said to have perished in the fighting and on the scaffold. The causes of this wide-spread and simultaneous uprising on the part of the mass of the rural population may be summarised as follows: there had been long continuance of heavy taxation; the villeins resented the reimposition since the Black Death of personal services, and were anxious to become tenants of their little farms at a fixed rental; the free tillers of the soil had formed themselves into associations to defeat the Statute of Labourers (1349), which fixed the maximum and minimum of wages; the Lollard or Wyclifite preachers were denouncing the idleness and vices of the regular clergy, and they and others (as John Ball) were promulgating social doctrines calculated to make the common people discontented with their lot and hostile to the landholders; the country clergy complained of the tyranny of the church; the mismanagement of the war, and the incapacity and selfishness of the court party provoked much discontent; there were many discharged soldiers in the country; and moral and religious feeling were sunk to a low ebb. From the fact that the insurgents directed their enmity against himself and the advisers of the king, John of Gaunt saw that he could never hope to succeed in his ambitious schemes in England; and from this time he kept very much in the background, until in 1386 he carried himself and his restless plottings to Spain

and Gascony. Richard in 1390 made him Duke of Aquitaine for life. In 1385 Richard invaded Scotland, and took Edinburgh and burned it; but, not encountering the Scots, returned home. About the same year another coalition of the baronial party, headed by Thomas of Woodstock, Duke of Gloucester, began to oppose the king and his chosen friends. They impeached several of them before the Merciless Parliament (1388), and secured convictions and executions. But on 3d May 1389 Richard suddenly declared himself of age, and proceeded to govern on his own responsibility. For eight years he ruled as a moderate constitutional monarch, and the country enjoyed peace—hostilities with France were not renewed after 1388—and was fairly prosperous. But in 1394 Richard's first wife, Anne of Bohemia, whom he had wedded in 1382, died, and two years later he married Isabella, daughter of Charles VI. of France, a girl of eight. From that time he seems to have adopted very largely French tastes, manners, and ideas. At all events, in the parliament of 1397 he began to assert the pretensions of an absolute monarch. On 8th July he had Gloucester, Arundel, and Warwick arrested on the charge of conspiring against the crown. Arundel was beheaded; Gloucester was sent a prisoner to Calais, and died there in prison, probably murdered, a fortnight after his arrest; and Warwick was banished to the Isle of Man. Thomas Arundel, Archbishop of Canterbury, was also banished. In the following year an obsequious parliament granted to the king the subsidy on wool for life, and delegated all its authority and power to a commission of eighteen members, all supporters of the king. Richard soon aroused the slumbering discontent of his subjects by his unjust methods of raising money, principally by means of forced loans, and by his arbitrary and despotic rule. In the beginning of 1398 the Duke of Norfolk and the Duke of Hereford (Henry, son of John of Gaunt) were accused to the king of having spoken treason against him. Richard banished them—Norfolk for life and Hereford for ten years. In January 1399 John of Gaunt died, and Hereford succeeded him as Duke of Lancaster; but the king refused to give up to the exile the lands of his dead father. Richard in May went over to Ireland, which he had previously visited at the head of a military expedition in 1394-95. Henry of Lancaster seized upon the opportunity afforded by the king's absence, and landed on 4th July (see HENRY IV.). Richard at once hurried back, but had neither heart nor power to withstand his cousin. He submitted to Lancaster at Flint (19th August), was carried to London, and placed in the Tower. On 29th September he resigned the crown, and on the following day was likewise deposed by the parliament, which chose Henry of Lancaster as his successor. A month after his resignation Richard was condemned to perpetual imprisonment by parliament. His fate is wrapped in obscurity, beyond the almost certain fact that he met a violent death, for which it is not altogether clear that Henry IV. was responsible. A month after Henry's accession some noblemen of Richard's party formed a conspiracy to restore Richard to the throne, but their purpose was discovered. No doubt this decided the fate of Richard; at all events, authentic history knows nothing more about him from this time. According to different accounts, either he was murdered in Pontefract Castle, or he starved himself to death, or he escaped to Scotland and died there a lunatic. By nature he seems to have been passionate, impulsive, and excitable; but though capable of bold and energetic action on occasion, his habitual mood was one of indolence. He had a good insight into men's characters: but suffered himself to be

influenced by those about him, and generally lacked the will and the steadfast resoluteness to act up to his own better judgment.

See *The Houses of Lancaster and York*, by J. Gairdner (1874); Stubbs's *Constitutional History*; Shakespeare's *Richard II.*; Ramsay's *Genesis of Lancaster* (1913); Oman's monograph on *The Great Revolt of 1381* (1906).

Richard III., king of England, was the son of Richard, Duke of York, a descendant of Edmund, Duke of York, fifth son of Edward III., and was born, the eleventh out of twelve children, in Fotheringhay Castle on 2d October 1452. After the defeat and death of his father in 1460 he was sent, along with his brother George, to Utrecht for safety, but returned to England after his eldest brother Edward won the crown (1461). Two years later he was created Duke of Gloucester, his brother George being made Duke of Clarence. In the final struggle between the York and Lancaster factions he took an active share: he led the van at the battle of Barnet, rendered valuable aid in winning the fight of Tewkesbury, and is believed, on fairly good evidence, to have had a hand in the murder of Prince Edward, son of Henry VI., who was slain after that battle. All through the reign of Edward IV. he gave valuable and faithful support to his brother, and was rewarded by him with every confidence, and with numerous high offices. He was believed to have been concerned in the murder of Henry VI. in the Tower on 21st May 1471; but the evidence, although strongly pointing in that direction, is not conclusive. In the following year he married Anne, the younger daughter of Warwick the King-maker, who had been betrothed to the murdered Prince Edward. This alliance was greatly resented by Clarence, who had married the elder sister, and wished to keep all of Warwick's vast possessions in his own hands. Clarence quarrelled too with King Edward, who in 1478 procured his impeachment by parliament. The refractory duke was put to death privately in the Tower on 18th February. Of this judicial murder Gloucester is likewise accused; but the evidence for his complicity is very slight. In 1482 he was put in command of the army that invaded Scotland. Along with the Duke of Albany he entered Edinburgh; but his one warlike achievement was the capture of Berwick town and castle. In the following year, whilst still in Yorkshire, he heard of King Edward's death (9th April), and learned that he himself had been named guardian and protector of his son and heir, Edward V., then aged thirteen. On his way south the Protector arrested Earl Rivers and Lord Richard Grey, the uncle and step-brother of the young king, and confined them in his northern castles. All who were of the old nobility, and resented the rise of the Woodvilles, rallied round Richard. Whether this accession of strength first suggested to him the idea of making himself king, or whether he had conceived it before, cannot of course be known; but certain it is that from this time Richard of Gloucester schemed for the crown, and by craft, boldness, and utter unscrupulousness carried his project into execution.

The arrest of Rivers and Grey had put the king entirely into his hands, for the queen-mother had hastened to take sanctuary at Westminster. On 13th June Gloucester suddenly accused Lord Hastings, an influential member of the council, of treason, arrested him there and then, and had him instantly beheaded. The 'crime' for which Hastings died was changing sides from Richard to the Woodville party. On 16th June the queen-dowager was induced to give up, at the demand of Richard and the council, her other son, the little Duke of York. He was put into the Tower to keep his brother, the king, com-

pany. On the Sunday following (22d) a certain Dr Shaw preached at St Paul's cross that the children of Edward IV. were illegitimate, nay, that Edward IV. himself and his brother Clarence were both born out of lawful wedlock. Three days later the parliament desired Richard to assume the crown; on the next day (26th June 1483) he declared himself king, and on 6th July was crowned in state by Cardinal Bourchier. Rivers and Grey were executed at Pontefract on 25th June. In point of *form* Richard was a duly elected king, and Edward V. had not yet been crowned; all the same, his accession was *de facto* a usurpation. Richard's principal supporter all through, from the date of Edward IV.'s death, had been the Duke of Buckingham, a descendant of the Duke of Gloucester who was privily slain at Calais when Richard II. was king. Shortly after his coronation Richard set out on a tour through the kingdom, and during the course of it he was surprised by the intelligence that Buckingham was plotting with the friends of Henry Tudor, Earl of Richmond (afterwards Henry VII.), the chief representative of the House of Lancaster, to effect his overthrow and proclaim Henry king. But the attempted rising soon collapsed, and Buckingham was taken, and on 2d November executed. It seems to have been shortly before this that Richard contrived the foul crime that has branded his name with infamy, and that caused himself inextinguishable remorse to the day of his death—the murder of his nephews in the Tower. The deed was done so secretly, by Sir James Tyrrell, one of Richard's devoted followers, and a couple of hirelings, that the nation did not know of it until some time after (see EDWARD V.). Indeed, the very fact of their murder has been seriously called in question, though not until much later times. But from the days of Richard himself he was popularly believed to have effected his nephews' destruction, and evidence supports the popular opinion. During the remainder of his short reign Richard directed all his energies to baffling the plans of Richmond, and to making preparations to meet the invasion which he saw to be imminent. But he was rapidly losing his hold upon the nation, alarming and horrifying it by his crimes and tyrannous acts. Henry of Richmond at length landed at Milford Haven on 7th August 1485. Richard met him at Bosworth in Leicestershire on the 22d, and there lost his kingdom and his life, fighting bravely like a king, crown on head, in the midst of his foes (see HENRY VII.). The body of the slain king was subjected to great indignities, carried to Leicester, and there, after being exposed for two days, was buried in the Grey Friars churchyard.

Richard's was a strangely mixed character. Its ruling passion was an inordinate craving for power, to gratify which he stopped at no crime, however heinous. He possessed many of the typical qualities of the best of the Plantagenets—a skilful soldier, of great ability and energy, brave, bold, reckless of consequences, fond of display, yet not incapable of nobler impulses. Had he been born the lawful heir to the throne, and succeeded to it peacefully, he would probably have been a great king; for he was a very capable ruler, aiming at the real welfare of his subjects, promoting justice, and furthering religion and morality. Yet circumstances, conflicting with his insatiable ambition, helped the evil tendencies of his nature to get the upper hand; and these grew and hardened as time went on, till his audacity and unscrupulousness were matched with a cunning and hypocrisy such as are seldom found united in one man. On the other hand, he unquestionably had great charm of manner, and knew how to inspire confidence even in those who had the best

reasons for distrusting him. He was liberal too, and, where his own personal ambition was not directly concerned, just and generous. He was also swayed by a lively sense of divine justice; and more than one religious institution owed its foundation to his bitter remorse for the murder of his nephews. Most of his subjects and contemporaries looked upon him as a monster of wickedness; others, however, cherished his memory as that of a wise and good ruler. The real man was probably not quite so black as the Lancastrian (Tudor) chroniclers have painted him, though their portrait is probably fairly accurate in its broad features. In person Richard was short of stature and slight of build, with one shoulder slightly higher than the other; but there is no evidence that he was a hunchback. His face was thin and intelligent, and in portraits wears a look of sadness.

The best biography is James Gairdner's *Life and Reign of Richard III.* (3d ed. 1898). Attempts to defend his memory from some of the foul crimes laid to his charge have been made by Horace Walpole, *Historic Doubts on the Life and Reign of Richard III.* (1768); J. H. Jesse, *Memoirs of King Richard III.* (1862); A. O. Legge, *The Unpopular King* (2 vols. 1885); and Sir Clements Markham, *Richard III.* (1907). None of them can be said to have been successful in making Richard out a good man or a good king. Sir T. More's *History of King Richard III.* (1813), though highly coloured and antagonistic, is full of interest and vivid pictures of the king. *The Paston Letters*, ed. by J. Gairdner (1872-75), convey a good impression of the life and manners of the period. Shakespeare's drama gives the popular idea of Richard.

Richard of Bury. See AUNGERVILLE.

Richard of Cirencester, an early English chronicler, whose life falls between 1335 and 1401. His name is found in 1355 in the list of monks of the Benedictine monastery of St Peter, Westminster. In 1391 he obtained a license from his abbot to visit Rome, and he died in 1401. The only known work of his extant is a poor compilation in four books, the *Speculum Historiale de Gestis Regum Angliæ 447-1066*, edited for the Rolls series by Professor J. E. B. Mayor (2 vols. 1863-69). It is of some independent value for the history of Westminster Abbey and Edward the Confessor. But Richard's name is best known in connection with the notorious forgery, *De Situ Britanniciæ*, long accepted, to the serious detriment of history, as an authoritative work on the antiquities of Roman Britain. This work was first printed in 1758 by its ingenious author, Charles Julius Bertram (1723-65), teacher of English in the naval cadets' school at Copenhagen, who professed to have discovered it in the Royal Library there. In the same volume were included the works of Gildas and Nennius, the title of the whole being *Britannicarum Gentium Historiæ Antiquæ Scriptores tres, Ricardus Corinensis, Gildas Badonicus, Nennius Banthorensis*. A new edition of the treatise, with an English translation, appeared at London in 1849; a reprint forms one of the 'Six Old English Chronicles' in Bohn's 'Antiquarian Library' (1848). Dr William Stukeley, with whom Bertram had corresponded since 1747, received the book warmly on its appearance; Gibbon commends 'a genuine knowledge of antiquity very extraordinary for a monk of the 14th century'; all the historians, even Lingard and Lappenberg, trusted it; and even so late as 1886 we find it gravely treated as an authority in a work by James Grant on the *Tartans of the Clans of Scotland*. Some later scholars, such as Guest, had doubted, if not condemned it, but its authenticity received its death-blow in the series of papers contributed to the *Gentleman's Magazine* (1866-67) by Mr Woodward, librarian of Windsor Castle. Again in Professor Mayor's preface the various sources of the forgery

are elaborately set forth, and everything satisfactorily accounted for but the credulity of its dupes.

Richard of Cornwall, second son of John, king of England, was born on 5th January 1209. In 1225-26 he and his uncle, William of Salisbury, commanded an expedition which recovered Gascony, and the next year he received Cornwall, as the result of a rising of the earls to compel the king (Henry III.) to make provision for him. He managed his money matters well, and his wealth, as well as his prudence, saved Henry in many an impending crisis. For some years he acted with the English barons, to many of whom he was closely related by his marriage with Isabel, Countess of Gloucester, daughter of the Earl of Pembroke. In 1232 he was one of the leaders in the opposition to Hubert de Burgh; and in 1238 he headed an armed rising provoked by the king's secret marriage of his sister to Simon de Montfort. But Richard was still heir to the throne, and the articles which Henry was prepared to sign, and which dismissed his foreign advisers, appeared to the earl to bind the king's hands too closely, and he drew back. In 1240-41 Richard was away on a crusade, and the next year he was with his brother in Gascony; and in 1244 he married Sanchia of Provence, sister of Queen Eleanor, and this second marriage drew him away from the baronage. In 1252 he refused the pope's offer to sell him the crown of Sicily; but in 1257 he was elected by a majority titular king of the Romans, and was soon afterwards crowned at Aix-la-Chapelle; and he was skilful enough to maintain a certain hold on Germany, lavishing his wealth to keep up his own position and the dignity of the empire. In the great struggle which took place between Henry III. and his nobles Richard at first acted as a peacemaker. Subsequently, however, he sided with his brother against Simon de Montfort; and he was taken prisoner at Lewes, and imprisoned for a year, until the battle of Evesham (1266) set him free. In 1267 he was a third time married, to Beatrice, niece of the Elector of Cologne. Richard died at Kirkham, 2d April 1272, broken-hearted at the loss of his eldest son, Henry, who was murdered at Viterbo by the Montforts, and immortalised by Dante. Two other sons died also without issue.

Richardson, CHARLES, lexicographer, was born in July 1775, studied law, kept school at Clapham, received in 1852 a pension of £75, and died 6th October 1865. His first work, *Illustrations of English Philology* (1815), led to his undertaking an English dictionary for the *Encyclopædia Metropolitana*, the first part of which appeared in January 1818. The project fell through, but Richardson's *New Dictionary of the English Language* at length appeared complete in two quarto volumes in 1837. The work was warmly received—Trench styled it 'the best dictionary in the language'—and at that time it deserved the praise. A later work was entitled *On the Study of Language: an Exposition of Tooke's Diversions of Purley* (1854).

Richardson, SIR JOHN, naturalist, was born at Dumfries, November 5, 1787, studied at Edinburgh University, became a navy-surgeon, served in the Arctic expeditions of Parry and Franklin (1819-22 and 1825-27), as well as in the Franklin search expedition of 1848-49, was knighted in 1846, married thrice, and died near Grasmere, June 5, 1865. The most valuable of his books were *Fauna Boreali-Americana* (4 vols. 1829-37) and *Ichthyology of the Voyage of H.M.S. Erebus and Terror* (1844-48). There is a *Life* by the Rev. John M'Ilraith (1868).

Richardson, SAMUEL, novelist, was born in 1689 in Derbyshire. Like Matthew Prior, he was

the son of a joiner; but unlike him, he made no effort to obscure his origin. 'My father,' he said, 'was a very honest man, descended from a family of middling note. My mother was also a good woman, of a family not ungenteeled.' His career is a curious exemplification of the truth of that Horatian precept which Thackeray chose for the motto of *Esmond*. It preserved to the end the characteristics of its outset. The man who was afterwards the moralist of Salisbury Court was as a boy the 'Gravity' and 'Serious' of his school-fellows; the novelist who penned the interminable epistles of *Clarissa* and Harriet Byron was as a youth the favoured and indefatigable amanuensis of half the girls in the neighbourhood, acquiring in this artless office something of that strange knowledge of the minuter mechanism of the feminine mind which is so conspicuous a feature of his genius. He says of himself that he had only 'common school-learning;' but he appears to have been at Christ's Hospital. In 1706, at the age of sixteen, he was bound by his own wish to John Wilde of Stationers' Hall, a printer, with whom he served the usual period. Allington Wilde, whose daughter he married, was also a printer, but was quite a distinct person from his master. From 1713 to 1719 he worked as a journeyman printer. In the latter year he opened an establishment of his own in the centre, and later in the north-west corner (No. 11) of Salisbury Square, then Salisbury Court. His printing-office and warehouses were in Blue Ball Court, on the east side of the Square. In a sober, methodical way he continued to prosper, perfecting his faculty for letter-writing in various ways, and serving the humbler needs of literature by diligent compilation of prefaces, indexes, advertisements, and the like. He printed more than one newspaper, and by the favour of Mr Speaker Onslow obtained the printing of the journals of the House of Commons, twenty-six volumes of which passed through his establishment. Then, in 1740, came the opportunity which transformed him into a literary celebrity. To use his own words, 'he accidentally slid into the writing of *Pamela*.' He was over fifty when two bookselling friends invited him to prepare a volume of familiar letters 'in a common style, on such subjects as might be of use to those country readers who were unable to indite for themselves.' He caught at the idea, superadding another. 'Will it be any harm,' he said, 'in a piece you want to be written so low, if we should instruct them how they should think and act in common cases?' 'Hence sprung *Pamela*,' published in November 1740. Its title was as leisurely as its method: '*Pamela; or Virtue Rewarded*. In a series of familiar letters from a beautiful young damsel to her parents. Published in order to cultivate the principles of virtue and religion in the mind of the youth of both sexes. A narrative which has its foundation in truth; and at the same time that it agreeably entertains by a variety of curious and affecting incidents, is entirely divested of all those images which, in too many pieces calculated for amusement only, tend to inflame the minds they should instruct.' The moral note is explicit enough on the good printer's title-page; but for all that *Pamela* is by no means *ad usum Delphini*. Its vogue, in a coarser and robust age than ours, was nevertheless extraordinary. Not to have read of Richardson's exemplary heroine was 'as great a sign of want of curiosity, as not to have seen the French and Italian dancers.' Divines extolled her from their pulpits; Pope declared she would do more good than their discourses; fine ladies triumphantly exhibited her popular chronicles at places of amusement; and in remote country villages, when at last she was happily married, her rustic admirers set

the bells a-ringing. In February followed a second edition; a third succeeded in March, and a fourth in May. Grub Street, fastening promptly upon this unexampled popularity, hastily put together for sequel a *Pamela in High Life*, which had the unfortunate effect of seducing Richardson into two supplementary volumes, now deservedly forgotten; and then Henry Fielding fluttered the Salisbury Court dove-cote by producing what Richardson and his coterie regarded as the 'lewd and ungenerous engraftment' of *Joseph Andrews*. Happily, however, both for Richardson and posterity, he speedily discarded burlesque for the immortal character of Parson Abraham Adams.

Eight years elapsed before Richardson published another novel. But during this time, consoling himself for the coarse sallies of the irreverent by the 'soft adulation' of a little circle, chiefly of the gentler sex, who gathered round him in his suburban home at Hammersmith, he continued, either in his snug writing-closet or his summer-house, to work placidly at his masterpiece—*Clarissa; or the Adventures of a Young Lady*, known generally as *Clarissa Harlowe*. Virtue, in this performance, was not 'rewarded,' but ruined. The heroine is nevertheless drawn with a tenacity of insight to which *Pamela* could scarcely pretend; and the chief male character, that of Lovelace, though more of an abstraction, is scarcely inferior. Johnson declared the book to be the first in the world for its knowledge of the human heart; and even Fielding did not refuse his tribute: 'Such simplicity, such manners, such deep penetration into nature, such power to raise and alarm the passions, few writers, either ancient or modern, have been possessed of' (*Jacobite Journal*, No. 5). Lesser voices swelled the chorus with greater energy, and it was repeated across the Channel with Gallic enthusiasm. The high-priest of sentiment, Diderot, did not scruple to name its author with Homer and Euripides; and as if to prove that this was no momentary Anglomania, in a later day the poet Alfred de Musset proclaimed it to be 'le premier roman du monde.' But from France also came its compactest condemnation. 'La nature,' said D'Alembert, 'est bonne à imiter, mais non pas jusqu'à l'ennui.'

Having drawn the ideal woman in *Clarissa*, Richardson proceeded, some five years later, to portray, in *Sir Charles Grandison*, the perfect man—the man of true honour. This is a work of much greater ability than *Pamela*, but still far below *Clarissa*. It has, moreover, no central story strong enough to reconcile the reader to the prolix impeccability of its superlative hero, who Taine, with an unwonted burst of critical levity, suggests should be stuffed and canonised for his wearisome good qualities. Besides a solitary essay in Johnson's *Rambler* (No. 97), and the voluminous but not very interesting correspondence published (with an excellent memoir) by Mrs Barbauld in 1804, Richardson left no other literary remains of any importance. In later life a nervous habit grew upon him, which terminated in 1761 by a fit of apoplexy, of which he died. He has left his own portrait in his letters to Lady Bradshaigh (*Corr.* ii. 206, and iv. 290); but it might almost have been deduced from his letters. He was a sentimental, purring, methodical, well-meaning little man, domesticated and affectionate, whose fitting environment was feminine society of the sympathetic sort; and he has repaid the gentle caresses with which his worshippers tempered the wind of adverse criticism to his sensitive soul by depicting their sex in return with a patience, a discrimination, a sustained analysis of secret spring and motive which it has been given to no other male author, living or dead, to achieve. It is the most unequivocal testi-

mony to his native genius that his impracticable method of telling his story by correspondence and his intolerable circumstantiality and diffuseness (he thinks nothing of an epistle of fifteen pages, and Clarissa takes nineteen for her will) have served only to emphasise and intensify the reality of his creations.

There was a reprint of Richardson's novels, with preface by Sir Leslie Stephen, in 1883. Mrs Barbauld prefixed a biography to his *Correspondence* (1804). See Miss Clara Linklater Thomson's 'biographical and critical study' (1900); Cazamian in the *Cambr. Eng. Lit.*, x. (1913); *Richardson* by Austin Dobson (1902).

Richborough. See SANDWICH.

Richelieu, ARMAND JEAN DUPLESSIS, CARDINAL, DUC DE, one of the greatest statesmen of France, was born of a noble but impoverished family at Richelieu, 12 miles SSE. of Chinon, September 5, 1585. He abandoned a military career for the church, in order to keep in the family the bishopric of Luçon, to which he was consecrated at twenty-two. Representative of the Poitou clergy at the States-general in 1614, he attracted the notice of the queen-mother, and rose in 1616 to be secretary at war and foreign affairs; but the downfall of Marshal d'Ancre, the queen-regent's favourite, in April 1617, sent him back to his diocese. At length in August 1620 the queen-mother and the young king were reconciled, mainly through the agency of the celebrated Capuchin Father Joseph—'l'éminence grise' of later days, till his death in 1638 the intimate friend of Richelieu. The latter showed much tact and patient forbearance in his measures; he formed an alliance with the powerful Duc de Luynes, and in 1622 was named cardinal, in 1624 minister of state. This position he retained to the end of his life, in spite of countless court intrigues, and ere long the most powerful open and secret opposition from the queen, Gaston, Duke of Orleans, and a host of minor intriguers, first among whom was the too famous Duchess de Chevreuse. His first important measure was the blow to Spain of an alliance with England, cemented by the betrothal (1625) of the king's sister Henrietta with Charles, then Prince of Wales. In the Valtelline war he cleared the country of the Spanish and papal troops, but was unable to pursue his advantage, and had to submit to the terms of the peace of Monzon (1626). His next task was to destroy the political power of the Huguenot party. After a fifteen months' siege, which he conducted in person, concentrating all his energy upon the task, the great stronghold of La Rochelle was starved into submission, 30th October 1628. He next turned to crush Rohan and the Languedoc rebels, and destroyed the proud walls of Montauban, last refuge of Huguenot independence. Early in 1630 he entered Italy with a splendid army, himself in command, and soon reduced Savoy to submission. Meanwhile he plunged into dark and tortuous intrigues with the Italian princes, the pope, and with the Protestants of the north against the House of Austria. He promised a large subsidy to Gustavus Adolphus, and, through the masterly diplomacy of Father Joseph at the Ratisbon Diet in June 1630, succeeded in persuading Ferdinand to dismiss Wallenstein. The first treaty of Cherasco (April 1631) ended the Italian war, the second gave France the important strategic position of Pinerolo. Just before this final triumph Richelieu had successfully surmounted the greatest danger of his life—a great combination formed for his downfall by the queen-mother, Gaston of Orleans, the House of Guise, Bassompierre, Créquy, and the Marillacs. She tried to bully the king by her violence, but Richelieu followed his master to Versailles, and again had the whole power of the realm placed entirely in his hands. So ended 'the

Day of Dupes' (11th November 1630). The queen-mother fled to Brussels, Bassompierre went to the Bastille, Gaston fled to Lorraine. The cardinal was now made duke and peer, and governor of Brittany. Further intrigues and attempted rebellions by the emigrant nobles and governors of provinces were crushed with merciless severity—Marillac and Montmorency and other nobles were sent to the block. Meantime Gustavus Adolphus had run his brief and brilliant course; and his death at Lützen removed an ally with whom it might have become difficult to reckon. In July 1632 Richelieu had seized the duchy of Lorraine. He continued his intrigues with the Protestants against Ferdinand, subsidising them with his gold, but till 1635 he took no open part in the war. In May of that year, after completing his preparations and concluding a close alliance with Victor Amadeus of Savoy, Bernhard of Saxe-Weimar, and the Dutch, he declared war on Spain, and at once placed in the field an army of 132,000 men. But his first efforts were singularly unsuccessful, and in 1636 Piccolomini and the Cardinal-Infante, governor of the Netherlands, entered Picardy, crossed the Somme, and threatened Paris itself. But in this hour of peril Richelieu rose to the height of his genius, and awoke a new and irresistible force as he threw himself upon the patriotism of France. With 30,000 foot and 12,000 horse he swept the enemy out of Picardy, while his ally Bernhard drove them across the Rhine, and in 1638 destroyed the imperial army in the decisive battle of Rheinfelden, a victory which opened to him the gates of the key-fortress of Breisach. The unexpected death of Bernhard threw the fruit of his victories into the hands of Richelieu, whose policy soon bore further fruit in the disorganisation of the power of Spain—revolts in Catalonia, and the loss of Portugal; the victories of Wolfenbüttel (1642) and Kempten (1642) over the Imperialists in Germany; and at length in 1641 in Savoy also in the ascendancy of the French party. Another triumph that same year was the speedy collapse of the Imperialist invasion in the north by the Count of Soissons, who perished in the first battle. The failure to capture Tarragona was the one exception to the complete triumph of the cardinal's latest years.

But the hatred of the great French nobles to his rule had never slumbered, and Richelieu found safety alone in the king's sense of his own helplessness without him. He was firmly convinced that the only safe government for France was a strong absolutism uncontrolled either by the selfish ambition of the nobles or the constitutional legalism represented by the Parlement of Paris. The last conspiracy against him was that of the Grand-querrie, the young Cinq-Mars, whose intrigues with Gaston, the Duke of Bouillon, and the Spanish court were soon revealed to the cardinal, the centre of a network of espionage which covered the whole of France. When the hour was ripe he placed in the king's hands at Tarascon proofs of the traitorous plot with Spain, and was given full powers as Lieutenant-general of the realm. Cinq-Mars and De Thou were at once arrested, and the wretched coward Gaston of Orleans hastened after his kind to buy his own security by betraying his accomplices. Cinq-Mars and De Thou were executed at Lyons in the autumn of 1642. But the great minister was himself dying in the hour of his greatest triumphs. Death had often drawn near him, but the strong will and fiery soul within his frail and feeble frame had thrust him aside and retained the fleeting life. He faced the inevitable at last with calm tranquillity—when the priest bade him forgive his enemies, he made answer, 'I have never had any other enemies than the state's.' We see the same unhuman impersonality in the

identification of himself with the state in his *Mémoires*—‘I have been severe to some in order to be good to all. . . . It is justice that I have loved and not vengeance. . . . I wished to give to Gaul the limits that nature had marked out for her . . . to identify Gaul with France, and wherever the ancient Gaul had been, there to restore the new.’ He died 4th December 1642, bequeathing Mazarin to the king as his successor.

Richelieu built up the power of the French crown, he achieved for France a preponderance in Europe, and throughout life he moved onwards to his goal with the strongest tenacity of purpose, unmoved either by fear or pity. He destroyed the local liberties of France, and crushed every element of constitutional government, and his policy overwhelmed the citizens with taxation and made waste places some of her fairest provinces and most thriving towns. Our judgment of him will always differ according as we examine his end or his means—the public or the private man. He never sacrificed to personal ambition the interests of his country as these seemed to himself, but he often forgot in his methods the laws of morality and humanity. There is no need here to discuss the more fundamental question of whether his end was actually identical with the highest good of France—the best defence that even so redoubtable a Chauvinist as Henri Martin can offer is that he merely developed out to the full tendencies long rooted in French soil, and that no other ideal of a policy was then possible for France but a systematised absolutism under a beneficent despot. Nor have we sympathy to spare for the corrupt and selfish nobles whom he crushed with a severity so merciless that he drove twenty-one persons into exile, all of them the greatest names in France, banished sixty-five, several of these ladies, while seventy-three nobles were flung into prison, and forty-three were either beheaded or died in prison.

We know the face of Richelieu best from Philippe de Champagne's picture in the Louvre, in which the energy of the model had passed into the hand of the artist. A pale apparition, the mere ghost of a great man in Michelet's phrase, neither flesh nor blood, but all intellect, as Quinet said of Voltaire, he looks down upon us still with that steady and penetrating eye and that imperious gesture that overawed the king and the proudest peers of France. The weakest point in Richelieu's character was his literary ambition and the extraordinary pains he took to construct a literary reputation. His own plays, for the fate of which he trembled with anxiety, sleep in safe oblivion, but his *Mémoires* are still read with interest, forming a subtle and elaborate panegyric upon himself, so that Michelet says in his paradoxical manner, yet not without truth, ‘If one would not know Richelieu, one should read his *Mémoires*.’ He founded the French Academy. His Correspondence and State Papers, edited by d'Avenel, fill 8 vols. of the *Collection de Documents inédits sur l'Histoire de France* (1853–77).

See the article FRANCE; Capefigue, *Richelieu*, *Mazarin*, et *La Fronde* (2d ed. 1844), and *Le Card. de Richelieu* (1865); Dussieux, *Le Card. Richelieu* (1885); D'Avenel, *Richelieu et la Monarchie absolue* (4 vols. 1884–95); Hanotaux, *Histoire du Card. de Richelieu* (1893–1903).

Richmond, an ancient municipal borough in the North Riding of Yorkshire, on the left bank of the deep-channelled Swale, 49 miles NW. of York. Its Norman castle (1072–1146) has a very fine banqueting-hall and a keep 100 feet high. Other buildings are the parish church (restored by Scott, 1860), with good wood-carvings; Queen Elizabeth's grammar-school (1567; rebuilt 1849–68); the market-house (1854); and the Perpendicular tower of a Franciscan friary, founded in

1258. The racecourse (847 feet above sea-level) commands a magnificent view. The military centre Catterick Camp is about 3 miles off. Till 1867 Richmond returned two members, and then till 1885 one. Pop. 4000. The earldom of Richmond was conferred by the Conqueror on his kinsman, Alan Rufus, son of the Count of Brittany, and, coming into the possession of the crown through John of Gaunt, was granted by Henry VI. to the father of Henry VII. Henry VIII. created his natural son, Henry Fitzroy (1517–36), Duke of Richmond, as Charles II. did his natural son, Charles Lennox (1672–1723), the ancestor of the Dukes of Richmond and Gordon.

Richmond, a town of Surrey, $8\frac{1}{2}$ miles WSW. of London (by rail $9\frac{1}{2}$, by river 16), stands partly on the summit and declivity of Richmond Hill, and partly on the level right bank of the Thames. The Terrace, stretching along the brow of the hill, commands an unrivalled prospect of hill and dale, woodland and winding stream; and one of the fairest river-views in England may be gained from Richmond Bridge, which, 100 yards long, was built in 1774–77. Only a gateway remains of the ancient royal palace of Sheen, where died Edward III., Richard II.'s queen, Anne of Bohemia, Henry VII., and Elizabeth. It was rebuilt by Henry V. and Henry VII. (1499), who renamed the place Richmond after his own former earldom. That palace, which has memories also of Wolsey, Charles V., and many others, was dismantled in 1648; but the splendid deer-park, formed by Charles I. in 1634, remains. It covers 2253 acres; and its brick wall is about 10 miles in circumference. Scott here makes Jeanie Deans have her audience with Queen Caroline. The well-known ‘Star and Garter,’ dating from 1738, largely destroyed by fire in 1870, but rebuilt in 1872–74, was demolished (1919) to make way for the palatial Star and Garter Home for Disabled Soldiers and Sailors (1925). At the parish church are buried the poet Thomson, Kean, Lady Di Beauclerk, and Dr John Moore; and here, too, Swift's Stella was baptised. St Mathias' (1858) is a striking building by Scott, with a spire 195 feet high; and there are also a Wesleyan training college (1834), a public library (1881), &c.; whilst Richmond worthies other than those above mentioned have been Reynolds, Gainsborough, Collins, and Earl Russell. Market and nursery gardening is a chief industry. Richmond was incorporated as a municipal borough in 1890. Pop. (1861) 7423; (1881) 19,066; (1891) 22,684; (1921) 35,639. The borough includes Kew (q.v.) with its Botanic Gardens, and Petersham.

Richmond (1) the smallest of the boroughs into which the city of New York (q.v.) is divided. —(2) Capital of Wayne county, Indiana, on the East Fork of Whitewater River, 69 miles by rail NNW. of Cincinnati, and 68 E. of Indianapolis. It was founded by the Society of Friends, who in 1859 established Earlham College here, for both sexes. There are manufactures of agricultural implements, machinery, boilers, flour, &c. Pop. (1880) 12,743; (1890) 16,608; (1910) 22,324; (1920) 26,765.

(3) The capital of Virginia, on the left bank of the James River (here crossed by a number of bridges), at the head of tide water, about 150 miles from its mouth, and 97 miles S. of Washington. It is a port of entry, with large docks. Richmond is picturesquely situated on a group of hills, the summit of one—Shoekoe Hill—being occupied by the capitol (1796), which contains valuable colonial archives and portraits; it possesses also a marble statue of Washington by Houdon, and in its grounds are statues of Henry Clay and ‘Stonewall’ Jackson, and the Washington monument, a

noble bronze group by Thomas Crawford. Patrick Henry is buried in St John's churchyard, and President Monroe in Hollywood Cemetery, where also is a Confederate monument 90 feet high. Other notable buildings are Chief-justice Marshall's house, Jefferson Davis's house (now a museum of Confederate relics), Soldiers' Home, and Masonic Temple. In the city are the University of Richmond (1832) and two medical colleges. The James River Falls supply immense water-power for tobacco-factories, ironworks, machine and locomotive works, flour and paper mills, and fertiliser-works. Several railways meet at Richmond, which is a terminus also of the James River and Kanawha Canal. The chief exports are tobacco and flour. Richmond was founded in 1737, and became the capital in 1779. In 1861 it was selected as the Confederate capital, and from that period was the objective point of the Union armies in the east, and defended by General Lee with a large army and formidable lines of earthworks (which eventually extended for nearly 40 miles), until the seizure of the lines of supply by Generals Grant and Sheridan compelled its evacuation (2d April 1865) after almost a year's siege and a series of sanguinary battles. Pop. (1860) 37,910; (1900) 85,050; (1910) 127,628; (1920) 171,667.

Richmond, GEORGE (1809-96), was born a miniaturist's son at Brompton, came under Blake's influence, and, distinguished as a portrait-painter, was successively A.R.A. and R.A.—His son, SIR WILLIAM BLAKE RICHMOND (1843-1921), portrait and mythological painter, was born at London, studied in Italy, became A.R.A., R.A., and Slade professor at Oxford. The St Paul's mosaics are his work.

Richmond, LEGH, born at Liverpool in 1772,* studied at Trinity College, Cambridge, was appointed in 1798 to the joint curacies of Brading and Yaverland in the Isle of Wight, and died rector of Turvey in Bedfordshire in 1827. He wrote on *The Fathers of the English Church*; and his *Dairyman's Daughter*, *Negro Servant*, and *Young Cottager* carried his name over the English world, and were collected as the *Annals of the Poor* (1814). See *Memoirs* by Grimshawe (1828).

Richter, EUGEN (1838-1906), born at Düsseldorf, became journalist in Berlin in 1864, and from 1867 was leader of the Radical party; as effective in speeches, pamphlets, and stories against the social democrats as he was against Bismarck.

Richter, HANS (1843-1916), born at Raab in Hungary, had been conductor in theatres at Munich, Budapest, and Vienna ere in 1879 he began his orchestral concerts in London. He co-operated with Wagner in the production of the *Nibelungen* performances at Bayreuth, and conducted the Halle orchestra from 1900 to 1911, when he retired to Bayreuth. He was a musical director of singular accomplishment and power.

Richter, JOHANN PAUL FRIEDRICH ('Jean Paul'), was born on 21st March 1763 at Wunsiedel in the sequestered pine-clad Fichtelgebirge of North Bavaria. The imaginative boy was brought up in the idyllic sabbath-life of the mountain villages in which his father was pastor, went to school at the town of Hof, and in 1781 was sent to Leipzig University to study theology. But, like Lessing, he did not study theology; Rousseau and Voltaire, Swift and Sterne, Pope and Young, had much stronger attractions for him, and he too resolved to write books. He asserted his independence of custom by discarding the periwig and stiff necktie, wore his hair long, his shirt and vest open at the throat, and dressed him as he pleased. But he found it harder work to get bread than to write and assert his position as an emancipated youth.

Being poor, he got into debt all round, and in November 1784 fled secretly from Leipzig, to go and hide his head in the poverty-stricken home of his mother (a penniless widow since 1779) at Hof. His first literary 'children' were satires; but he could get no publisher to introduce them to the world, until in 1783 Voss of Berlin gave him forty louis d'or for *The Greenland Law-suits*. The book was a failure. For three years Jean Paul struggled on at home, his mother spinning hard for bread, he helping with the few florins he earned by his pen. He read enormously, omnivorously, and sat hours making excerpts from the books he devoured—a practice he kept up from early boyhood to old age. These many folios of closely-written pages were the storehouses upon which he drew for materials when he came to write his romances. He took long rambles amongst the hills and forests, his hair flying in the wind, a book in his hand or a song on his lips, and a favourite dog at his heels. In the beginning of 1787 he began to teach the children of different families in the district, and of course taught by original methods. All this time he still went on writing, and during his nine years of tutorship produced, amongst other things, the satirical *Extracts from the Devil's Papers* (1789), *Falbel's Journey* (1796), and *Freudel's Complaint* (1796), the last two amongst the best examples of his satirico-humorous writings; the beautiful idylls *Dominie Wuz* (1793), *Quintus Fiacin* (1796; Eng. trans. by Carlyle, 1827), the *Parson's Jubilee* (1797), the first two perhaps the most finished things Jean Paul ever wrote; the grand romances *The Invisible Lodge* (1793), *Hesperus* (1795; Eng. trans. 1865), and *Flower, Fruit, and Thorn Pieces*, or *Siebenkäs* (1796-97; Eng. trans. by Noel 1844 and 1871, by Ewing 1877); *Campanerthal* (1797; Eng. trans. 1857), a series of reflections on the immortality of the soul, an undigestible book; and the prose lyrical idyll, *My Prospective Autobiography* (1799). *The Invisible Lodge* was his first literary success; *Hesperus* made him famous. In 1796 Charlotte von Kalb, perhaps the most remarkable, certainly the most advanced, woman of her age in Germany, wrote to express her admiration of the book; and a few months later, at her invitation, Jean Paul visited Weimar. There Goethe received him politely, but with cool reserve; that, too, was Schiller's attitude, when Jean Paul went on to Jena to see him. The antagonism between them was deep and fundamental, and lasted till death, being at times but ill concealed by all three. Herder and his wife, on the other hand, greeted the young romance-writer with overflowing admiration, and gave him their friendship, which also endured till death. As for Charlotte von Kalb, she did not stop at friendship: in spite of having a husband already, she exercised her sex's fabled privilege of leap-year—her first letter to him was dated 29th February—and gave him unasked the love of her vehement heart.

From this time for a few years Jean Paul's life was rich in incident and full of excitement—an Odyssey of love adventures, in which he was the object of extravagant idolatry on the part of the women of Germany, especially of aristocratic dames who dabbled in literature. They gave him their love whether or no, and would have deserted husband and children for his sake; for, though not personally handsome, Jean Paul had a wonderful fascination of manner, particularly towards women. He found all women charming, he was a delightful talker and a good listener, and had a sweet and sympathetic smile—qualities that explain a good deal. In 1801 he married a Berlin lady, and three years later settled down at Bayreuth, attracted by its beauties of hill and valley, and by its beer. There he

spent the rest of his days, leading a simple, busy life, writing his books, playing with his children, tending his pet animals, and taking short summer journeys to different towns of Germany; the present of a flower filled him with perfect joy. His last years were clouded by the death of his only son, a promising student, in 1821, and by his own blindness. From 1799 he enjoyed a pension from the Prince-primate Dalberg, and then from the king of Bavaria. He died on 14th November 1825. The principal works of his married life were the two grand romances, *Titan* (1800-3; Eng. trans. 1862) and *Wild Oats* (1804-5; Eng. trans. as *Walt and Vult*, 1849), the former accounted by himself and by most German critics his masterpiece, though Englishmen would generally prefer the latter, as they would certainly prefer *Siebenkäs* to *Hesperus*; *Schmeltze's Journey to Flatz* (1809; Eng. trans. by Carlyle, 1827) and *Dr Katzenberger's Trip to the Spa* (1809), the best two of his satirico-humorous writings; the idyll *Fibel's Life* (1812); the fragment of another grand romance, *Nicholas Markgraf*, or *The Comet* (1820-22); a series of reflections on *Literature* (*Vorschule der Ästhetik*; improved ed. 1812), containing many excellent things about poetry, humour, wit, style; another series on *Education* (*Levana*, 1807; Eng. trans. 1848, 1876, and 1887), a book that ranks with Rousseau's *Emile* as a standard work on training the young, and is full of evergreen wisdom; various patriotic writings (1808-12); and an unfinished *Autobiography* (1826), the finest of all his idylls.

Jean Paul stands apart entirely by himself in German literature, a humorist of the first water, a Titan, 'a colossal spirit, a lofty and original thinker, a genuine poet [in prose], a high-minded, true, and most amiable man. . . . He advances not with one faculty, but with a whole mind, with intellect, and pathos, and wit, and humour, and imagination, moving onward like a mighty host, motley, ponderous, irregular, irresistible. He is not airy, sparkling, and precise, but deep, billowy, and vast' (Carlyle). Two irreconcilable tendencies strive for mastery in him and his works—a dreary, lachrymose sentimentality, that shrank from the rough buffeting of life, and sought refuge in emotional dissipation, luxuriating in tears, caressing sorrow, coquetting with love, melting in melancholy longings for the world beyond the grave; and a sharp-eyed, wide-awake common sense, that saw workaday realities with the utmost clearness and discrimination. All his great qualities of imagination and intellect were, however, made ministers to his humour, which had the widest range, moving from the petty follies of individual men and the absurdities of social custom up to the paradoxes that are rooted in the permanent ordinances of the universe. He turns his irony—a tender, reverent, playful irony—upon all the relations of human life, even upon the holiest beliefs of his own heart. And, in spite of the egotism of genius that often shows itself so strongly in him, Jean Paul had the heart of a truly great and good man. Börne calls him the author *par excellence* of the lowly born, the poverty-stricken, the neglected, and the despised; to this class belong some of his finest characters, as Wuz, Fixlein, Siebenkäs, Vult. As a master of pathos he is put by De Quincey above Sterne. Few, if any, have written with such tender love and such delicate feeling of the idyllic joys of the country and the happiness of simple domestic life, particularly in the schoolhouse and parsonage. He had a wonderfully deep and sympathetic insight into the nature of woman, but has not created more than one lifelike woman (Lenette). Yet the male characters of his books, in so far as they are

humorous, are generally living beings, or else, if secondary characters, well-drawn pencil sketches in outline. Jean Paul is the classic author of friendships (Siebenkäs and Leibgeber, Walt and Vult); he matched them with his own friendship for Hermann and Oertel, and for Otto and the Jew Emmanuel Osmund. Nature was to him a living and divine presence: he loved her reverently, from the solemn stars to the tiniest flower, and his descriptions of nature embrace some of the loftiest hymns the spirit of man has chanted to the beauty and sublimity of created things—e.g. several passages in *Hesperus* and *Wild Oats*, the Dream of the Universe in *Siebenkäs*. God and the immortality of the soul were the great facts ever present to his mind, influencing all his thoughts. An enduring sense of the ethic worth of human action, 'a noble reverence for the spirit of all goodness forms the crown and glory of his culture' (Carlyle). The reason why he is so little known, except by name, is that of all great writers he is one of the most difficult to read, and it may be added to understand. No reader who has not the strongest constitution can struggle through the tangled thickets of encyclopedic learning, the tortuous wit, the dreary wastes of digression and dullness, the hothouses of tropical sentimentality, amid which the gem-like gardens of his creative art are hidden. His prose is harder to translate than Heine's verse. For literary form, for order, harmony, or restraint he has not the slightest respect. The principal idea in his (often) long sentences is too frequently lost amid a labyrinth of subordinate clauses. The story is chiefly a peg for Jean Paul to hang Jean Paul's self-communications and reflections upon, a *point d'appui* for the play of his wit and humour. The wildest improbabilities, the wildest extravagances of fancy, are indulged in without check. Sentence follows sentence teeming with allusions, analogies, images, metaphors, similes, tumbling one over another in inextricable confusion. A Crusus of idioms, he is the greatest and most prolific word-coiner in the language: he compels words to adapt themselves to his ideas. Often enough his diction is inflated and bombastic, and his literary taste execrable; yet when he is at his best his language marches with a majesty, a dignity, a natural beauty that are seldom matched in German literature. Carlyle's *Sartor Resartus* and *French Revolution* are steeped in the spirit of Jean Paul, and show how greatly he fascinated the imagination of the rugged Scotsman.

See *Wahrheit aus Jean Paul's Leben*, his Autobiography (1826), continued by Otto and Förster (1827-33); Spazier's *Biographischer Kommentar zu Jean Paul's Werken* (5 vols. 1833); Förster's *Denkwürdigkeiten* (4 vols. 1863); Correspondence between Jean Paul and Otto (4 vols. 1829-33), Charlotte von Kalb (1822), Jacobi (1828), and Voss (1833); two works by Nerrlich (1876-89), and two by F. J. Schneider (1901-6), the *Life* by Friedrich Burschell (1925); also Carlyle's *Miscellaneous Essays* (vols. i. and iii.), De Quincey's *Analecta* of specimen passages translated (vol. xi. of *Collected Works*), and *Life of Jean Paul F. Richter* (1845); and Stefan George's essay in *Tage und Taten*.

Richthofen, FERDINAND, BARON VON, traveller and geographer, was born at Karlsruhe in Silesia, on 5th May 1833, was educated at Breslau and Berlin universities, and at the Geological Institute of Vienna (1856), and in 1860 accompanied a Prussian expedition to eastern Asia. The next twelve years he spent in travelling through Java, Siam, Burma, California, Sierra Nevada, and China and Japan (1868-72). After his return to Europe (1872) he was appointed president of the Berlin Geographical Society (1873-78), professor of Geology at Bonn (1875), and of Geography at Leipzig (1883) and at Berlin (1886), and director of the Museum für Meereskunde in Berlin (1900). His reputation

as a geographer is built principally upon his great work on *China* (Berlin, 5 vols. and atlas 1877-1912), and upon *Die Metallproduktion Kaliforniens* (1865), *The Natural System of Volcanic Rocks* (San Francisco, 1867), *Aufgaben und Methoden der heutigen Geographie* (1883), and articles in geographical journals. He died 7th October 1905.

Ricinus. See CASTOR-OIL.

Rickets (etymology unknown), or RACHITIS (Dr Glisson's pseudo-Greek coinage in 1650 from Gr. *rhachis*, 'the spine,' because a peculiar form of spinal curvature results therefrom), is a disease of children, chiefly characterised by the imperfect development, softness, and consequent distortion of some or many of the bones. Though so soft, they are thickened, especially at the parts where growth normally takes place most rapidly; the enlargement of the wrists, ankles, &c. which results has led to the term 'double-jointed,' often applied to those suffering from the disease. The weight of the body and the traction of the muscles acting on bones thus constructed cause them to bend, and the thighs or shins are abnormally arched, or the spine is curved, or, in slighter cases, only the normal form of the ankle is modified. In aggravated cases the chest is so affected as to give rise to a deep groove low down in either side; the lower jaw is imperfectly developed, and the teeth project; the forehead is high or overhanging, and the pelvis becomes so altered in form as, in the case of girls, to render future child-bearing in the highest degree perilous. Rickets is exclusively a disease of childhood, and rarely begins later than the second year. It appears to be caused by unhealthy surroundings, particularly defective or improper food, and insufficient light and air. It is therefore much more common among the poorer classes, and in towns. It is not due in most cases to the want of lime-salts in the food, but to the want of power in the child's system to assimilate them. This has been shown to be largely dependent on the insufficiency of suitable fresh food, especially of animal fats, which contain a vitamin (fat-soluble vitamin A) necessary for growth. In some of the large cities of Europe one-third or even a larger proportion of the children brought to the out-patient departments of hospitals are more or less affected. It is a very chronic disease, and if at all severe leaves its mark on the bones for life. It is very rarely fatal of itself; but affected children are much less able than others to resist attacks of other diseases (bronchitis, diarrhoea, hooping-cough, measles, &c.). In Germany this malady is, under an old misapprehension, called the 'English disease.'

The treatment must be mainly directed to the improvement of the general health. Free exposure to pure bracing air, sponging with sea-water, or sea-bathing if the little patient can bear it, an abundance of suitable and nourishing food, cod-liver oil, and, above all, fresh natural foods like milk, eggs, butter, and a little fresh fruit are requisite. The administration of lime-salts seems to do little good, though it might naturally be thought the one thing needful. While the bones are still soft great care must be taken to keep the child in such attitudes as will cause the least possible strain upon the affected parts. When the bones have become ossified in faulty positions surgical interference may often be useful in producing amelioration of the deformity.

Rickettsia Bodies. See GERM (THEORY OF DISEASE).

Rickman, THOMAS, an English architect, was born at Maidenhead in Berkshire in 1776. He was undecided as to a calling, being in succession chemist, grocer, corn-factor, and insurance agent.

But he seems to have always had a love for architecture, and to have studied it carefully. Having sent in a design for a church that proved successful in a government competition, he settled at Birmingham as an architect. He designed a great number of Gothic churches and chapels—e.g. in Birmingham, Hampton Lucy, Bristol, Preston, Carlisle, &c., many country-houses, and the New Buildings of St John's College, Cambridge. He died in March 1841. His *Attempt to discriminate the Styles of Architecture in England from the Conquest to the Reformation* (1817; 6th ed. by J. H. Parker, 1862) became a standard authority.

Rickmansworth, a town of Hertfordshire, at the confluence of the Colne, Gade, and Chess, 4 miles W. by S. of Watford. It has a church (rebuilt in 1890) with interesting monuments; and near it is Moor Park, the seat of the ill-fated Duke of Monmouth, as its predecessor was the residence of Wolsey. Its garden was described as it appeared when it belonged to the Bedford family by Sir William Temple (q.v.), who called his own house at Farnham by the name of Moor Park. Pop. 7500.

Ricord, PHILIPPE, a French physician, was born on 10th December 1800, at Baltimore, U.S. He came to Paris in 1820, and after 1828 delivered there two annual courses of lectures at the Pitié on surgical operations, and was appointed surgeon-in-chief to the hospital for venereal diseases. This post he held till his retirement in October 1860. He died on 22d October 1889.

Riddles have been defined as 'roundabout definitions of the hearer has to guess what.' They were widely popular in dim antiquity, as to-day among many half-civilised races. They may be broadly divided into two classes—riddles admitting of solution, and riddles whose solution is beyond any wit of man, unless indeed, as is very often the case, the answer is known already. Of insoluble riddles Samson's is a good instance, and this which, in a Russian folk-tale, is put by 'Boots' to the princess: 'As I came to you I saw on the way what was bad, and I struck the bad with a bad thing, and of what was bad the bad died.' Naturally the princess could not guess that he had killed a snake with his lance; she gave it up, and had to marry him. Such propounding of riddles for wagers (her hand to his head in this instance) meets us frequently—e.g. in the ballad of 'Proud Lady Margaret,' 'Captain Wedderburn,' and 'The Elf Knight.'

The riddle is found in the Koran, and several collections of riddles exist in Arabic and Persian. They were, it seems, also known to the ancient Egyptians, while among the Greeks they were allied in the earliest times with the oracular responses, and were generally in poetical form. But in Greece they first came into vogue about the time of the 'Seven Sages,' one of whom, Cleobulus, was celebrated for the composition of metrical *griphoi*. Even the greater poets did not disdain to introduce them into their writings, or to devote whole poems to the subject—e.g. the *Syrinx*, commonly ascribed to Theocritus. Appuleius wrote a *Liber Ludicrorum et Griphorum*, but it is lost; and almost the only name we can fix upon is a certain Cælius Firmianus Symposius, whose riddles, comprising a hundred hexameter triplets, are termed by St Aldhelm 'rubbish' ('carmina inepta'). Some of the English riddles (probably 8th century) in the Exeter Book rise to the level of literature.

The riddle was much cultivated during the middle ages. Many French, English, and German riddle-books exist in MS., and some were printed at an early period. Wynkyn de Worde's *De-maundes Joyous* (1511) contains several that are simply coarse jests; but others, again, well illus-

trate the simple faith of mediæval Christendom—e.g. '*Demand*: What bare the best burden that ever was borne?' *Response*: The ass that carried our Lady when she fled with our Lord into Egypt.' The Reformation checked riddle-making; but in France, in the 17th century, it began to creep back into favour. Le Père Menestrier, in 1694, wrote a grave treatise on the subject; and before that, in 1646, the Abbé Cotin had published a *recueil*, in the preface to which he modestly dubbed himself 'le Père de l'Enigme.' 'Posterity,' adds a French critic, 'has not recognised his paternity.' The taste grew and grew, and many brilliant French writers, such as Boileau, Voltaire, Madame du Deffand, and Rousseau, did a little in this line, until finally the *Mercure de France* became a fortnightly repository of riddles, the solution of which secured a reputation in society. In Germany we have Schiller's delightful extravaganza, *Turandot*; and in England Cowper, Fox, Canning, and Praed are a few of the makers of poetical riddles or Charades (q.v.).

See chap. iii. of Tylor's *Primitive Culture* (1871); Ralston's *Songs of the Russian People* (1872); Friedreich's *Geschichte des Räthsels* (1860); Rolland's *Devinettes ou Enigmes Populaires*, with a preface by Gaston Paris (1877) and a bibliography; and for Old English riddles, Stopford Brooke's *Early English Literature* (vol. i. 1892); Tupper, *Riddles of the Exeter Book* (Boston, 1910); Wyatt, *Old English Riddles* (Boston, 1912).

Ridge, WILLIAM PETT, born in 1864 at Chatham near Canterbury, began to write stories and novels in 1890 (amongst them *A Clever Wife*, *Mord Em'ly*, *Name of Garland*), and is best known as an exponent of cockney humour.

Ridgeway, SIR WILLIAM (1853-1926), archaeologist, occupied the chair in that subject at Cambridge from 1892. His writings include *Origin of Metallic Currency* (1892), *Early Age of Greece* (1901), *Origin and Influence of the Thoroughbred Horse* (1905), *The Origin of Tragedy* (1910).

Ridgway, ROBERT, born in 1850 at Mount Carmel, Illinois, in 1880 was made curator of the birds division of the National Museum at Washington. He has written numerous works on American birds, notably *The Birds of North and Middle America* (8 vols. 1901 et seq.).

Riding. The two objects aimed at in *ordinary riding* (which includes riding on the road, hunting, pig-sticking, stock-driving, breaking in young and freshly-handled horses, playing polo, race and steeplechase riding) are to remain in the saddle and to make the animal carry its rider with the greatest possible ease to itself. The former of these objects is the one almost entirely aimed at by the breaker when giving his first lessons; the latter, by the flat-race jockey. Hence we find that the saddle and seat adopted by the Colonial buck-jumping rider are those that are best suited for 'sticking on.' The large pads on the flaps of his saddle are about six inches deep, and are curved backward, so as to fit against his thighs, a little above the knees. The seat of the jockey, instead of being that in which most security can be obtained, is the one by which the rider can best conform to the movements of his mount. Hence we find that, even in Australia, many of the best jockeys on the flat are but very poor performers on a buck-jumper. In all kinds of riding balance rather than grip should be the chief means for retaining one's seat in the saddle, for if muscular action be constantly employed to 'stick on' the muscles then brought into play will soon become tired, and will be unable to act at the very moment their aid is most required. One valuable rule in riding is that, except when applying the leg to the animal's side, the leg from the knee down should remain unaltered in its position, so that neither knee nor foot will work back-

wards or forwards. The movements of the upper part of the body should be regulated by the play of the hips. There should be no hollowing out of the small of the back or pushing out of the chest, or any other action which would give rigidity to the muscles. The rider should endeavour to avoid the two very common faults of holding on by the reins and of putting too much weight on the stirrups, and he should try to ride with his seat well under him and not stuck out behind. To give an additional grip the saddle may be covered with buckskin, or with leather the rough side of which is put on the outside. The saddle should be roomy. The back part, upon which the seat rests, should be fairly flat; the seat ought to have a good 'dip' in it; and there should be tolerably large 'rolls' on the flaps. To become a good rider one will require plenty of practice, and a frequent change of horse and saddle. The English style of riding is that adopted in the hunting-field, race-course, steeplechase-course, and polo-ground.

In *school riding* the object of getting the horse to carry his rider with the greatest possible ease to himself, which is the chief aim of the ordinary rider, is sacrificed to a large extent for increased control, so as to get the horse to perform the various *airs de manège* with precision. The English military riding system is a kind of compromise between that of the Continental *haute école* and the English hunting style.

In *side-saddle riding* the lady depends for security of seat on balance and on the grip she has on the upper and lower crutches. Her right leg is placed over the former, and she presses her left leg, a little above the knee, against the latter when she seeks their aid. Her left foot should not be placed 'home' in the stirrup, but only as far as the ball of the foot; and the heel should be slightly depressed. If, when her left leg is held in this manner, she can just feel the pressure of the lower crutch, the length of her stirrup will be about right. The only pace at which she should put weight on the stirrup is the trot. The great requisite for obtaining a 'square' seat, which is the one correct position, is to put the weight on the right leg, and not equally on both, as is often wrongly advised, and to bring the left shoulder up as much as the right. The body should be free from all stiffness, and should be kept erect by the play of the hip-joints. The side-saddle for ladies was introduced into England about 1382 by Anne of Bohemia, and almost disappeared early in the 20th century.

Ridinghood, LITTLE RED. See PERRAULT.

Ridings—originally *thrithings* or *thridings*—are ancient divisions of counties, now practically known only in Yorkshire; the initial consonant of the Old English word having been absorbed by the *t* or *th* of the preceding *west*, *east*, *north*. The word also appears as *trithing*, *triding*, *treiding*, and in many other spellings. According to the (so-called) 'laws of Edward the Confessor,' the *treiding* was the third part of a province, and to its court were brought questions that could not be settled in the court of the wapentake. There were three ridings of Lindsey in Lincolnshire (north, south, and west). There were at one time ridings in Tipperary, as also in Ontario and in Long Island, New York. Under the Local Government Act of 1888, each of the Yorkshire ridings is a separate administrative county. See YORKSHIRE, COUNTY.

Ridley, NICHOLAS, Protestant martyr, was born about 1500, of good Northumbrian stock. From the grammar-school of Newcastle-upon-Tyne he passed to Pembroke Hall, Cambridge, became fellow in 1524, and master in 1540. The spirit of the Reformation had already begun to penetrate both universities; Tyndale and Bilney had taught

the new doctrines at Cambridge, and Ridley, no less than Cranmer and Latimer, Cambridge students about the same period, had early caught something of their spirit. Ridley went next to Paris and to Louvain, and, having encountered some of the most active Reformers abroad, after a three years' absence returned firmly grounded in the new doctrines. He was made proctor to the university of Cambridge in 1533, became domestic chaplain to Cranmer, afterwards to the king, and had already been made vicar of Herne, canon, first of Canterbury, then of Westminster, and rector of Soham, when in 1547 he was raised to be Bishop of Rochester. An ardent and outspoken Reformer, yet without either bigotry or intolerance, he brought great learning and admirable preaching power to the cause, and quickly made himself one of the foremost leaders of the church. On the deprivation of Bonner, Bishop of London, in 1550, Ridley became his successor. In this high position he distinguished himself by his moderation, his learning, and his munificence, prompted Edward VI. to the foundation of Christ's, St Bartholomew's, and St Thomas' hospitals, and assisted Cranmer in the preparation of the Forty-one Articles, afterwards reduced to thirty-nine. In 1552 he visited the Princess Mary at Hunsdon, but failed to shake her adherence to her mother's faith. Thereupon, after the death of Edward VI., he warmly espoused the cause of Lady Jane Grey, and at St Paul's Cross declared both Mary and Elizabeth to be illegitimate, July 16, 1553. As soon, however, as Mary was proclaimed he repaired to Framlingham to make his peace, but was coldly received, and soon stripped of his dignities and sent to the Tower. Once at least he attended mass, but his spirit soon returned to him. In March 1554 he was sent to Oxford, together with Latimer and Cranmer, to be tried by a committee of convocation, and after a profitless disputation all three were adjudged defeated and obstinate heretics, and condemned to suffer at the stake. As England was not yet formally reconciled to Rome, the sentence could not be carried out, and accordingly Ridley lay in Bocardo gaol at Oxford for eighteen months, writing the while a noble and touching farewell letter to his friends. After the formality of a second trial he was led forth to execution, along with Latimer, 16th October 1555. The stake was placed in front of Balliol College, and here Ridley played the man in the midst of awful torments of a smouldering fire that burned him slowly to death. His writings were collected in a volume of the Parker Society series (1841), with a life by Rev. H. Christmas. See his Life by Dr Gloucester Ridley (1763).

Rieka. See FIUME.

Riel, LOUIS, a Canadian insurgent, born in Manitoba in 1844, became a leader of the Métis, or French half-breeds, and headed the Red River rebellion in 1869-70, afterwards escaping from the country. In 1885 he again established a rebel government in Manitoba, and in November, the rising having been quelled, he was executed at Regina.

Riemann, KARL WILHELM JULIUS HUGO, German musical theorist and historian, was born 18th July 1849 at Sondershausen, and died at Leipzig, 10th July 1919. After a wide education in the arts and in music, he lectured on musical theory at Bromberg, Hamburg, Sondershausen, and Wiesbaden. He became professor at Leipzig (1901), director of the Musical College (1908), and head of the musical research institution in 1914. His writings are enormous in extent and in influence, and include text-books, histories, catechisms, &c., his *Handbuch der Musikgeschichte* the most notable.

Rienzi, COLA DI, the famous Roman tribune, was born at Rome in 1313. His parentage was humble, his father being a tavern-keeper named Lorenzo, by abbreviation, Rienzo; the family name of Gabrini is sometimes added. The son Nicolas (shortened into Cola) studied grammar and rhetoric, read and re-read the Latin historians, philosophers, and poets (Greek was scarcely yet known in Italy), and excited his imagination, while at the same time he coloured his speech, with the prophetic enthusiasm of the inspired writers. The assassination of his brother by a Roman noble, whom he found it impossible to bring to punishment, finally determined him to deliver the city from the barbarous thralldom of the barons. In 1343 he was appointed by the heads of the Guelph party spokesman of a deputation sent to the papal court at Avignon to beseech Clement VI. to return to Rome in order to protect the citizens from the tyranny of their noble oppressors. Here he obtained a favourable hearing from the pope, who appointed him notary to the civic chamber. In April 1344 Rienzi returned home, and sought to obtain the countenance of the magistrates in his ideas of reform; but reform he found was impossible without revolution; and for three years he loudly and openly menaced the nobles. At last, when Rienzi thought he could rely on the support of the citizens, he summoned them together on the 28th of May 1347, and, surrounded by 100 horsemen and the papal legate, he delivered a magnificent discourse, and proposed a series of laws for the better government of the community, which were unanimously approved. The aristocratic senators were driven out of the city, and Rienzi, as tribune of the holy Roman republic, was invested with practically dictatorial power. The pope confirmed the eloquent dictator in his authority; all Italy rejoiced in his success, and foreign lands, even warlike France (according to his enthusiastic friend and admirer, Petrarch), began to dread the reviving majesty of the Eternal City. A bright dream flashed across Rienzi's imagination, the dream of every great Italian from Dante to Mazzini—the unity of Italy and the supremacy of Rome! Rienzi despatched messengers to the various Italian states, requesting them to send deputies to Rome to consult for the general interests of the peninsula, and to devise measures for its unification. These messengers were everywhere received with enthusiasm, and, on the 1st of August 1347, 200 deputies assembled in the Lateran Church. Rienzi was crowned tribune with great ceremony on the 15th April. But the nobles were still bitterly hostile; Rienzi, who defeated them in a bloody battle on the 20th November, became suddenly infected with the insolence of victory and power, and proceeded to levy taxes and enforce obedience. The papal authority was turned against him; after a short reign of seven months he lost heart at the combination of forces against him, and fled to Naples.

After two years of religious meditation among the mountains of the Abruzzi, Rienzi resumed his life as political reformer, and went to Prague to secure the support of the emperor, Charles IV. Charles, however, sent him as a prisoner to Pope Clement VI. to Avignon, but by the mediation of Petrarch he was released from imprisonment. A new pope, Innocent VI., resolved to take advantage of Rienzi's old popularity in order to crush the power of the Roman nobles, now becoming troublesome, and sent him to Rome in the train of Cardinal Albornoz. Their mission was swiftly accomplished, and the power of the nobles overthrown again. Rienzi aimed, however, at re-establishing himself in supreme authority. In August 1354,

having borrowed money and raised a small body of soldiers, he made a sort of triumphal entry into Rome, and was received with universal acclamations. But misfortune had impaired and debased his character; he abandoned himself to luxurious living, and his once generous sentiments had given place to a hard, mistrustful, and cruel disposition. The barons refused to recognise his government, and fortified themselves in their castles. The war against them necessitated the contraction of heavy expenses; the people grumbled; Rienzi only grew more severe and capricious in his exactions and punishments. He even murdered the free captain, Fra Monreale, for his wealth. In two months his rule had become intolerable, and on the 8th of October an infuriated crowd surrounded him in the Capitol, and put him to death with ferocious indignities.

The fortunes and fate of Rienzi have been made the subject of a romance by Lord Lytton, and of an opera by Wagner. See monographs on Rienzi by Papencordt (1841), Auriac (1885), Rodocanachi (1888), Cosenza (1913), and D'Annunzio (1913; not critical); and the histories of Mediæval Rome by Gregorovius and Reumont.

Riesa, a town of Saxony, on the left bank of the Elbe, has large ironworks and other factories, and is, thanks to its situation on a navigable river, spanned here by a fine bridge, and to its railway connections, a distributing centre for agricultural products, coal, wood, petrol, &c.; pop. 24,000.

Riesengebirge (i.e. 'Giant Mountains'), a mountain-range separating Bohemia from Prussian Silesia. Seen from Silesia on the north they look like a gigantic wall of rock, pierced at places by deep ravines. On the south they fall away more gradually. The highest peak is the Schneekoppe (5280 feet), the loftiest mountain in this part of Europe. Granite and crystalline schists, especially mica-slate, are the principal rocks. There are only three passes: one in the east, with a railway, from Landeshut in Silesia to Trautenau in Bohemia; one in the west, from Hirschberg to Reichenberg; and one in the middle, from Hirschberg to St Peter in the upper Elbe valley in Bohemia. These mountains are a favourite tourist resort of the Germans. They figure in popular legend as the home of the mountain-spirit Rûbezahl ('Number Nip'), called also 'Herr Johannes,' who rules the weather.

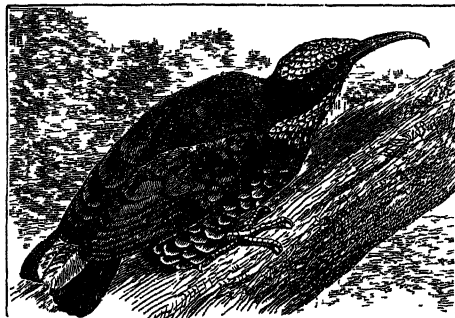
Riesi, a town of South Sicily, 10 miles NW. of Terranova, has sulphur-mines and makes wine and olive-oil; pop. 17,000.

Rieti (anc. *Reate*), a city of Central Italy, on the ancient Via Salaria, 40 miles NE. of Rome, is walled, and presents a mediæval appearance; it has a fine cathedral with a monument by Thorwaldsen; pop. 19,000. See Colasanti, *Rieti* (1911).

Rievaulx Abbey, situated 26 miles N. of York and 10 E. by N. of Thirsk, is a ruined edifice, Norman and Early English in style, originally built for the Cistercian order by Walter l'Espece in 1131. The ruins consist of the choir and transepts of the church, with a choir-arch 75 feet high, the refectory, and the gate-house. They occupy a beautiful site in the valley of the river Rye; 'Rievaulx' is but a Norman-French translation of 'Rye vale.' At the dissolution this was one of the richest foundations in Yorkshire.

Rif, **ER**, the coast districts of northern Morocco extending from Centa to the western frontier of Algiers, and forming a line of steep cliffs with few harbours. Its Berber inhabitants were formerly much addicted to piracy. In our own day their subjugation has strained the power of Spain and France. Their leader, Abd-el-Krim, president of the Rif republic, surrendered to the French in May 1926. See W. B. Harris, *France, Spain, and the Rif* (1927).

Rifle-bird (*Ptilorhus paradisea*), one of the Birds of Paradise, occurring in the bush of Australia and New Guinea. The male is extraordinarily brilliant, velvety-black above with a purple gloss, with green head, throat, and median tail-feathers, and bronzy abdomen. The female is, as usual,



Rifle-bird (*Ptilorhus paradisea*).

more soberly coloured. Another fine species, *P. magnifica*, has a stiff breast shield of green. The name Rifle-bird or Rifleman-bird is also applied to a tiny New Zealand bush-wren (*Acanthodositia chloris*), which makes a bottle-shaped nest in holes in trees. For another Rifle-bird see HONEY-EATER.

Rifleman. See VOLUNTEERS AND TERRITORIAL ARMY; and for the bird so called (*Ptilorhis*), see RIFLE BIRD.

Rifles are small-arms with barrels spirally grooved internally; the name, like cognate German, Danish, and other words for grooving or for the weapon, being referred by the *New English Dictionary* to the Old French *ryfler* or *riffler*, 'to scratch, scrape.' The object of rifling any weapon, whether cannon or small-arm, is to cause the projectile to rotate, and thus to impart steadiness to it in flight. It was first used in small-arms to rotate a spherical bullet, and much later on to rotate an elongated one and keep it point first; for the latter, if not rotated, will turn end over end in flight, and instead of maintaining its initial velocity much better than a spherical one, and shooting much more truly at any except the very shortest range, as it actually does, would be markedly inferior in both respects. The reasons why rotation gives a gyroscopic steadiness to a projectile and keeps an elongated one point first are somewhat abstruse, and cannot be dealt with here; but the reason why an elongated projectile maintains its velocity better than a spherical one of similar weight is readily shown. Let us assume a solid elongated projectile of a diameter of 3 inches, with a length of 12 inches—a very usual proportion of length to diameter—and with head struck with two diameters, as in fig. 1; a solid spherical projectile of similar weight would have a diameter of 5.17 inches, as in fig. 2. Now the ability

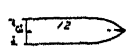


Fig. 1.



Fig. 2.

of any projectile to retain the velocity which is impressed on it is directly proportional to its weight, and the force tending to bring it to rest is the resistance of the air, and this resistance varies approximately directly as the area of the greatest cross-section of a projectile. In the elongated projectile considered this is 7 sq. inches, and in the spherical one 21.1 sq. inches, while the weights are the same. The spherical projectile, therefore, is on this account alone only about one-third as efficient ballistically as the elongated one.

For other reasons it would be even more inferior. Since the sectional area of a projectile is proportional to the square of its diameter, a handy method of comparing the ballistic properties of two bullets is furnished by the ratios of their weights

to the squares of their diameters $\frac{W}{D^2}$, where D is

the diameter of the projectile in inches and W its weight in pounds. Thus a bullet whose weight is 215 grains and diameter 0.3 inch is superior ballistically to one which has a weight of 250 grains and a diameter of 0.35 inch, *always assuming that the shape of the head is the same in both the bullets compared.* As will be shown hereafter, the shape of the head greatly affects the air resistance, and an altered form of head may counterbalance an

indifferent $\frac{W}{D^2}$. These points are fundamental in the consideration of all ballistic questions.

The cause of the inaccuracy of smooth-bores was the necessity, especially in military arms, for allowing a clearance ('windage') between the bullet and the barrel to permit of easy loading, for, as the bullet passed up the bore on firing, it bumped from side to side of the bore, and its direction on leaving the muzzle depended on the chance position of the last bump.

The invention of rifling has been attributed to Gaspard Knoller, of Vienna, in the 15th century, and to Augustus Kottler, of Nuremberg, about 1520, and there is the evidence of many rifles dated before 1560 and still in existence—one of these, made in Hungary and dated 1547, being in the Rotunda Museum at Woolwich. Of course any of these may have been originally smooth-bores and rifled long subsequently to the dates on them or attributed to them, but it is very unlikely that all of them can have been thus treated; and after 1563 there is documentary evidence incontestably vouching for the existence of rifles. The genesis of the invention is variously ascribed to the practice of spinning a spear when throwing it; to the spiral feathering of arrows, which caused rotation; or to barrels, which were grooved with *straight* grooves to give a place for the fouling (which always proved a hindrance to loading) to lodge in, having been accidentally grooved spirally. This last idea seems now to be somewhat discredited. There is, however, no certain ground for any of the theories.

The rifle rapidly gained favour as a sporting arm, but the great objection to it for military use was the time taken in loading. The spherical ball had to be a tight fit to fill the grooves in the bore, and, apart from the friction due to fouling (in itself very considerable), had to be rammed down with great force, a mallet being sometimes employed to drive the ramrod down. Roughly speaking, it took about four times as long to load a rifle as to load a smooth-bore. As a result of this, although we hear of troops being armed occasionally with rifles as early as the beginning of the 17th century, and of some of the French cavalry regiments being supplied with a rifled carbine in 1680, these remain isolated instances, and no serious action was taken in the matter of introducing military rifles until towards the end of the 18th century, when it is unquestionable that the events of the American War of Independence (1775-81) brought the matter prominently forward, and it was never dropped again. The American soldiers were practically irregulars—a large number of them hunters and skilled in the use of the rifle—and their feats of shooting were often remarkable, for a time when the percentage of hits on firing with a musket at a target 100 feet by 6 feet at 75 yards was sixty, and only forty at 150 yards! (*Stray Military Papers*, Hime, London, 1897, page 29)—for accurate shooting at 400 yards has been recorded by a credible

witness. As a result, a corps of *Jagers*, armed with rifles, was recruited on the Continent and employed on the British side, and it may be said that the adoption of rifles into the British service dates from about 1800, when the 95th Regiment, afterwards the Rifle Brigade, was armed with the 'Baker' rifle, so named after the inventor. This weapon had a calibre of .620 inch, was sighted to 300 yards, and weighed about 9½ lb. The bullet was spherical, and was wrapped in a greased patch. The 'Baker' was superseded in 1835 by the 'Brunswick' rifle, which had a calibre of .704 inch and weighed about 11 lb. 5 oz. The Brunswick had two grooves only, and the bullet had a belt which fitted into them. The Baker rifle was most difficult to load after a few rounds, owing to fouling, and there was considerable trouble with the Brunswick on account of the bullet being wrapped in a greased patch, which rendered it difficult to fit the belt on the bullet into the grooves. It is probable that only the peace in Europe between 1815 and 1854, so far as Great Britain was concerned, rendered the retention of either of these rifles possible for so long. The Brunswick rifle was the first to have a percussion-lock instead of the old flint-lock. Percussion-firing was generally adopted in 1842. The use of the ignition of detonating mixtures by percussion for firing small arms undoubtedly originated with the Rev. Alexander Forsyth, of Bellhelvie, Aberdeenshire, in 1805; but the percussion-cap, as ultimately adopted, was worked out by others.

The advantage of the rifle, due to its accuracy, had now become established, and many efforts were made to overcome the difficulty in loading. These all took the form of a bullet which was a loose fit in the bore, and could be dropped into the barrel, where it rested, not on the powder charge, but on a ledge formed by a slight contraction of the bottom of the bore, or else on a pillar projecting up from the end of the bore round which the powder lay. The bullet, resting in either of these positions, was expanded into the grooves by blows with the ramrod. The first system was proposed by Captain Delvigne in 1826, and, modified by Colonel Poncharra in 1833 by the addition of a wooden 'sabot' or wad between the bullet and the powder, was adopted by France for some rifle regiments between 1838 and 1840. The second system, invented by Colonel Thouvenin about 1833, was not adopted by any Power. Neither system was taken up by Great Britain.

We now come to the introduction of the elongated bullet. Proposed as early as 1662, if not earlier, and actually tried by Benjamin Robins about 1740, by Captain Norton in 1823, and by Colonel Davidson (in India) in 1832, it was brought forward by W. W. Greener in 1835 in conjunction with a plug in the base, so that the bullet, easily loaded, might be expanded by the gases of explosion into the rifling. Delvigne in 1841 proposed one with a hollow base, apparently with much the same object, for the other and principal advantages to be obtained from an elongated bullet seem to have been but imperfectly appreciated at this time. About 1847 Captain Minié produced his

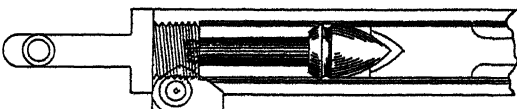


Fig. 3.

flat-based, elongated bullet (fig. 3), which was at first used in conjunction with Colonel Thouvenin's pillar for expansion; and finally, in 1849, a bullet with a hollow base and an iron cup in it (fig. 4), which was self-expanding. This bullet, modified,

and Captain Minié's rifle were adopted by the British, French, and Belgian governments in 1850-1851. Minié's bullet was not, however, the first elongated one used in the British service, for a certain number of Lancaster's rifles, with two large grooves forming an oval bore, were issued to the 1st Battalion of the Rifle Brigade for use in the Kaffir war (1846-52). The bullet for these had two wings fitting the grooves and a flat base, and shot fairly.

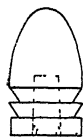


Fig. 4.

With the introduction of the Minié rifle, the important decision was come to in Great Britain, about 1852, to replace all the smooth-bores—with which the army, except 'rifle regiments,' was equipped—by rifles. The Minié rifle had a calibre of .702 inch, a bullet of 680 grains, a powder charge of 69 grains, was sighted to 1000 yards, and weighed about 9 lb. 13 oz. without, and 10 lb. 13 oz. with, bayonet. It was probably the best rifle in existence when adopted—apart from its being a muzzle-loader—but it was heavy; and as early as 1852 experiments to obtain a better had been undertaken at Enfield, with the result that the 'Enfield' rifle was approved for adoption in 1853, and many were issued in 1855 to the troops in the Crimea. In this rifle there was a considerable reduction of calibre—viz. to .577 inch. The bullet weighed 530 grains, but the powder charge was 69 grains, as in the Minié, and as a result a much higher velocity was obtained with it. It was sighted to 900 yards, and weighed about 8 lb. 14 oz. without, and 9 lb. 11 oz. with, bayonet. A shortened pattern was subsequently issued to rifle regiments, and a carbine, very similar to the short pattern, to the artillery and cavalry. The Enfield was issued to the native troops in India shortly before 1857, and suspicion of the grease on the bullets (which was believed by the Hindoo to be made of cows' fat, and by the Mohammedan of pigs' fat, and therefore an abomination to both) was alleged to be one of the proximate causes of the Indian Mutiny. The Enfield rifle, it may be added, whether converted to breech-loading on the Snider plan or unchanged, was an excellent weapon for its time, and remained the British arm until the adoption of the Martini-Henry rifle in 1871.

It is now necessary to revert to an earlier period in order to deal with the important subject of breech-loading. Breech-loading is very nearly contemporaneous with the introduction of Firearms (q.v.), and many early weapons were so made; but the method was dropped, even for small-arms, about 1600, owing to the inability to seal the escape of gas as gunpowder improved and pressures grew greater. Constant efforts were made to re-introduce it in small-arms, and Robins speaks of a method in existence about 1740. Prescient in this as he was over the advantages of rifling, he says that breech-loading, 'though not in the manner now practised, would be of all others the most perfect for the construction of these sorts of (rifled) barrels,' for obviously breech-loading would get over all loading difficulties and the provision of expanding bullets. In this matter Prussia led all nations, and between 1841 and 1848 discarded the smooth-bore musket, and rearmed her forces with the celebrated 'needle-gun.' This weapon had a bolt-action very similar to those of the latest arms, to be described later; but instead of the metal cartridge, one of paper and of very peculiar construction, and containing both the powder and bullet. The latter was egg-shaped, with the rear part tapering off on finer lines than the front, and only .53 inch in diameter, whereas the bore was .607 inch in diameter. In order, therefore, that the bullet might be rotated, it was firmly embedded

in a papier-maché plug, which fitted tightly in the bore and took rotation from the rifling. On the base of the bullet there was a patch of detonating composition, and the striker-needle, when the trigger was pulled, perforated the powder charge and struck this detonating patch, thus firing the cartridge. The rifle weighed, without bayonet, about 10 lb. 4 oz., had a bullet of 478 grains and a muzzle velocity of 1000 ft.-seconds, and was sighted to 656 yards (800 paces). It was not by any means a perfect arm; the paper cartridge sealed the escape of gas indifferently, and the needles were apt to break; but it was an immense advance over any muzzle-loader, as it embodied a self-contained cartridge with its own means of ignition, whereas with contemporary arms caps had to be placed on the nipples for each discharge. This weapon, improved in various ways, served the Prussians and, later, the Germans through the wars of 1864, 1866, and 1870, until in 1871 an improved weapon, the Mauser, was adopted.

The special advance made by the self-contained cap, as in the needle-gun cartridge, does not seem to have been appreciated at first, for of the many breech-loaders brought forward at this time, 1850 to 1860 (Sharp's, Terry's, Greener's, Westley-Richards's in Great Britain alone), all had nipples to be capped.

The result of the war of 1864 seems, however, to have brought home to all the Powers the advantages of the Prussian system, and by 1866 France had adopted the Chassepôt breech-loader, a bolt-action weapon of .434-inch calibre, with a paper cartridge, having a cap fixed in the base. On the face of the bolt was an india-rubber washer to check escape of gas. It had a bullet of 386 grains, a muzzle velocity of 1328 ft.-seconds, was sighted to 1312 yards (1200 metres), and weighed, without bayonet, 9 lb. 5 oz. England in 1867, after a number of trials, adopted the Snider system, largely because the existing stock of Enfield rifles could be rapidly converted to it, as it was recognised that a better pattern was desirable; and a committee was appointed in 1866 to go into the question of the adoption of a new rifle, with the result that in 1871 the Martini-Henry was adopted. With the Snider was introduced a metallic cartridge—complete with bullet, charge, and cap—and with this cartridge the rifle shot about as well as the Enfield from which it was converted, and was quite efficient. Indeed, its metal cartridge-case put it well above both the needle-gun and Chassepôt. The breech-block was attached to a hinge running parallel with the barrel, and opened sideways and upwards. The striker passed diagonally through the block to the cap, and was struck externally by the hammer, which was part of the old rifle.

The Martini-Henry—a combination of the Henry barrel and Martini action—had a calibre of .45 inch, a bullet of 480 grains, and a muzzle velocity of 1350 ft.-seconds. It weighed 9 lb. without, and 9 lb. 12 oz. with, bayonet. It was a good rifle, but it is very doubtful whether it represented the best that might have been adopted at the time. Certainly in one respect—its extraction—it was decidedly weak. Its rifling (see fig. 5) was peculiar, forming really a heptagonal bore with projections (B) at the junctions of the faces (A) of the heptagon. It was only a modification of Whitworth's hexagonal bore, which, for match-shooting

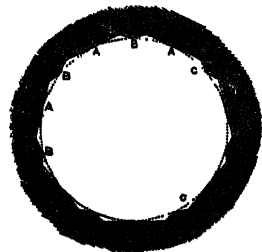


Fig. 5.

purposes, had carried all before it from 1857 to 1865, though unsuited for a military small-arm. The action of this rifle works as follows (see fig. 6): The breech is closed by the block (B) pivoted at P. Gearing with the back of the block (B)—in a manner which does not appear in the

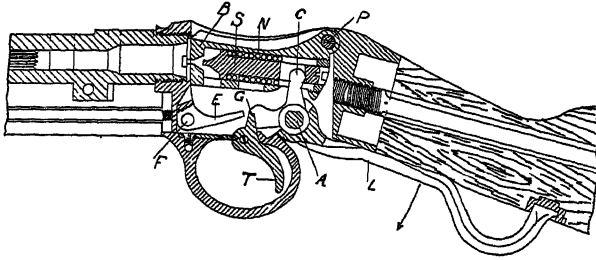


Fig. 6.

figure—is a lever (L) pivoted at A, so that if the lever be pushed outwards in the direction of the arrow the front of the block falls and uncovers the breech, and if it be pressed back the block rises and closes the breech. When the block (B) falls its lower edge strikes the lower arm of the double-armed extractor (E), which is pivoted at F. The upper arm of the extractor (only partially shown) is forked, and the cartridge lies between the prongs, with its rim in rear of them. When, therefore, the lower arm is pressed down by the block, the fork moves backwards and extracts the cartridge. Taking the position in the figure, if the trigger (T) be pressed its sear leaves the notch (G) on the lower arm of the double-armed tumbler, also pivoted at A. This permits the compressed spring (N) to drive the striker (S), which is held back by the nose (C) of the upper arm of the tumbler, on to the cap of the cartridge. The action of opening the breech forces the tumbler back into the cocked position, withdraws the striker (S), and compresses the spring (N) ready for firing again.

At about the same time that Great Britain decided on the Martini-Henry, other Powers were in the main adopting bolt-action rifles of a type similar to the needle-gun and Chassepôt, but with cartridges with metal cases. Before, however, passing to the rifle of the present day, it will be well to consider more fully one or two features of the rifles which have been mentioned.

First, as to the grooves and twist of rifling. It is practically certain that the number and form of grooves in the early rifles were chosen by makers quite empirically and with no certain notion of what the rifling actually did; indeed, it was considered by some that it was the air passing over the inclined grooves on the bullet which caused the latter to rotate! Their number varied generally between six and eight, and their forms between rounded, sharp-cornered, notch-shaped, ratchet-form, shallow, and deep. As to twist, examples of both increasing and decreasing twists are found, and even of combinations of both—the last probably due to defective workmanship. The twist was usually slow, one turn in 47 calibres being about the quickest, the Enfield rifle of 1855 having a twist as low as one turn in 135 calibres. No doubt a slow twist was enforced by the small hold in the grooves of a spherical bullet, and the danger of 'stripping'—i.e. the bullet being forced through the barrel without turning, and the lead in the grooves being torn off—if a more rapid one were used; but with the elongated bullet the hold of the grooves is wider, and with velocities of less than 1500 ft.-seconds a twist up to one turn in 30 calibres is

quite feasible. If the velocity be increased above this, as in modern rifles, the lead, even if hardened with about 1 part of tin to 12 of lead, will not stand the rapid stress put on it, and the bullet must be sheathed with a stronger metal, such as cupronickel or mild steel. Professor Sir A. G. Greenhill,

F.R.S., has provided a formula whereby the twist required to keep projectiles of various lengths steady in flight can be calculated, and the theoretical twists accord well with those found satisfactory in practice. The depth of the rifling also was based on no principle, and the grooving was unnecessarily deep and caused quite needless friction, especially with elongated bullets. The needle-gun had grooves .03 inch in depth, and most of the rifles introduced between 1841 and 1870 had grooves over .01 inch in depth. Metford, to whom many of the improvements in rifles are due, showed in 1865 that excellent results could be obtained with grooves only .004 inch in depth, and the depths of grooves in the latest rifles, with their very high velocities, rarely exceed .0065 inch.

As to sighting, the smooth-bore musket had only a fore-sight and no back-sight, and aim was taken roughly along the barrel. Back-sights came in with the Baker rifle, which was sighted to 300 yards with flap back-sights. The Lancaster rifle, sighted to 900 yards, was the first to have the back-sight with folding leaf and slide, such as is used, though much modified, at the present time.

The comparatively poor ballistic properties of the Martini-Henry—it was outclassed by several foreign arms adopted about the same time—were recognised after a time, and a committee was assembled in 1883 to consider an improved pattern, and in 1886 recommended the Martini-Enfield rifle. This rifle had a bore of .402 inch, rifled with seven segmental grooves of the Metford pattern. It had a charge of 85 grains, a bullet of 380 grains weight, and a muzzle velocity of 1570 ft.-seconds. This rifle, owing to its higher velocity and an increase in the leverage for extraction, was an improvement

on the Martini-Henry, though its $\frac{W}{D^2}$ showed no improvement. A number of these rifles were made, but there was no regular issue of them to the troops, as three advances in rifle armament had taken place about this time—viz. the adoption of magazine arms by several Powers between 1878 and 1884, of a smokeless powder by France in 1886, and by the same Power at the same date of a rifle with a bore only .315 inch in diameter, the rifles of the previous breech-loading period having had calibres well over .4 inch, and it was clear that much more was needed in a new rifle than was provided by the Martini-Enfield.

To deal first with the question of magazine arms: the great importance of a magazine arm was first practically demonstrated in the American war between the North and South in 1861, when one regiment of the Northern army, armed with a magazine rifle, successfully resisted the attack of a force at least three times as numerous armed with the ordinary single-loader, simply on account of the great rapidity of fire. And again, in the war between Turkey and Russia in 1877, the constant repulse of the Russian assaults on the Turkish lines before Plevna was in a great measure, if not mainly, due to the fact that the Turks were armed with the Winchester repeating rifle, which enabled them to mow down the Russians by hundreds as they crossed the open to the assault. In the United States there were at that time several systems already in practical use, and after the

experience of the Turkish war the question was seriously taken up by most of the European governments. By the end of the year 1879 the French government had adopted the Kropatschek magazine rifle for the navy; the Germans were experimenting with a Mauser rifle converted to take the Lee magazine; the Austrians were experimenting with the Kropatschek and the Spitalski; in Italy the Bertoldo rifle had been issued to some few regiments for trial; in Switzerland the troops were armed with the Vetterli repeater; and in Norway and Sweden a repeater on the German principle was on trial.

There have been many patterns of magazines for rifles, but of those which have been adopted all can be placed in one or other of two groups—viz. the *tube* magazine, in the butt or under the barrel, in which the cartridges lie nose to base and are pressed forward or backward by a spring; or the *box* magazine, lying just behind and below the breech, in which the cartridges lie parallel to each other, vertically or horizontally, and are fed upwards or sideways by a spring. The tube magazines were earliest adopted, and were invented in America; the Spencer about 1860, with a tube magazine in the butt; and the Winchester about 1867, with one under the barrel. Both of these have falling block-actions, for which the tube magazines alone are readily rendered suitable. The Fruwirth (of which the Lebel and others are only slight variants) is the type of the tube-action for the bolt-action rifles. Of box magazines there has been only one example of those in which the cartridges lie horizontally and side by side—viz. the Krag-Jorgensen, with which the United States were, and Denmark still is, armed. The vertical box, either fixed or detachable, is that commonly used at the present time.

Comparing tube and box magazines, the former have the disadvantages that the emptying of the tube under the barrel alters the balance of the rifle; that the placing of the points of the bullets against the cap in the base of the cartridges in front is not devoid of danger, and accidental explosions have resulted from it; and, lastly, that the tube does not lend itself to any system of rapid charging. As a result the tube magazine is only used now by the army of one Power—France; and it is certain that she will not perpetuate the principle in any rearmament, as her cavalry already have a carbine with a box magazine. It may be added that no nation has ever adopted a tube magazine in the butt as in the Spencer rifle, owing, no doubt, to its unsuitability for combination with a bolt-action.

Smokeless powders are discussed under GUN-COTTON, and it is only necessary to say here that the advantage of these powders in their much greater power, in addition to their smokelessness, was soon appreciated.

Lastly, as to the smaller bore. The credit for this change appears to rest with Major Rubin of the Swiss ammunition factory at Thun, who brought forward a .295 rifle in 1883; but there is little doubt that the conviction was general that in order to reap the full advantage of the magazine the soldier should be able to carry more ammunition; and in addition to this, the lighter bullet could be propelled at a much higher velocity, as soon as the difficulty of 'stripping' was overcome, by introducing the enveloped bullet already referred to.

These new developments were considered in Great Britain by various committees, and in January 1888 a .303-inch rifle with the Lee bolt and magazine, and a barrel rifled with the Metford system of rifling, was recommended for trial, and the trials having proved satisfactory, the rifle, with several minor modifications, was approved for the service in December 1888. This rifle had a bullet with

cupro-nickel envelope weighing 215 grains, a charge of 70 grains of (black) gunpowder compressed into a pellet, and a muzzle velocity of 1850 ft.-seconds; weighed 9 lb. 8 oz. without, and 10 lb. 7 oz. with, bayonet; and was sighted from 200 to 2900 yards. [Unchanged in its main features, except as to its rifling, but with many improvements, it is substantially the rifle in the hands of the troops to-day. The alterations made are, briefly, the adoption of a somewhat simplified bolt, and the increase of the magazine to hold ten cartridges, instead of eight, in 1890; the adoption of 'cordite,' with an increase of velocity to 2060 ft.-seconds, in 1892; a new safety-catch and the alteration of the rifling in 1895; the adoption of a rifle for general use by both infantry and cavalry, 5 inches shorter and about half a pound lighter, with more delicate sighting arrangements allowing for small corrections in elevation and for wind; and the general adoption, both for new and old rifles, of the system of loading by 'charger' in 1902, and in 1907 some further improvements in the sighting and a better guide for the charger.]

As regards the alteration in rifling, the Metford rifling (see fig. 7), admirable for lead bullets, was found to wear badly with the bullet with cupro-nickel envelope; and the Enfield rifling (see fig. 8),

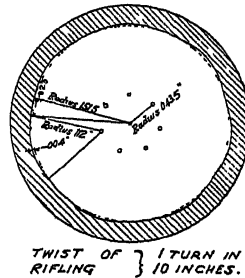


Fig. 7.

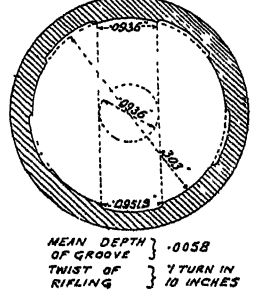


Fig. 8.

with slightly deeper grooves and much wider 'lands' (metal between the grooves), was found to stand much better, without any diminution in accuracy, even when both systems were tried comparatively in new barrels.

As regards 'charger' loading, the vertical box magazines lend themselves readily to being loaded rapidly by the insertion of a bundle of cartridges (usually five in number) side by side, held together in a 'clip' or 'charger'. The magazines of the Lee-Metford and Lee-Enfield rifles until 1902 were filled by putting in cartridges one at a time. The adoption of the latter system was no doubt based on the idea that with well-controlled infantry the use of the magazine would be exceptional, and that loading by single cartridges would be the rule; that loading by clip or charger would lead to waste of ammunition, while both chargers and clips add considerably to the weight of the ammunition to be carried. Accordingly the British rifle was provided with a magazine holding double the number of cartridges contained in the magazines of foreign rifles, and capable of being closed by a 'cut-off,' so that the rifle could, until emergency called for very rapid fire, be used as a single-loader. The experience of the South African war led, however, to the adoption of the Continental plan of loading by bundles of five cartridges, and the Lee-Enfield magazine being suited for 'charger' loading, this system was adopted. The difference between 'clip' and 'charger' loading is that the clip is used in a magazine with straight sides, and is inserted bodily with its load of five cartridges into the magazine,

where it is held by a catch, and the cartridges are pushed one by one out of the clip by the bolt in loading, and the clip when empty drops out of the bottom of the magazine; whereas the charger is placed in a guide over the magazine, and is thrown away after the cartridges in it have been pressed down out of it into the magazine, where they are retained, owing to the walls of the magazine being curved over at the top. This prevents the cartridges from being pushed out again vertically by the spring, which, in both systems, causes the cartridges to rise immediately there is a space left by a cartridge having been pushed into the breech. In both systems the top cartridge in the magazine lies with its base projecting into the path of the bolt when the latter has been fully withdrawn. In the British and a few other rifles a 'cut-off' is provided whereby the top cartridge can be pushed down and held clear of the bolt's path, so that the rifle can be used as a single-loader.

Fig. 9 shows a Mannlicher rifle-action with the clip and cartridges in the magazine, and fig. 10 a Mauser rifle with charger in place over the magazine ready for the cartridges to be pressed out of it into the magazine. Fig. 11 shows the Lee-Enfield action with magazine empty.

The working of a block-action for breech-closing in the case of the Martini-Henry has been explained, and an explanation of the essentials of a bolt-action will now be given. It should be noted that the same lettering is used for similar parts in figs. 9, 10, and 11.

Bolt-actions are of two kinds, the 'straight pull' and the turning. With the former the bolt lever or knob is pulled straight to the rear to open, and pushed straight to the front to close and lock, the breech. This is effected by the bolt being made in two or more parts, so arranged that the pushing or pulling of the rear part, to which the lever is attached, shall cause, by suitable cam-grooves, the part of the bolt carrying the locking-lugs (projections), by which the bolt as a whole is held firmly against the breech, to engage the lugs with, or disengage the lugs from, the locking recesses which are cut in the body attached to the barrel, or in the barrel itself. There are only three military rifles with this class of action—viz. the Austrian (Mannlicher), Swiss (Schmidt-Rubin), and the Ross rifle, with which the Canadian forces were armed up to 1918. It is very doubtful whether the small gain in time in not having to turn the bolt-lever in order to unlock or lock the bolt compensates for the increase in complication which is an undoubted feature of all straight-pull actions. With turning bolts the locking-lugs are engaged with or disengaged from the locking recesses by simply turning the bolt-lever up or down.

As already stated, the earliest forms of breech-loaders depended for the sealing of the gases of explosion on the use of a paper cartridge-case, supple-

mented, of course, by the accurate fit of the bolt-head in the breech; and, in the case of the Chassepôt, by the use of an india-rubber washer squeezed out against the sides of the chamber. Great Britain was the first country to adopt the metal cartridge-case, and her example was soon followed by all other nations. It is not too much to say that without the metal cartridge-case the breech-loading small-arms of the present day, with their high gas pressures of, quite normally, 19 tons on the square inch, would be impossible. But the metal case necessitates a powerful system of extraction to remove it, when, after being fired, it fits tightly in the breech, owing to expansion by gas pressure. This is effected by an extractor, which is a spring claw lying by the side of and projecting slightly beyond the bolt-head. As the breech is closed, the claw rides up

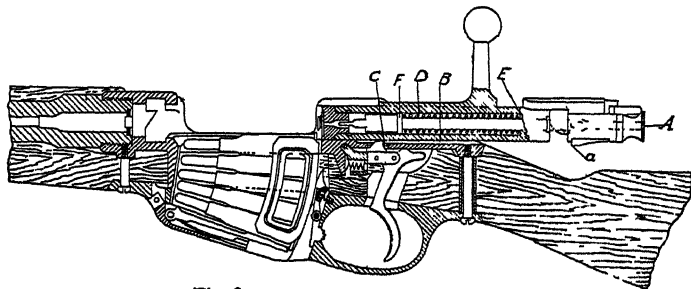


Fig. 9.

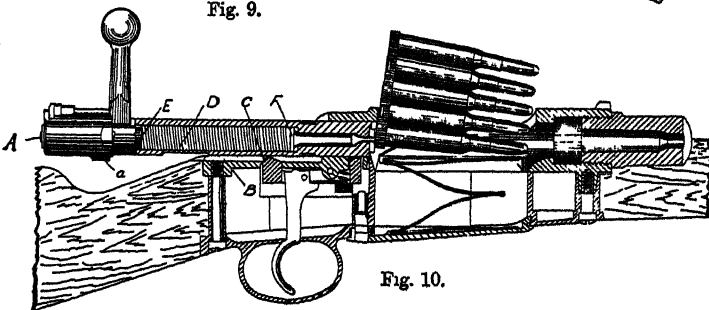


Fig. 10.

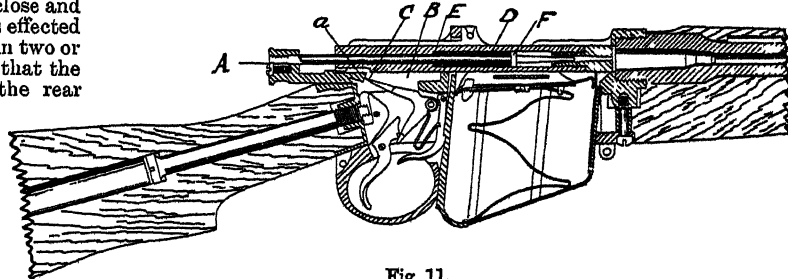


Fig. 11.

over the base of the case and snaps over the rim, or into the extractor groove, of the case. As the bolt-lever is turned for opening, 'primary extraction' with considerable leverage is usually provided by one or both of the locking-lugs fitting in cam-shaped locking recesses, so that turning up the bolt-lever causes the bolt to be slightly withdrawn and the cartridge to be slightly shifted; after which, since all cartridges are slightly coned, it can be readily removed by pulling the bolt. The case is ejected by the part of its base opposite to that gripped by the extractor coming against a projection, which is brought into its path by suitable means just as the bolt has been nearly fully withdrawn. This causes the case to one side or upwards, according to the disposition of the parts chosen, and as withdrawal of the bolt is always done

sharply, it is thrown clear of the rifle (see fig. 12, which shows the ejection of the case from a Lee-Enfield rifle).

The way in which a fresh cartridge rises from the magazine ready to be pushed into the breech has been explained in discussing the action of clips and chargers.

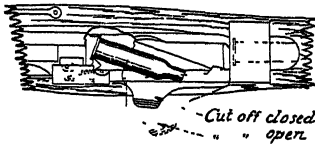
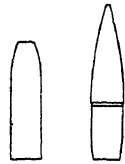


Fig. 12.

The cocking of the striker and the compression of the striker-spring is effected as follows (see figs. 9, 10, and 11): The bolt slides in a bolt-way in the body of the rifle, and contains the striker and its spring. Attached to the rear end of the striker is the cocking-piece (A), a part of which (a) projects into a groove (B) in the bottom of the bolt-way. Projecting also into the groove (B) is the nose of the trigger-sear (C). When the bolt is pushed forward to close the breech, the projection (a) of the cocking-piece (A) encounters the sear-nose (C), and as a consequence the striker is held back, and the bolt being pushed forward and locked, the spring (D) is compressed between the rear face (E) of the hollow in the bolt and the collar (F) on the striker. This is the position shown in fig. 11. If now the trigger be pulled the sear-nose (C) is depressed, and the striker and cocking-piece, being no longer held back, are driven forward by the main-spring. Suitable means are provided to prevent the possibility of the rifle being fired before the bolt is locked, and safety-catches to render firing impossible if desired.

Fig. 13 shows the short Lee-Enfield rifle and bayonet with which the bulk of the British forces were armed during 1914-18. The rifle stood the test of war excellently in spite of two weak features which may be mentioned briefly. Its bolt differs from those of practically all other military rifles in that it has not its two locking-lugs (projections) in front and engaging in recesses cut in the rear end of the barrel itself, but has them in rear of the centre of the bolt (longitudinally), and engaging, the one in a recess in, and the other against a projection on the side of, the boltway. Should the bearing of the lugs, owing to wear, not be quite even, the heavy pressure on the front of the bolt on firing causes a 'whip' of the bolt to one side or the other, as there is necessarily a little clearance between the bolt and the side of the boltway in which it travels and is housed. This 'whip' can, if bad, throw out the aim to some extent; and generally the design does not provide the strongest possible form of locking. Another feature which has been criticised is its small cartridge, limiting the possibility of increase of charge to get the highest possible velocity and flattest trajectory with a sharp-pointed bullet, as discussed later. As, however, the cartridge fulfilled excellently all that it was designed originally to do, and later on admitted of substantial increase in ballistics, it cannot perhaps fairly be described as a 'weak' feature. This latest development of the bullet is due to the action of France. In 1904, after considerable experiment, she adopted a bullet, with a very sharp point and tapered base (see figs. 14 and 15, which show her

old and new bullets respectively), made of an alloy of copper with 11 per cent. of zinc. This form of bullet is much less affected by air resistance, and this, coupled with a reduction in weight from 216 to 198 grains, and a consequent rise in velocity from 2073 ft.-seconds to 2380 ft.-seconds, led to the bullet's trajectory being very much flatter. Flatness of trajectory discounts considerably incorrect judgment of distances and errors in elevation generally; for, if the difference in height of trajectory for, say, 300 and 600 yards range be only 3 feet instead of 5 feet, it is clear that the chances of missing in the former case are much reduced as compared with the latter (see Sighting, Fig. 14. Fig. 15. under CANNON).



All nations have adopted, or will adopt, the pointed bullet, but similar generally (apart from the aluminium filling at the point) to the British enveloped bullet (see CARTRIDGE), and not to the French solid design described above. The British bullet weighs 174 grains, and has a velocity of 2400 ft.-seconds, as compared with 215 grains and 2060 ft.-seconds with the pattern which was superseded in 1910. Although this improved bullet (the charge having been increased from 30 to 40 grains) gave a reduction in height of trajectory much the same as with the French bullet, the improvement was not considered sufficient, and in 1912 experiments were started to obtain a new rifle which would satisfy requirements. These experiments showed that—even with all the conditions of strength of rifle, a cartridge-case of ample size, and a bullet of the best ballistic design fully satisfied—the problem of getting the best possible com-

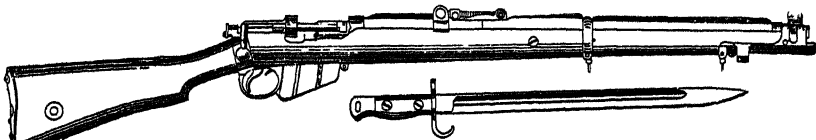


Fig. 13.

bination is far from simple, the immense heat due to firing the heavy charges needed to obtain velocities of 2900 ft.-seconds or more in a rifle of a reasonable weight—a fundamental condition—bringing about special difficulties. Consequently in 1914 re-armament had not commenced, and obviously had to be postponed, as the great changes in existing plant which would have been required were wholly impossible when immediate supplies of rifles and ammunition, on the largest possible scale, were essential. When placing, however, large orders for rifles in 1914 in the United States of America, where new plant had of necessity to be laid down in any case, the improvements introduced in the experimental rifle were adopted in the rifle, termed 'Pattern 1914,' ordered, except that it was designed to take the same cartridge as the short rifle, as the risk of mistakes in ammunition-supply in the field with two patterns of cartridge in use was far too great to run. When the United States joined the Allies in 1917, advantage was taken of the plant existing to manufacture this rifle, and it was adopted, with the small alteration required to suit the United States '300' cartridge, as 'Model 1917,' for their expeditionary forces. It is not, however, a certainty that the short rifle will be superseded in Great Britain by Pattern 1914.

As to future developments, there can be little doubt that the next step will be the replacement of the ordinary by automatic rifles, operated either

by gas or recoil as are Machine Guns (q.v.). Several already exist, and the Lewis machine gun, which played a great part in the war of 1914-18, is, as generally used, really a heavy automatic rifle. The advantage to be gained would not lie merely in being able to fire with great rapidity, but in ability to do so without the really great physical effort which the working of the bolt involves in long-continued rapid fire, even if, as can be done, the rifle is not brought down from the 'presented' position for loading. No doubt, to counterbalance the possible advantages, the waste of ammunition would often be prodigious, but it is quite certain that re-arming with an automatic rifle by any great power would force its general adoption. The moral effect on troops of being armed, or even thinking that they are armed, with an inferior arm is apt to be so disastrous that no nation could afford to risk it.

In 1883 the 'Morris' tube of 0.22-inch calibre, which could be fitted inside the barrel of the service rifle, and a miniature cartridge to be used with it, were introduced for short-range, or indoor, rifle practice. See MORRIS-TUBES.

The table which follows (based on that in the official text-book of small arms) gives the more important details of the rifles of the various nations; but, so far as the velocities given go, the period is one of transition, and, except in the case of Denmark, France, Germany, Great Britain, Japan, Russia, Spain, Switzerland, and the United States, who have already adopted the new form of light and sharp-pointed bullet, a considerable increase in muzzle velocity over the figures given in the table may be expected in the near future, but a velocity of about 2900 ft.-seconds will probably not be exceeded.

Country.	Calibre in Inches and Designation.	Weight with Bayonet.	Weight without Bayonet.	Weight Bullet.	Muzzle Velocity (About).
		lb. oz.	lb. oz.	grains.	ft.-sec.
Austria .....	.315 Mannlicher	9 0	8 5	244	2080
Belgium .....	.301 Mauser	9 10	8 0	219	2030
Denmark .....	.315 Krag-Jorgensen	10 4	9 12	196	2550
Great Britain and British Dominions .....	.308 Lee-Enfield	9 10	8 10	174	2440
France .....	.315 Lebel	10 1	9 3	198	2380
Germany .....	.311 Mauser	9 14	9 0	154	2900
Greece .....	.256 Mannlicher-Schoenauer	9 0	8 5	159	2230
Holland .....	.256 Mannlicher	10 7	9 11	162	2440
Italy .....	.256 Mannlicher-Carcano	9 8	8 6	168	2400
Japan .....	.256 'Year 88'	9 9	8 10	189	2500
Portugal .....	.256 Mauser-Vergero	9 9	8 13	155	2350
Rumania .....	.256 Mannlicher	9 9	8 13	162	2400
Russia .....	.8 'Three-line'	9 11	8 15	214	2850
Spain	Nagant	10 5	9 6	178	2800
Switzerland .....	.295 Schmidt-Rubin	8 10	8 0	not known	
Turkey .....	.8 Mauser	10 8	9 1	212	2100
United States ..	.8 Short Magazine	9 8	8 8	150	2600

As to charging systems, all Mannlicher rifles (except the Greek rifle) use a clip, and all others the charger. All the magazine systems are box except that of France, and all magazines hold five cartridges, with the exception of Great Britain (ten) and Switzerland (six). The French tube magazine holds eight.

Rift Valley, a valley with steep parallel walls formed by a subsidence or vertical displacement of the earth's crust (see FAULT). Sometimes there is a single line of displacement along which the strata on one side have all been depressed. Frequently there are parallel faults dividing the strata into blocks, which show the effects of differential movement. The depressions thus caused may be

occupied by rivers or lakes, or both, and in time they tend to lose their characteristic sharp contours, so that in some cases they have assumed the appearance of ordinary erosion-valleys (see VALLEY). Rift valleys are not uncommon in mountainous countries in most parts of the world. The Upper Rhine marks one. A classical example is the gorge of the Jordan and the Dead Sea. The Yosemite is a characteristic type. The Great Basin (q.v.) in the United States shows many notable specimens, especially south-eastern Oregon. A great rift valley in South Australia, marked by Spencer Gulf and Lake Torrens, separates the South Australian highlands from Eyre Peninsula and the plateau of Western Australia. The East African plateau displays two great lines of depression. One is largely a subsidence of whole segments of the earth's crust. Of both, the lowest parts are occupied by great lakes. Southwards the two lines converge into one great valley occupied by Lake Nyasa, the southern part of this valley being less directly due to subsidence than the rest. Farther north, the western rift, the Central African trough or Albertine depression, contains a great succession of fresh-water lakes—Tanganyika, Kivu, Edward Lake, and Albert Lake. The Eastern African depression or rift valley contains Lake Rudolf and a number of smaller lakes, many of them brackish and without outlet. Volcanic peaks, obviously associated with the two depressions, occur on a line east of the eastern trough.

See H. R. Mill, *International Geography* (2d ed. 1900); J. W. Gregory, *Rift Valleys of East Africa* (1921).

Riga, capital of Lettland (Latvia), on the Dwina (crossed here by a bridge of boats and a railway bridge) 7 miles from its mouth, was till 1918 the third seaport of Russia. The old town has narrow streets and mediaeval houses and stores; but the suburbs are laid out in broad streets with handsome buildings. The chief edifices are the (Lutheran) cathedral, built in 1204, burned down in 1547, but rebuilt; St Peter's Church (1406), with a steeple 460 feet high; the House of the Blackheads; the castle of the old Knights of the Sword (1494-1515), the former residence of the grand-master of the order; and several old guild houses and Hanseatic halls. The modern buildings include an Orthodox cathedral, an art museum, university buildings, schools, and a monument to Herder, who lived in Riga. It is the seat of an archbishop of the Greek Church, and a university (1919, till then a polytechnic). It manufactures cottons, machines, tobacco, corks, spirits, oil, metal wares, glass, paper, flax, jute, and oilcloth. Exports include flax, eggs, grain, timber; imports, machinery, rubber, coal, cotton, herrings, and tea. The port is kept open by ice-breakers in February and March. The town is accessible only to vessels up to 20 feet draught. Larger ships discharge at Ust-Dvinsk (Dünamünde) and Mühlgraben. Pop. 378,000. Nearly one-half of the inhabitants are Germans (with German-speaking Jews), and one-fourth Letts. Riga was founded in 1201 by Albert, Bishop of Livonia, and soon became a commercial town of the first rank, and member of the Hanseatic League. It belonged to Poland from 1561, in 1621 was taken by Gustavus Adolphus, and in 1710 was annexed to Russia. In September 1917 it was occupied by the Germans, and in October and November 1919 the German troops in the Russian service shelled it. Lettish independence was proclaimed at Riga in 1918, and there peace was made between Russia and Poland in 1920.

The GULF OF RIGA, an inlet on the east side of the Baltic, washes the shores of Lettland and Esthonia. It is 105 miles long, and about 60 broad. The Esthonian islands of Oesel, Dagö, Mohn, and Worms lie athwart the entrance. The chief river

which falls into it is the Dwina. Sandbanks render navigation in some parts dangerous.

Rigas. See RHIGAS.

Rigg, JAMES HARRISON (1821-1909), third in the Wesleyan roll of honour—after Wesley and Jabez Bunting—was born the son of a Wesleyan minister at Newcastle-on-Tyne, and entered the ministry in 1845. He was a member of the first London School Board, and was twice president of the Wesleyan Conference. He wrote on Wesley, the Wesleyan Church, and on theology generally, and edited the *London Quarterly Review*.

Righi. See RIGI.

Right, PETITION OF. See PETITION OF RIGHT.

Right Ascension. See ASCENSION.

Right-handedness is and has been the rule with men and women in all regions, amongst all races, and, so far as we can trace, at all past stages of human development. Amongst English-speaking adults, perhaps 97 per cent. show very much greater facility, dexterity, sensitiveness, and power in the use of the right hand. Very young children betray little disposition to use the right hand more than the left; but the habit, once established, is rapidly strengthened in childhood and youth. It is alleged that though the sickles of the Bronze Age were obviously made for right-handed people, the debated eoliths were chipped both for left-hand and for right-hand use. But though some of the cave-men's drawings suggest left-hand craftsmanship, the bulk of them are manifestly the work of right-handed people. Some allege that of every hundred children now born into the world, seventeen are from the first decidedly right-handed; three only are congenitally left-handed; perhaps eighty are either-handed persons, who with training might become ambidextrous or both-handed.

Right-handedness is a specialty of function, and must not be assumed as merely one aspect of the normal and organic asymmetry of the human body. But it should be remembered that though at first sight man seems to be built on symmetrical lines, in detail asymmetry is the general rule. In most people one eye is more powerful than the other, and one nostril is usually more sensitive. The ears are not shaped alike, are not equally acute, and are not placed equally far forward on the skull. The arms are usually of slightly different length and strength, and so are the legs. Very often the fingers of the two hands do not match perfectly. In these variations, sometimes the right has the advantage, sometimes the left; but there is one form of asymmetry in which the right always exceeds the left side. The viscera of the right side are distinctly heavier than those on the left side, the right lung being three-lobed, the left two-lobed. So with several other organs; and the arrangement of the blood-vessels has been treated as the main cause. Some have alleged that this is the actual cause of right-handedness; the greater weight on the left side leads to resting most on the right leg, and from that pillar of support we use the right arm with natural inevitable preference. But the question is not so simply settled. Some authorities deny that there is any organic or physical reason for right-handedness; refer it to instinct, to training, or to acquired habit due to the recognised convenience of uniformity of action amongst members of the same community. Some emphasise and some belittle the degree to which the preferential use of the right hand is transmitted by heredity. Right-handedness has been referred by some to the effect of nursing and infantile treatment; to the use of the left hand for defence of the heart in war, and of the right for striking; to the instruction of

seniors and the derisive criticism of eccentricity by comrades.

Of organic causes the lop-sidedness of the brain admittedly stands on a different footing from the other organic asymmetries. It is fully recognised that if the right limbs are acting most readily, the left side of the brain is doing more work than the right side. For nobody denies that the left hemisphere of the brain controls the right side of the body (see BRAIN). It used to be constantly alleged that the left cerebral hemisphere was larger and heavier than its counterpart, and that the convolutions of gray matter (the reservoirs of nervous energy) were more numerous on the left side than the right of the brain. But Professor D. J. Cunningham, in his Huxley Lecture (1902), emphatically denies this time-honoured view, and refers the belief in the greater weight of the left cerebral hemisphere to mere errors of observation. Braune has conclusively shown that if there is a difference in weight between the two hemispheres, it is the right that is the heavier, not the left; normally they are nearly of the same weight, and there is no evidence that the left is heavier in a right-handed person. Cunningham insists that our anthropoid ancestors were ambidextrous, like all monkeys, and that doubtless primitive man, while going on all-fours, was ambidextrous also. As soon as man began to walk on two feet, right-handedness asserted itself, feebly marked at first, but gradually gathering strength as the connection between hand and brain became more intimate, and as the work allotted to the hand grew in importance. He refers this human characteristic to the evolution of man by natural selection, and holds it to be due to left-brainedness, or the functional pre-eminence of the left brain—a superiority resting on 'some structural foundation,' which is transmitted from parent to offspring, but which has not yet been detected; for it is not, he is convinced, either the greater mass of the cerebral substance on the left side of the brain, or the multitude and arrangement of the convolutions. Mr B. S. Parson's theory is that man has for the sake of clearer sight departed from pure binocular vision; that partial one-eyedness brought one-handedness for co-ordination in aiming a blow; and that the necessity of defending the heart determined that the one should be the right.

See BRAIN; Sir Daniel Wilson, *The Right Hand* (1891); Immedeckens, *Rechts- und Linkshändigkeit* (1905); D. J. Cunningham's Huxley Lecture to the Anthropological Society in 1902; Ewald Stier, *Linkshändigkeit* (1911); H. Macnaughten-Jones, *Ambidexterity* (1914), for a summary; Beaufort Sims Parsons, *Left-handedness*; J. Jackson, *Ambidexterity* (1905)—a plea for ambidextral culture; Elliot Smith, *Evolution of Man* (new ed. 1927).

Right Honourable. See ADDRESS (FORMS OF).

Right of Way, the right which the public has to the free passage over roads or tracks. The expression is more generally applied to those public routes which are *not* statutory roads, such as hill or field paths, drove roads, bridle and other paths, and cart or driving roads in the common use of the public, which are not kept up by the county authorities. In many instances these roads are the only means of communication between important districts; and generally they are the shorter, and often the more picturesque, ways from one point to another. Right of way also exists along the seashore and on the banks of tidal rivers. The law of rights of way is judicial and not statutory. In Scotland, where of late the chief causes célèbres have originated, forty years' continuous use by the public of such roads or paths is the prescriptive period for constituting a right of way; while in England the public acquire a right of way under

dedication to them by the owner of the soil, and user signifying their acceptance of the same, or when dedication can fairly be assumed from notorious user, which needs generally to be proved for a lengthened period, but which may yet, according to circumstances, be presumed from a period of user of only a few years. The following points fall under the legal aspect of a public right of way, according to the law of Scotland: (1) The path or road must go from one public place to another public place. By this is not meant that it must go from one town or village to another; it may be between any two points at which the public have a right to be, and to which they resort for some definite and intelligible purpose. Thus it may run from one highway to another; but it cannot run between a public road and a private house. (2) It must be along some tolerably well-defined route between the *termini*. (3) If there is a definite road between two public places it does not matter for what purpose it is used. It is not necessary that the public should use the road for any business purpose; it is quite sufficient if the purpose is merely for recreation, the exercise of walking, or the contemplation of the beauties of nature. (4) Its use must be maintained by the public themselves in order to keep up the right to the way. Continuous use is necessary, though the public need not use the road every day or every month; yet the right is in danger if use is discontinued for any length of time. But if the public allow themselves to be excluded from the road for seven years the proprietor becomes entitled to continue the exclusion by interdict without raising the question of public right—that is to say, possession for seven years throws the *onus probandi* on the public. According to the law of England such points are not construed in a narrow sense, and they distinctly differ in the following respects: (1) It is not necessary that the right of way be between two public places, and (2) continuous use is not necessary, for no lapse of time as regards user or the claiming of their rights can bar the right of the public to a footpath or a highway once dedicated to them, or where dedication can be assumed. There are, however, statutory provisions for shutting up a road when it becomes unnecessary. The whole breadth of the originally dedicated road, including what is known as 'road wastes,' must always remain as the right of way to the public, and cannot be encroached upon. See ROAD, TRESPASS.

In Scotland any member of the public, or, under the Local Government (Scotland) Act, 1894, a town council, a district committee, or a county council, may bring an action of declarator in the Court of Session for the maintenance of a public right. But 'what is everybody's business is nobody's business,' and many valuable rights have been lost. In England the Local Government (England) Act, 1888, enacts that county councils 'may, if they think fit, contribute towards the cost of the maintenance, repair, enlargement, and improvement of any highway or public footpath in the county, although the same is not a main road.'

Rights, DECLARATION AND BILL OF. The Convention Parliament which called the Prince and Princess of Orange to the throne of England set forth, in a solemn instrument known by the name of the Declaration of Rights, the fundamental principles of the constitution which were to be imposed on William and Mary on their acceptance of the crown. This declaration (February 1689), drawn up by a committee of the Commons, and assented to by the Lords, began by declaring that King James II. had committed certain acts

contrary to the laws of the realm, and, having abdicated, had left the throne vacant. The main provisions of the Declaration, and of the Bill of Rights (October 1689) based upon it, were to the effect that the power of suspending and of dispensing with laws by regal authority is illegal; that the commission for creating the late Court of Commissioners for Ecclesiastical Causes, and all commissions and courts of the like nature, are illegal; that the levying of money for the use of the crown by prerogative, without grant of parliament, is illegal; that it is the right of the subjects to petition the king, and all prosecutions for such petitioning are illegal; that the raising or keeping of a standing army in time of peace, except with consent of parliament, is illegal; that Protestant subjects may have arms for their defence; that the election of members of parliament should be free; that freedom of speech in parliament should not be questioned in any place out of parliament; that excessive bail ought not to be required, or excessive fines imposed, or cruel or unusual punishments inflicted; that jurors should be duly empanelled, and that jurors in trials for high-treason should be freeholders; that grants and promises of fines and forfeitures before conviction are illegal; and that for redress of all grievances, and the amendment, strengthening, and preserving of the laws, parliaments ought to be held frequently. The remaining clauses treat of the succession to the crown.

Rights of Man, DECLARATION OF THE, a famous statement of the constitution and principles of civil society and government adopted by the French National Assembly in August 1789. In historical importance it may fairly be ranked with the English Bill of Rights and the American Declaration of Independence. It suggested the title for Paine's defence of the French Revolution against Burke (1791-92), which was followed by Mary Wollstonecraft Godwin's *Vindication of the Rights of Women*.

Rigi, or **RIGHI**, an isolated mountain (5906 feet) between the lakes of Lucerne, Zug, and Lowerz, in Switzerland, is greatly frequented by visitors on account of the extensive views it commands of some of the finest Swiss scenery. Verdant pastures clothe the summit, and the slopes are belted with forests. Toothed railways ascend from Vitznau (1871) on the Lake of Lucerne, and Arth (1875) on the Lake of Zug. Near or at the summit are hotels, and a Capuchin monastery (1689), whose church contains a wonder-working image of the Madonna that attracts numerous pilgrims.

Rigidity is one of the properties of matter which sharply differentiate solids from fluids. In abstract dynamics a rigid system is a collocation of particles which, however much they may move as a whole, never alter their mutual relative positions. Such a system has no true physical existence, since there is no known substance which can resist deformation. Nevertheless, those substances which yield but slightly to deforming stresses—all solids practically—are regarded as possessing a certain rigidity, which is measured by the ratio of the deforming stress to the deformation produced. The greater this ratio is, the more nearly does the substance approach the condition of the ideal *rigid* body. The property of rigidity itself, as described above, falls to be discussed under the general subject of elasticity. Of ordinary substances steel possesses the highest rigidity. See ELASTICITY, ETHER, MATTER.

Rigor Mortis. See DEATH.

Rigveda, the first and principal of the four Vedas (q.v.).

Rijeka. See FIUME.

Riley, JAMES WHITCOMB (1853–1916), 'the Hoosier poet,' born at Greenfield, Indiana, wrote in Middle West dialect. His poems about children are well known.

Rilievo. See RELIEF.

Rilke, RAINER MARIA, German poet, was born at Prague, 4th December 1875, of a Carinthian family. After studying at Prague, he spent most of his time in travel. For some years he was secretary to Rodin, on whom he wrote an excellent monograph (1903–8). His poetry—*Leben und Lieder, Traumgekrönt, Buch der Bilder, Stundenbuch, Neue Gedichte, Sonnette an Orpheus*, &c.—much influenced by Maeterlinck and the French Symbolists, is of a wistful, dream-like character, resting on a pantheistic mysticism. He also wrote plays and prose tales. He died 29th December 1926. See monographs by Scholz (1914) and Faesi (1920).

Rillo. See RHODOPE.

Rimbaud, JEAN NICOLAS ARTHUR (1854–91), a precocious French poet, precursor of the Symbolists, was born at Charleville, ran away from home repeatedly, lived as a tramp, fought in the Commune, associated with poets in Paris, travelled with Verlaine, who tried to murder him, wandered over Europe, deserted from the Dutch army in Java, and had many other adventures, and finally became an Abyssinian gold and ivory trader, chief, and explorer, and died at Marseilles, whither he had gone to have a leg amputated. See Lives by Delahaye (1906) and Berrichon (1912); studies by Claudel, Rivière, Delahaye, and Coulon.

Rimini, a city of Italy, stands on the shore of the Adriatic, 69 miles by rail SE. of Bologna; it is still surrounded with walls, and contains many mediæval buildings. The cathedral, the temple altered and built to commemorate the unhallowed love of Sigismondo Malatesta and Isotta degli Atti, a beautiful Renaissance structure, dates from 1446–50; the church of San Giuliano is adorned with pictures by Veronese, and San Girolamo with a picture of that saint by Guercino. The ancient castle of the Malatesta is now used as a prison. The little river on which the city stands is spanned by a white stone Roman bridge, built by Tiberius, 236 feet long, with five arches. Beside one of the gates stands the triumphal arch, 46 feet high, erected in honour of Augustus. The spot (so tradition has it) where Cæsar stood to address his soldiers after crossing the Rubicon (q.v.) is marked in one of the squares by a monumental pillar. The city manufactures silks and sailcloth. Pop. (1921) 19,996; with suburbs, 57,672. One of these suburbs, half a mile distant on the seashore, is much visited for sea-bathing. Originally an Umbrian, and then for several centuries an Etruscan, city, Rimini (Ariminum) fell into the hands of the Romans in 286 B.C. They made it the northern terminus of the Flaminian Way from Rome, and the southern terminus of the Æmilian Way to Piacenza and of the Popilian Way to Venice, and utilised the advantages of its position as a seaport for communicating with the east side of the Adriatic. After being battled for by Goths and Byzantines, and held by the latter, the Lombards, and the Franks, it became a shuttlecock between the emperor and the pope. At last, weary of this alternation of masters, neither of whom profited her, Rimini put herself under the protection of the House of Malatesta (1237), whose chiefs soon made themselves absolute masters of her fortunes. Amongst the tragic episodes that marked the family history of these rulers may be mentioned the killing of Francesca (q.v.) da Rimini and her lover by his brother, and the story of Parisina, the subject of Byron's poem. The most famous, or rather infamous, member of

the family was Sigismondo (1417–68), a brave and skilful soldier, a scholar, a patron of the fine arts, but a man of brutal animal passions, and with no sense of right and wrong. The head of the house sold his rights over Rimini to the Venetians in 1503; but the pope wrested them to himself in 1528, and kept them until 1860. See Yriarte's *Un Condottiere au XV. Siècle: Rimini* (1882); Ricci, *Il Tempio Malatestiano* (Rome, 1925).

Rimsky-Korsakov, NICOLAS ANDREIEVITCH, Russian musical composer, was born of well-to-do parents at Tikhvin, Novgorod, in 1844. He was destined for a naval career, and in 1865 produced his first symphony—also, the first symphony ever written by a Russian composer—when still a midshipman. It was only in 1873 that he definitely resigned from the navy, after being appointed Professor of Orchestration in the St Petersburg Conservatoire. He died at St Petersburg in 1908. His compositions comprise three symphonies, the symphonic suite, *Scheherazade* (1888), many beautiful songs and several operas, including *Night in May* (1878), *Snow Maiden* (1880), *Madra* (1892), *Sadko* (1896), *Tsar Saltan* (1900), *Invisible City of Kitesh* (1904), and *Cog d'Or* (1907). Rimsky-Korsakov is essentially a nationalist composer, his art being closely connected with Russian history, folk-song and folk-lore generally. His works are characterised by brilliant orchestration, especially in descriptive scenes, and by great lyrical expression. He edited the operas of Mussorgsky, produced an excellent Treatise on Orchestration (Eng. trans. 1922), and wrote an autobiography, *My Musical Life* (Eng. trans. 1924).

Rinderpest, CATTLE-PLAGUE, or BOVINE PEET, is a specific, contagious and infectious, eruptive fever, and the most serious and fatal epizootic disease to which the bovine race is liable. It is indigenous to the steppes and high tablelands of Central Asia, and never appears in Europe unless introduced directly or indirectly from the East. It affects all ruminants, but is best known in cattle. It appeared several times in Britain during the 18th and 19th centuries, the last severe epizootic occurring in 1865–66. It was introduced by cattle from Reval, on the Gulf of Finland, which were landed at Hull on the 29th May 1865. They were spread over the country, at least to Leeds, Manchester, and London, and in a very short time the disease had extended as far north as Aberdeenshire, conveyed by calves from the neighbourhood of London. It spread rapidly, and the loss of cattle was enormous; never known exactly, it has been estimated at about 250,000. It was again introduced in July 1872 by cattle from Cronstadt, which were landed at Leith, Hull, and Deptford, and again in January 1877 by cattle from Hamburg which were landed at Hull and Deptford. On both occasions it spread to home cattle, but energetic measures were used and the disease was checked. Since May 1877 it has not been seen in Britain. It is very contagious, and its incubative stage is from three to eight days. No causal organism has been found; in fact, the virus passes through the finest filters. The symptoms are great depression, severe shiverings, twitching of the muscles, high fever—temperature often 105° to 108° F. There is often constipation at first, followed by profuse diarrhoea. An eruption appears in the mouth, on the udder in cows, and on the thinner parts of the skin. There is a discharge from eyes, nose, mouth, and in fact from all the natural orifices; often moaning; and the animal looks a pitiable object. The mortality is very high. In the 1865–66 outbreak it was estimated at 90–95 per cent. But in countries where the disease is indigenous it may be as low as 25 per cent. After death the principal lesions

are found in the alimentary tract. The fourth stomach, intensely inflamed, often contains circular or irregular patches of a deep claret colour with white lines between the patches. The bowels also may be acutely inflamed in streaks and patches with superficial ulcerations. Treatment is of little importance, except preventive—isolation, stamping out, and disinfection.

About 1889-90 the disease gained a footing in north-east Africa, and spread steadily south and west, killing off the ruminants in that continent, wild as well as domestic, and was still ravaging the cattle in South Africa at the time of the war. In 1897 Dr Koch, who had gone to East Africa to investigate the disease, found that by injecting a healthy animal with bile from an animal in the height of the fever an immunity was conferred, which lasted about four months. After long experimenting by various investigators, a method was elaborated by which a useful serum could be obtained from recovered or 'salted' animals. A veterinary conference held at Bloemfontein in December 1903 concluded that the best method of stamping out was a liberal use of serum, failing that, pure bile. A serum institute was established at Abbassieh by the Egyptian government at which serum was manufactured on a large scale.

Ring. Rings of gold, silver, and of other metals and materials have been worn in all times and countries, and while they have been used to decorate the ears, neck, nose, lips, arms, legs, and toes, finger-rings have always occupied the most important and significant place among such ornaments. From the earliest period of civilised relationships the finger-ring was a convenient means for carrying the signet of its wearer. In Genesis, xxxviii. 17, 18, we read that Judah left his signet as a pledge with his daughter-in-law; and in chap. xli. 42 it is narrated that Pharaoh delivered to Joseph his royal signet as a token of deputed power and authority. From the fact that these ancient rings carried engraved signets early ring-lore is intimately mixed up with the origin and development of gem and seal engraving. Herodotus mentions the wearing of finger-rings by the Babylonians; and from Asia the habit probably passed into Greece, although the Homeric poems mention ear-rings alone. In the later Greek legends the ancient heroes are described as wearing rings, and every freeman throughout Greece seems afterwards to have possessed one. The Lacedæmonians wore iron rings. Iron finger-rings were in use in Italy before the Iron Age began there—perhaps brought by Minoan traders. Every free Roman had a right to wear one; and down to the close of the republic the iron ring was worn by those who affected the simplicity of old times. Ambassadors, in the early age of the republic, wore gold rings as a part of their official dress—a custom afterwards extended to senators, chief-magistrates, and in later times to the equites, who were said to enjoy the *jus annuli aurei*, from which other persons were excluded. It became customary for the emperors to confer the *jus annuli aurei* on whom they pleased, and the privilege grew gradually more and more extensive, till Justinian embraced within it all citizens of the empire whether *ingenui* or *libertini*. Rings entered into the groundwork of many oriental superstitions, as

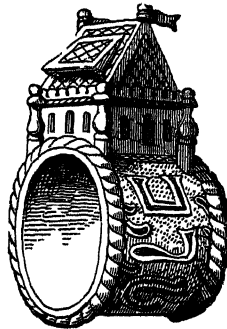


Fig. 1.

in the legend of Solomon's ring, which, among its many magical virtues, enabled the monarch to triumph over all opponents, and daily to transport himself to the celestial spheres, where he learned the secrets of the universe. The Greeks mention various rings endowed with magic power, as that of Gyges, which rendered him invisible when its stone was turned inwards; and in old Saxon romances a similar ring legend is incorporated. The ring of Polycrates (q.v.), which was flung into the sea to propitiate Nemesis, was found by its owner inside a fish; and there were persons who made a lucrative traffic of selling charmed rings, worn for the most part by the lower classes. By many Mussulmans at the present day a ring having enclosed in it a verse from the Koran is worn as an amulet. Black coral rings are widely esteemed.

Various explanations have been given of the connection of the ring with marriage. It would appear that wedding-rings were worn by the Jews prior to Christian times. Fig. 1 shows a Jewish marriage-ring beautifully wrought in gold filigree, and richly enamelled. It has been said that as the delivery of the signet-ring to any one was a sign of deputing or sharing of authority, so the delivery of a ring by husband to wife indicated her admittance to share his rights and privileges. In pagan times in Europe the ring seems to have been connected with fidelity or with espousals. Fig. 2 shows a form of ring called a *gimmel*, or linked ring, which was used in later times; the upper fig. shows the three parts brought together, the lower fig. the parts separately. Ordinarily a

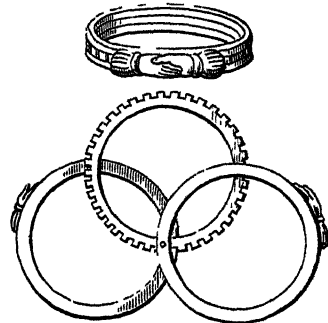


Fig. 2.

gimmel betrothal-ring was in two parts. By an ancient Norse custom, described in the *Eyrbyggja Saga*, when an oath was imposed, he by whom it was pledged passed his hand through a silver ring, sacred to that ceremony; and in Iceland the ceremony of betrothal used to be accompanied by the bridegroom passing his four fingers and thumb through a large ring, and in this manner receiving the hand of the bride, as is represented in a woodcut in an old edition of *Olafus Magnus*. As lately as 1780 the practice existed in Orkney of a man and woman plighting their faith at the Standing Stones of Stennis by joining their hands through the perforated Stone of Odin. For betrothal, as well as for marriage, a ring is commonly bestowed; and in many countries both spouses wear wedding-rings. Although the third finger of the left hand is the official finger, rings are worn on all fingers, and in mediæval times even the thumbs were frequently decorated with large and massive rings. During the 16th, 17th, and 18th centuries it was a very common practice to have mottoes inscribed on rings (fig. 3), including wedding rings, and the motto was called the *posy* or *chanson*. The ring was the symbol of the dominion of Venice over the Adriatic; and yearly,

on Ascension Day, a ring was thrown by the Doge from the ship *Bucentaur* into the sea, to denote that as the wife was subject to her husband, so was the Adriatic Sea to the republic of Venice.



Fig. 3.

The reception of a ring forms an essential feature in the investiture of many Catholic and Anglican dignitaries. The 'fisherman's ring,' containing an engraved representation of St Peter in an ancient fishing-boat, is the official ring of investiture of the pope. It is broken and remade on the death of each pontiff, and when presented to the new head of the church he declares the name under which he desires to rule, which name is thereafter engraved on it. Cardinals on their elevation receive a sapphire ring, and bishops on their consecration are also invested with a special ring. The reception of novices into Catholic sisterhoods is accompanied with the presentation of a ring, which is worn as a badge of espousal to the church. In the investiture of sovereigns the ring also occupies an important place in the coronation ceremonial. In addition to these, special rings were formerly worn by serjeants-at-law, who also on receiving silk made presents of rings to various functionaries (see *Notes and Queries*, 1884). Moreover, the knightly orders, masonic bodies, and merchants employed distinctive rings for enabling them to claim their privileges or facilitate their business. The carrying of seals attached to the watch-chain, and the introduction of gummed envelopes, had no small influence in decreasing the official importance of rings.

See the articles CRAMP RINGS, GEM; *Finger-ring Lore*, by W. Jones (1877), an elaborate compilation of the practices, superstitions, and traditions connected with rings. See also King's *Antique Gems and Rings* (1872); *History and Poetry of Finger-rings*, by C. Edwards (New York, 1880); articles by Waterton, Fortnum, and others in *Archæological Journal*; F. Schneider, *Die Gestaltung des Ringes vom Mittelalter bis in die Neuzeit* (Mainz, 1878); and G. F. Kunz, *Rings for the Finger* (1917).

Ring. See ASSOCIATIONS, TRUSTS, AND CARTELS.

Ringan, St. See NINIAN.

Ringbones. This term is applied to osseous or bony growths which are found upon the pastern bones of the horse. They are of two kinds, true and false. The false ringbone is an exostosis situated about the middle of the long pastern bone, and as a rule gives no inconvenience, and unless very large is not looked upon as an unsoundness. The true ringbones, which are of two kinds—viz. high and low—are always to be considered as constituting an unsoundness of the gravest character, involving the articular ends of the bones, and giving rise to obstinate and often incurable lamenesses. The high ringbone involves the pastern joint, and the low ringbone the coffin joint, and is partly within the hoof; in many cases both high and low ringbones are coexistent. Ringbones vary in size, but the degree of lameness does not depend upon the mere size of the new formation. Very often the 'ring' may be a mere segment appearing only upon the side of the pastern; in other cases it may completely envelop the whole circumference. Ringbones are hereditary, and it is unwise to breed from an animal having a ringbone.

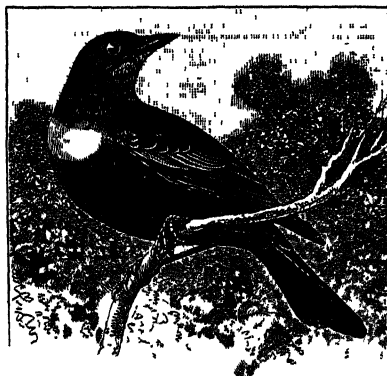
The treatment should be complete rest, fomentations and poultices at first, and afterwards blistering, firing; and in cases that do not give way to these remedies neurectomy should be performed. A horse that is unable to work on the causeway or road may be able to work comfortably on the land.

Ring-dotterel, or RINGED PLOVER. See PLOVER.

Ring-dove. See PIGEON.

Ring Money. In early commerce, before the invention of coinage, but after the inconveniences of direct barter became evident, the precious metals in the form of rings and other personal ornaments were used as a medium of exchange. The employment of gold and silver as currency in this form among the early Egyptians is proved by contemporary wall-paintings showing the weighing of gold and silver rings, one such picture occurring in the decorations of a rock-grotto associated with the cartouche of Amenophis II. The allusion also in Genesis, xliii. 21, to the sons of Jacob finding their money 'in full weight' in the mouth of their sacks, may be taken as indicative of such a currency at a time when coinage of definite weight and value did not exist. A similar currency appears to have been in use among certain western communities at a much later period. A Norse law made about 1220 alludes to an established ring money, of which, however, each ring was of definite weight. It has been suggested that many ancient Celtic ornaments of gold and silver had a definite weight and value to fit them for exchange purposes; but, while it is certain that these objects served both for personal adornment and for purposes of traffic, it has not been proved that they were made to any standard of weight or value. Caesar mentions that in Gaul and Britain gold and silver rings were used as money. Among the modifications of ring money in use in different countries may be mentioned the silver fish-hook money of Ceylon, mentioned by Tavernier, of the form of a flat wire bent into a hook, and issued as late as 1659. At the present day ring money for African traders is regularly manufactured at Birmingham of copper, or an alloy of copper, and is known under the name of 'Manillas.'

Ring Ouzel (*Turdus torquatus*, or *Merula torquata*), a species of thrush, rather larger than a blackbird. It is a native chiefly of the western parts of Europe; it spends the winter in the south of Europe, Northern Africa, Syria, and Persia, and visits more northern regions in summer. It occurs frequently in many parts of the British Islands, where it breeds even in the Orkneys, but in very few districts does it remain all the year round. It is seldom seen in the more cultivated and thickly-peopled districts, preferring mountain-slopes, heaths, and their vicinity. It begins to breed in the later part of April, and makes its nest generally in heathy banks, often under a bush.



Ring Ouzel (*Turdus torquatus*).

The nest is made of coarse grass, within which is a thin shell of clay, and an inner lining of fine dry grass. The eggs are usually four in number, and are greenish blue in colour, flecked and spotted

with reddish brown; and not infrequently there is a second brood in July. The food consists of worms, slugs, insects, and moorland berries, and the bird often makes raids upon fruit-gardens in its neighbourhood; while in vine countries it feeds largely upon grapes. In some parts of Scotland it is known as the *Moor Blackbird*. It is of a dark-brown, almost black, colour; the feathers are edged with blackish gray, the wing feathers more conspicuously with gray, and there is a broad crescentic white gorget—whence the name. The legs and feet are brownish black. The female is lighter and browner, with a narrower and duller gorget. The song consists of a few loud, clear, and plaintive notes, but is somewhat monotonous. See also OUZEL, and for the Water Ouzel, DIPPER.

Ringworm (*Tinea tonsurans*) is a disease dependent on the presence of various parasitic fungi, the two chief being the small-spored *Microsporon Audouini* and the large-spored *Trichophyton megalosporon*. The disease is more intractable when due to the small-spored variety. The fungus consists of a mycelium, or network of thread-like filaments, with oval, transparent spores. When found on the surface of the body the fungus grows in the epidermis; but on the scalp, where it is most common, it is chiefly seated in the interior of the hair-roots. The diseased hairs lose their elasticity and break when they have risen a line or two above the scalp.

Ringworm of the Body (*Tinea circinata*; *Tinea marginata*) first appears as a rose-coloured and slightly-elevated spot about the size of a threepenny-piece, on which a bran-like desquamation of epidermis soon begins, accompanied by slight itching. This spot gradually increases in size, but retains its circular form; and as it extends, the healing process commences at the centre, so that the circular red patch is converted into a ring, enclosing a portion of healthy skin; and a ring thus formed may continue to increase till it reaches a diameter of four inches, or even more. It is apt to affect the face, the neck, the back, and the outside of the wrist. This form of ringworm frequently terminates spontaneously.

Ringworm of the Scalp (*Tinea tonsurans*) usually occurs in children, and is especially prevalent when the nutrition is defective, or the child is of weakly constitution. In infants, and after the age of puberty, it is rare, and can usually be readily cured. It appears in the form of round, scaly, irritable patches on different parts of the head; and the irritation often occasions the formation of minute vesicles. The hairs at these spots become dry and twisted, and are easily removed, but when the disease advances they break close to the scalp if an attempt is made to extract them. The stumps, and the epidermis surrounding them, become covered with a characteristic grayish-white powder, consisting of the spores of the fungus. The diseased parts are slightly elevated and puffy, and differ from the healthy scalp in colour, being bluish or slate-coloured in dark persons, and grayish red or yellow in fair patients. The inflammation will last as long as the growth of the fungi continues; and even when they die spontaneously, as sometimes occurs, the affected spots may become bald in consequence of the hair-bulbs having become atrophied. This condition, however, generally passes off in time. In some children only single hairs here and there may become or remain affected, and such cases are particularly apt to lead to the spread of the disease, because they are difficult to detect, and often escape recognition.

Ringworm is also sometimes met with in the beard, giving rise to one form of the troublesome

disease known as Sycosis. Ringworm is extremely contagious; and when a case of it occurs in a family or a school strict precautions are necessary to prevent its spreading to others. The greatest care should be taken that no brushes, sponges, towels, caps, &c., touched by the patient are used by others. When one child in a family gets ringworm, the others should have the hair cut short at once and the head washed daily with some antiseptic lotion in order to prevent infection. No child with ringworm should be allowed to go to school, unless under very special precautions, nor to the hatter or hairdresser; and intercourse with other children should be permitted as little as possible.

Treatment.—Ringworm of the body is usually not difficult to cure. The application of some parasiticide, white precipitate ointment, solution of sulphurous acid, tincture of iodine, usually kills the parasite in a week, and ends the disease. Ringworm of the scalp, on the other hand, is often an extremely intractable affection, because the parasite extends deep into the hair-follicles, and it is very difficult to bring the remedies employed satisfactorily in contact with it in this situation. An ointment containing white precipitate, sulphur, salicylic acid, oleate of mercury, or similar drugs may be rubbed well into the affected patches night and morning. Blistering is sometimes employed as a stimulant to the skin; and removal of the hair by careful exposure to the X-rays is the favourite treatment at the present time. The fungus is easily killed after the hair drops out, and the hair should grow again after recovery.

Ringworm in the lower animals, as in the human subject, consists of the growth of a vegetable fungus on the surface of the skin, is common amongst young animals, is decidedly contagious, and communicable from man to the lower animals, and probably, also, from the lower animals to man. Commencing with a small itchy spot, usually about the head or neck, or root of the tail, it soon spreads, producing numbers of scurfy circular bald patches. It is unaccompanied by fever, and seldom interferes seriously with health. After washing with soap and water, run over the spots lightly every day with a pencil of nitrate of silver, or rub in a little of the red ointment of mercury, or some iodide of sulphur liniment.

Riobamba, capital of Chimborazo province, Ecuador, 102 miles S. of Quito; pop. 20,000.

Rio Bravo. See RIO GRANDE.

Río Cuarto, the second city in the Argentine province of Córdoba, formerly called Concepción, occupies an important strategic situation on the river of the same name, 500 miles NW. of Buenos Aires, and 170 by rail S. of Córdoba. Pop. 20,000.

Rio de Janeiro, a maritime state of Brazil, lying between Espírito Santo, Minas Geraes, and São Paulo. Area, 16,000 sq. m.; population, 1,560,000. The coast is low and swampy, the interior mountainous and healthy; the chief ranges are the Serras dos Orgãos (5750 feet) and da Mantiqueira in the extreme west (8900). The principal river is the Parahyba. There are still considerable forests, though they have been greatly thinned. Coffee is the chief agricultural product, and after that sugar and cotton. The capital is Nictheroy (pop. 86,000), which from 1894 to 1903 was superseded by Petropolis. The German colonies in the state have a considerable population. The city of Rio is not in the state.

Rio de Janeiro, actual capital of Brazil, on the west side of one of the most magnificent natural harbours in the world. An inlet of the Atlantic, the bay of Rio de Janeiro runs northwards for some 15 miles, varying in width from 2 miles to 7; it is girdled on all sides by picturesque

mountains, covered with tropical vegetation. The entrance, which is less than a mile wide, passes between two bold headlands, on one of which is a steep conical mass called the Sugar-loaf (1270 feet). The city and its suburbs stretch nearly 10 miles along the shore, climbing up the numerous irregular eminences and dipping into the little green valleys between them, whilst great mountain-ranges (1500 to 3000 feet) shut in the background. About 3 miles SW. of the city stands the precipitous cone of Corcovado (2336 feet), up which a cog-railway carries many thousands of visitors every year to enjoy the magnificent view. The streets are mostly narrow and often mean, and the houses and public buildings, though generally quaint and gay with colour, seldom boast of any very striking architectural features. But the building of new suburbs and of the Avenida Rio Branco with its fine buildings in 1904-6 has transformed Rio. It possesses very useful public institutions, as the vast hospital of La Misericórdia, the national library (1807), the national museum (with unique collections), the large lunatic asylum (1841) at the suburb of Botafogo, the botanical gardens with a celebrated avenue of palms (beyond Botafogo), the observatory, the Geographical and Historical Institute (1838), the former royal palace at São Christovão, the arsenal, the naval dockyards, the academy of fine arts, a cadet-school, a school of medicine, a conservatory of music, a polytechnic school, and the noble municipal theatre (1906). In spite of a good water-supply, chiefly by an aqueduct (1750) 12 miles long, and modern sewage-draining, the city remained unhealthy until yellow fever, which prevailed in the hot season, was stamped out in the first decade of the 20th century when war was waged against the mosquito *Stegomyia*. The natives are styled Cariocas. Pop. (1872) 274,972; (1920) 1,157,873, including many foreigners—Portuguese, British, French, and Germans.

Rio is also the commercial capital. The exports, of which the most important is coffee, go to the United States, Germany, Great Britain, and France. The imports, chiefly cotton, gold and silver, metals, wool, provisions, and machinery, are from Great Britain, Uruguay, the Argentine Republic, France, and Germany. The whole sea-frontage of the city is lined with quays, and in 1889, and again in 1903, extensive new works were begun, embracing a magnificent marine drive, many miles of docks and deep-water quays, with railways, &c. Further great extensions have been sanctioned since. The city possesses cotton, jute, and silk mills, tobacco and hat factories, machine-shops, tanneries, &c.

On 1st January 1531 a Portuguese captain, Alphonso de Souza, entered the bay, and thinking it was the mouth of a large river, he called it Rio de Janeiro—i.e. January River. The French established themselves on one of its islands (Villegagnon) in 1555; but they were driven away by the Portuguese in 1567. Rio was founded in the preceding year, was plundered by Duguay-Trouin in 1711, supplanted Bahia as the capital of the viceroy in 1763, and in 1822 was made the capital of the empire of Brazil. The revolution of 15th November 1889, which transformed the empire into a republic, centred in Rio; and its bay was the scene of most of the naval fighting in the revolution of 1893-94. The federal district in which the city stands (area, 450 sq. m.; pop. 1,158,000) is administered directly by the federal authorities.

Rio de Oro, since 1885 a Spanish possession on the north-west coast of Africa, between Cape Blanco and the Wadi Draa, is in soil and climate part of the Sahara. Area (including Adrar), 100,000 sq. m.

Rio Grande, also *Rio Grande del Norte* and *Rio Bravo del Norte*, a large river of North

America, rises in the San Juan Mountains in south-western Colorado, and flows generally south-eastward into the Gulf of Mexico, forming on its way the entire boundary between Texas and Mexico. Its length is about 1800 miles; it is for the most part a shallow stream, but small steamboats can ascend for nearly 500 miles. Its chief affluent is the Rio Pecos.—See also, for other Rio Grandes, PARANÁ and SENEGAMBIA.

Rio Grande do Norte, a maritime state of Brazil, occupies the north-east angle of the country, and is bounded on the N. and E. by the Atlantic. Area, 20,000 sq. m.; population, 537,000, one-half Indians. It derives its name from the river Rio Grande, which flows into the Atlantic at the capital, Rio Grande do Norte or Natal (q.v.); but the principal river is the Piranhas. The surface is flat along the shores, which are skirted by dangerous shoals and reefs, but is mountainous in the interior. The principal crops are sugar and cotton; large herds of horses and cattle are reared on the extensive pastures.

Rio Grande do Sul, the southernmost province of Brazil, is bounded on the N. and W. by the river Uruguay, on the S. by the republic of Uruguay, and on the E. by the Atlantic. Area, 110,000 sq. m.; pop. 2,183,000, including many thousands of Germans and Italians. The northern portion of the province consists of an elevated plateau, the edges of which are heavily timbered; the southern half is a rolling grassy plain, on which large numbers of cattle are kept. The climate is healthy, well suited for Europeans. All the cereals and fruits of central Europe can be grown advantageously, and the immense agricultural resources of the province are being developed. The fisheries are of some importance. Along the coast stretch the two lagoons, Dos Patos (174 miles long by 34 wide) and Mirim, connected by a navigable channel. There are productive oil-wells. Cattle-breeding is the most important industry. The principal towns are Porto Alegre (q.v.), the capital, Rio Grande, and Pelotas.—The town of Rio Grande stands on the south side of the strait leading into the southern end of the Lagoa dos Patos. Pop. 50,000. The sand-bar that obstructed the entrance has been removed. The harbour has been deepened, and Rio Grande has become a great port for southern Brazil, exporting fruit and vegetables, lard, hides, and beef. The new port (on reclaimed ground) is a mile and a half from the town and old port.

Rioja, LA, a western province of the Argentine Republic, with an area of 38,000 sq. m. and a pop. of about 90,000. Much of it is desert, but in the west there are very fertile Andes valleys, where wheat, maize, vines, cotton, and tropical fruits are grown. Copper, silver, and gold are mined.—LA RIOJA, the capital, founded in 1591, lies at the foot of the Sierra Velasco, among orange groves and vine-clad hills, 350 miles by rail NW. of Córdoba. Pop. 10,000.

Riom, a town of France (dept. Puy-de-Dôme), is picturesquely situated on a hill, 8 miles by rail N. of Clermont-Ferrand. It is built of dark lava, and is a perfect treasury of domestic architecture, especially of the Renaissance period. Pop. 10,000.

Rio Muni, or BATA, the mainland portion of Spanish Guinea, on the west coast of Africa, forest-clad, with a swampy coast. Area, 10,000 sq. m.; pop. 150,000; capital, Bata (8000).

Rion. See PHASIS.

Rio Negro, (1) one of the principal affluents of the Amazon River, rises as the Guainia in south-eastern Colombia, and flows east into Venezuela, then south into Amazonas in Brazil, and again east

and south-east until it empties into the Marañon, after a course estimated at 1350 miles. Its chief tributary on the right is the Uaupes; on the left it receives the Cassiquiare (q.v.), by means of which communication is established between the Orinoco and the Amazon, and also the Cababuri, Branco, and other streams. It is over a mile broad when its clear, inky-black stream enters the yellow, muddy Amazon. A few miles from its mouth is Manáos (q.v.), on the left bank; and higher up the river opens into great lagoons, nearly choked with numerous islands. See A. R. Wallace's *Travels on the Amazon and Rio Negro*.—(2) A river of Argentina, which rises in the Andean lake or Nahuel-Huapi, flows north-east as the Cunuonilla and afterwards the Limay, and receives the name of Rio Negro at its junction with the Neuquén, after which it flows east and south-east into the Atlantic Ocean. It is over 500 miles long, and for small steamers it is navigable all the way. Near its mouth there are great saline lakes, from which immense quantities of salt are collected. It bounds on the north and gives its name to a national territory, formerly part of Patagonia, and now containing an area of 80,000 sq. m. of for the greater part level but barren soil. The chief town is Viedma (pop. 5000), 20 miles from the mouth of the Rio Negro.

Rionegro, a town in the centre of Colombia, some 15 miles S.E. of Medellín. It was founded in 1545, and the National Convention met here in 1863. Pop. 9000.

Rionero, a town of Southern Italy, 12 miles N. of Potenza; it suffered greatly from earthquake in 1851. Pop. 11,000.

Riot consists in the joint unlawful action, by breach of the peace or by causing terror to the public, of three or more persons assembled together whether they originally assembled for these purposes or no. When a riot becomes formidable any justice of the peace may command the persons assembled, if not less than twelve in number, to disperse peaceably by a form of words called reading the Riot Act (1 Geo. I. chap. 5), thus: 'Our Sovereign Lord the King (or Lady the Queen) chargeth and commandeth all persons being assembled immediately to disperse themselves, and peaceably to depart to their habitations, or to their lawful business, upon the pains contained in an Act of King George for preventing tumults and riotous assemblies.—God save the King (or Queen).' (The omission of these last four words makes the reading nugatory.) To justify the use of military force in the prevention of serious outrages and damage to persons and property, it is not necessary to wait for the proclamation being read, still less to wait for an hour after it has been read. Though death or wounds result to those composing the mob, such hurt is not a criminal offence. The rioters are guilty of felony, and are liable to penal servitude for life. Prosecutions under the Riot Act must be commenced within twelve months of the time of committing the alleged offence. Sometimes the Riot Act is read more than once during the disturbance, in which case the second or third reading does not supersede the first. The Riot Damages Act, 1886, provides compensation from the rates to those whose property is damaged during a riot. Less serious than riot are *unlawful assembly*, a meeting of three or more for an unlawful object, but where no part of the object is actually carried out; and *route*, where the assembly proceeds to execute the act, but does not actually accomplish it; and *affray*, that is, a fight between two or more in some public place (e.g. a prize-fight), but it must not be premeditated. In private the disturbance would be an *assault*.

Río Tinto, a river in southern Spain, in the province of Huelva, near whose sources are rich copper-mines; copper and sulphur minerals are exported from the port of Huelva (q.v.), 45 miles distant by rail, near the mouth of the river. These mines were worked by the Romans—their *Tharsis*. During the years of Moorish supremacy they were unused, but they have been worked again since the middle of the 16th century.

Riparian Rights. See RIVER.

Ripley, (1) a town of Derbyshire, 10 miles NNE. of Derby, with silk-lace, candle-wick, and horsehair-cloth manufactures and large neighbouring collieries and ironworks. Pop. (1851) 3071; (1891) 6815; (1921) 13,560.—(2) A village in the West Riding of Yorkshire, on the Nidd, $3\frac{1}{2}$ miles NNW. of Harrogate. Rebuilt in 1829–30, it has an hôtel-de-ville (1854), an interesting church, and Ripley Castle (1555), where Cromwell is said to have slept the night before Marston Moor.

Ripley, GEORGE, was born at Greenfield, Massachusetts, 3d October 1802, graduated at Harvard in 1823, afterwards studied theology there for three years, and was ordained to a pastorate in Boston. This he held till 1841. In the meantime he had joined actively in the Transcendental movement—the first meeting of the club was at his house in 1836; and on leaving the pulpit he at once started the Brook Farm (q.v.) experiment. This came to an end in 1847, and Ripley removed to New York, when he afterwards engaged in literary and journalistic work. He was joint-editor with Charles A. Dana of Appleton's *New American Cyclopædia*. He died 4th July 1880. See Life by O. B. Frothingham in the 'American Men of Letters' series (1882).

Ripon, a city in the West Riding of Yorkshire, on the Ure, 23 miles NW. of York, 28 N. of Leeds, and 11 N. of Harrogate. A monastery, founded here in 660 by St Cuthbert and other monks of Melrose, was granted about 664 to St Wilfrid, who rebuilt the church with stone, and dedicated it to St Peter. Willibrord, the apostle of the Frisians, was trained in this monastery, which in 678 was made the seat of a short-lived bishopric, re-erected in 1836 after a lapse of more than eleven centuries. The beautiful minster, which from the Conquest to the Dissolution was the church of Augustinian canons, was built between 1154 and 1520, so exhibits every variety of style from Transition-Norman to Perpendicular. A cruciform pile, 266 feet long, with three towers 120 feet high, which lost their spires in 1600, and with a Saxon crypt, where a hole called 'St Wilfrid's Needle' was anciently used as an ordeal of chastity, it suffered much through the Scots (1319), decay, and vandalism, and in 1861–76 was restored by Sir G. G. Scott. An obelisk, 90 feet high, in the marketplace was erected in 1781 by W. Aislabie, for sixty years one of the two members for Ripon, whose representation was reduced to one in 1867, and merged in the county in 1885. A free grammar-school was founded in 1546. Studley Royal is 2 miles south-west; and near it is Fountains Abbey (q.v.). Ripon spurs, once famous, belong to the past, but saddle-trees are still manufactured, besides varnish, machinery, &c. The municipal borough was chartered by James I. Ripon is a spa. Pop. 8400.

Ripon, FREDERICK JOHN ROBINSON, EARL OF, was born 1st November 1782, the second son of the second Lord Grantham. After graduating at Cambridge he entered parliament in 1806 as a moderate Tory, and had successively been Under-secretary for the Colonies, Vice-president of the Board of Trade, and Chancellor of the Exchequer, when, having that same year been created Viscount

Goderich, in August 1827 he became head of a seven months' administration. He held office afterwards as Secretary for the Colonies, Lord Privy Seal, and President of the Board of Trade; in 1833 was created Earl of Ripon; and died 28th January 1859.

GEORGE FREDERICK SAMUEL ROBINSON, MARQUIS OF RIPON, was born in London 24th October 1827, and succeeded his father as Earl of Ripon and Viscount Goderich, his uncle as Earl de Grey, Baron Grantham, and a baronet. Since 1852 he had sat in parliament as a Liberal for Hull, Huddersfield, and the West Riding, and he became successively Under-secretary for War (1859), Under-secretary for India (1861), Secretary for War (1863), Secretary of State for India (1866), Lord President of the Council (1868), Marquis of Ripon (1871), Viceroy of India (1880-84, where he was popular with the natives, unpopular with Anglo-Indians), First Lord of the Admiralty in 1886, Colonial Secretary in 1892 and 1894, and Lord Privy Seal in 1906. From 1874 a Roman Catholic, he died 9th July 1909.

Ripon Falls. See NILE.

Rip Van Winkle, the hero of Washington Irving's delightful sketch (1820), a scapegrace who seeks refuge from a scolding wife in the forests of the Catskill Mountains. There he falls in with Hendrick Hudson and his crew of the *Half Moon*, who are playing at ninepins in a secluded hollow, the balls as they roll echoing along the mountains like rumbling peals of thunder. Rip is directed to wait on them, and while doing so tastes and returns to the liquor he hands, till his senses forsake him. He awakens on a bright summer morning, his dog gone, a rusty firelock by his side, his beard a foot long, and in the village he finds new buildings, new names over the doors, new faces at the windows. His sleep has lasted twenty years, and meantime the American Revolution has passed and left all things changed. Rip, however, is recognised by some of his old cronies, and finds a home at his daughter's house. The story has been often dramatised in America, but no version has held the stage except Boucicault's (1865), with which the name of Joseph Jefferson is identified. The opera by Planquette (1882) also deserves mention, as keeping pretty closely to the story.

Rishanger, WILLIAM, a monk of St Albans, who styles himself 'Chronigraphus' in an extant memorandum written by himself in 1312. He tells us, moreover, that he had been forty-one years a monk, and was then sixty-two years old, so that he must have been born in the year 1250. It has been usual to consider his *Chronica*, which covers the period from 1259 to 1307, as a continuation of Matthew Paris, and it has been to a large extent borrowed from the *Annales* of the Dominican friar, Nicholas Trivet. As a chronicler Rishanger is full and truthful, but his work is fragmentary towards the close, and besides some confusion has crept into the order of the narrative. The story is told with considerable spirit, and reveals high admiration for Simon de Montfort. The *Wilhelmi Rishanger Chronica et Annales*, forming vol. iii. of the *Chronica Monasterii S. Albani*, was edited for the Rolls Series by H. T. Riley (1865).

Rishi is the title given to the inspired poets of the Vedic hymns. See *VEDAS*.

Ristori, ADELAIDE, a great actress, born 26th January 1821, at Cividale in Friuli, died 8th October 1906. Her parents were strolling players, and she almost began life in the theatre. At the age of fourteen she played in *Francesca da Rimini*, and in a few years became the leading Italian actress. In 1847 her marriage with the Marquis Del Grillo (died 1861) temporarily interrupted her dramatic

career; but she soon returned to the stage. After having acted in Italy for some years with immense applause, she presented herself before a French audience in 1855, when Rachel was at the height of her fame. But Ristori won a complete triumph; and thereafter gained fresh laurels in nearly every country of Europe, in the United States (in 1866, 1875, and 1884-85), and in South America, where her magnificent tragic acting roused the greatest enthusiasm. The rôles in which she especially shone were Mary Stuart (Schiller's), Elizabeth (Giacometti's), Medea and Marie Antoinette (Legouvé's), Lady Macbeth, and Adrienne Lecouvreur (Scribe's). See her *Studies and Memories* (Eng. trans. from French, 1888).

Ritchie, LADY RICHMOND. See THACKERAY.

Ritornello, in Music, in its original sense, a short repetition, like that of an echo, or a repetition of the closing part of a song by one or more instruments. The same term has, by later stages, been applied to all symphonies played before the voices begin which prelude or introduce a song, as well as the symphonies between the members or periods of a song. The name is also given to the oldest form of the Italian popular poetry, and consists typically of a strophe of three iambic lines, the first and third rhyming.

Ritschl, ALBRECHT, Protestant theologian, was born 25th March 1822, at Berlin, where his father was a clergyman. His university studies were carried on at Bonn, Halle, Heidelberg, and Tübingen. In 1846 he 'habilitated' at Bonn, the subject of his thesis (in the treatment of which he substantially reflected the views of his Tübingen master, Baur) being the relation between the gospel of Marcion and the canonical gospel of Luke. His next published work, on the origin of the early Catholic Church, was of similar tendency, though seeking to modify the conclusions of his contemporary Schweigger as to the influence and extension of Ebionitism in the apostolic and post-apostolic age; but in the second and completely rewritten edition of the same work he took up towards the fundamental positions of the Tübingen school an attitude of antagonism, which he ever afterwards maintained. He now denied the alleged Ebionitism of primitive Christianity altogether, and, accepting as genuine the epistles of James and Peter as well as the Apocalypse and Acts, maintained that none of the apostles had regarded the law as religiously binding, and that they only continued its observance as a national custom among Jews, leaving Gentile converts free. Ritschl, who had become professor extra-ordinarius of Theology at Bonn in 1853, was promoted to an ordinary professorship in 1860, and in 1864 was transferred to Göttingen, where the rest of his life was spent. His lectures, especially those on Christian ethics, soon became famous for their originality and vigour. While in Bonn he had also published a tract on the relation between the church and its confession (1854), and a Latin dissertation on the wrath of God (1859). The list of his Göttingen publications includes, besides his principal work, a treatise on Christian perfection (1874), a tract on conscience (1876), a history of Pietism (1880-86; 3 vols.), a tract on theology and metaphysics (2d ed. 1887), and a volume containing three academical discourses (1887). He died at Göttingen, 20th March 1889.

His principal work, on the Christian doctrine of justification and reconciliation, was published in three volumes (1870-74; 3d ed., with noteworthy alterations, 1888), the first of which traces the history of the doctrine, the second discusses its biblical premises, and the third its theological meaning. There is an English translation of this great treatise

(vol. i. 1871; 2d edition, 1900). The work as a whole expounds with much force and effectiveness a theological system marked by great dialectic acuteness and subtlety, ingenious and searching exegesis, and bold disregard of ecclesiastical tradition. The distinguishing feature of the Ritschlian theology is perhaps the prominence it gives to the practical, ethical, social side of Christianity. As a reasoned system it starts from a definite theory of cognition, eclectically derived from Kant through Lotze, which has sometimes been called a subjective idealism, and criticised as denying all objective reality to the objects of theology. But hardly with justice. For, though doubting the possibility of demonstrating God to the merely speculative intellect, Ritschl holds that God is really, effectively, practically revealed to man on his religious side; in other words, becomes known to those who have found their need of him. God is to be thought of as love; there is no other conception of equal value. In particular the conception of his holiness is an obscure one, and his righteousness is in fact identical with his grace. All metaphysical statements as to his absoluteness or existence through, or in, or for himself are of no religious value. In connection with his doctrine of God, Ritschl attaches high importance to the conception of the church as being the community within which alone men can have reconciliation with God and freedom from the sense of guilt, and so be able to act from motives of love, and realise that human and divine fellowship of perfect love which is the kingdom of God. In this Ritschl expressly differs from Schleiermacher (in many other respects a master whom he follows closely); but, while rejecting the Protestant formula of the latter, that the relation of the individual to the church depends on his relation to Christ, he is very far removed from the position of Roman Catholicism. His doctrine of Christ attaches no value to the hypostatical distinction of persons in the God-head or to the ecclesiastical doctrine of the two natures or the three offices, but states the divinity of Christ in terms of his peculiar and unique relation to the church, which he founded by his life and work on earth. This work was atoning work; but the reconciliation with God and immunity from the sense of guilt which he secured for the church were obtained not by vicarious endurance of the punishment due to sinful men, but by his perfect fulfilment, in loving deed and word, of the work of his calling, and by his perseverance in it in spite of all opposition, and by his patient endurance of all suffering even unto death. The justification possessed by the Christian as a member of Christ's community is practically shown in his freedom or dominion over the world. This dominion is exercised, in trust in God's providence, by patience, by humility amid all the vicissitudes of life, by faithfulness of the individual to his calling as being his contribution to the kingdom of God, and by Christian prayer, which is chiefly thanksgiving or humble recognition of the divine rule. Ritschl is usually classified as an 'eclectic mediating theologian'; perhaps 'intermediate' would be a better word, for his theology is uncompromisingly opposed alike by the 'rationalist' and 'orthodox' parties. The Ritschlians became a large and important school in Germany, the most prominent among them being Kaftan, Herrmann, and Harnack.

See the Life by his son Otto (2 vols. 1892-96); Stählin, *Kant, Lotze, and Ritschl* (trans. 1889); works on Ritschlianism by Pfeiderer (1891), Mielke (1894), Pfennigsdorf (1896), Orr (1898, 1903), Garvie (1899), and Edgill (1910).

Ritschl, Friedrich Wilhelm, classical scholar, was born at Grossvargula, near Erfurt, 6th April 1806. He studied at Leipzig and at Halle, held chairs of Philology at Breslau (from 1834),

Bonn (from 1839), and Leipzig (from 1865), and died at Leipzig on 9th November 1876. As a teacher he exercised great influence over his pupils, amongst whom were Curtius, Ihne, Brugmann, &c. His greatest work is an edition of Plautus (3 vols. Bonn, 1848-54; new ed. 1881-87), provided with the richest critical apparatus. This standard work was preceded by *Parerga Plautina et Terentiana* (Leip. 1845). He achieved a second triumph in the department of Latin inscriptions, his collection, *Priscæ Latinitatis Monumenta Epigraphica* (Berlin, 1864), being the forerunner of the great *Corpus Inscriptionum Latinarum*. Ritschl's numerous critical papers and dissertations are collected in *Opuscula Philologica* (5 vols. Leip. 1867-79). Ribbeck's Life of him is the best (2 vols. 1879-81); see also another by L. Müller (1878).

Ritson, Joseph, a learned and honest, but pedantic, acrid, and ill-mannered antiquary, was born of Westmorland yeoman family at Stockton-on-Tees, in 1752. He was bred to the law and practised as a conveyancer in London, but was enabled by the profits of the office of Deputy High-bailiff of the Duchy of Lancaster to give most of his time to antiquarian studies. He made himself as notorious by his crazy vegetarianism, his whimsical spelling, and irreverence, as by the acerbity of his attacks on much bigger men than himself. Scott alone of his contemporaries kept good terms with him, but then none other had his large heart and genial humour. Undoubtedly Ritson's mind was deranged, and he died in a fit of gloom, 3d September 1803. Ritson's industry was remarkable, and all his forty books are valuable despite the blemishes in which they abound. His first important work was an abusive but well-grounded attack on Warton's *History of English Poetry* (1782). Next year he assailed Johnson and Steevens for their text of Shakespeare; in 1790 he attacked Bishop Percy with absurd ferocity in the preface to a collection of *Ancient Songs*; in 1792 appeared his characteristic *Cursory Criticisms* on Malone's Shakespeare.

Other works were *A Select Collection of English Songs* (3 vols. 1783); *Pieces of Ancient Popular Poetry* (1791); *The English Anthology* (3 vols. 1793-94); *A Collection of Scottish Songs* (2 vols. 1794); *Poems*, by Laurence Minot (1795); *Robin Hood: a Collection of all the Ancient Poems, Songs, and Ballads* (2 vols. 1795); *Bibliographica Poetica: a Catalogue of English Poets of the XII.-XVI. Centuries* (1802); and *Ancient English Metrical Romances* (3 vols. 1802). His various North Country *Garlands* and his *Essay on Abstinence from Animal Food as a Moral Duty* (1802) were less important. There are Lives by Joseph Haslewood (1824) and A. Burd (Illinois, 1917); his Letters were edited, with a Life, by Sir N. Harris Nicolas (2 vols. 1833).

Ritter, Heinrich, German philosopher, was born at Zerbst in Anhalt on 21st November 1791, studied theology and philosophy at Halle, Göttingen, and Berlin; was professor of Philosophy successively at Berlin (1824-33), Kiel, and Göttingen (1837-69); and died in Göttingen on 3d February 1869. His fame rests upon an extremely careful and impartial *Allgemeine Geschichte der Philosophie* (12 vols. 1829-51), with a continuation carrying on the work from Kant (1853); and upon *Die christliche Philosophie* (2 vols. 1858-59).

Ritter, Karl, geographer, was born 7th August 1779 at Quedlinburg in Prussia, was educated at Schnepfenthal under Guts Muths, studied in Halle, was in 1820 nominated professor of Geography at Berlin, became subsequently member of the Academy and Director of Studies of the Military School, and died 28th September 1859. With Ritter as the founder of general comparative geography begins a new epoch in the history of the science. His chief work (uncompleted)

was *Die Erdkunde im Verhältnis zur Natur und zur Geschichte des Menschen*. Besides this he wrote an *Introduction to General Comparative Geography* (1852); *Europe* (2 vols. 1807); and *The Stupas, or the Architectural Monuments on the Indo-Bactrian Royal Road, and the Colossus of Bamian* (1838). His lectures were published in three volumes (1851-63) by Daniel. See *Life* by Gage (Edin. 1867), and Kramer, *Carl Ritter, ein Lebensbild* (2d ed. Halle, 1875).

Ritual (Lat. *rituale*, 'book of rites'), one of the service-books of the Roman Catholic Church, in which are contained the prayers and order of ceremonial employed in the administration of certain of the sacraments (communion out of Mass, baptism, penance, marriage, extreme unction) and other priestly offices of the church, forms for churchings, burials, and blessing. In its present form it dates from the Council of Trent, which directed a revision of all the different rituals then in existence (also known as *manuale*, *sacerdotale*, &c.), which were numerous, and exhibited considerable variety of detail. Paul V., in 1614, published an authoritative edition, which has frequently been reprinted, and of which a further revision was issued by Benedict XIV. Besides the Roman Ritual there are many diocesan rituals, some of which are of much historical interest. In the Greek Church, as in the other eastern communions, the Ritual forms part of the general collection (which contains also the Eucharistic service) entitled *Euchologion*. In the Anglican Church the *Book of Common Prayer* may be said to contain the Ritual. The most approved commentary on the Roman Ritual is that of Barrufaldo (3d ed. 1763).

Ritualism, the name popularly but inaccurately given to the remarkable increase of ceremonial in the Church of England since about 1860-65. It may be considered as a development of Tractarianism, though it is one not contemplated by the authors of that movement, whose aim was rather to disseminate doctrines than to introduce ritual changes. Dr Pusey and his associates deprecated any innovations in the way of conducting the services, anything of ritualism, or especially any revival of disused vestments. Collateral causes of the movement may be said to be the great advance of æsthetic taste, and the increased cultivation of the fine arts in the service of religion; as also the extended study by the clergy of ancient liturgies, and the connection discovered to exist between them and the offices of the English Church. With the spread of High Church principles certain changes in the mode of conducting divine service had been introduced by the clergy, which, though unpopular at first, were widely adopted, and up to a certain point had received the sanction of the law. But the restored church with low and open benches; the separated chancel; the altar-table with coverings of different colour according to the ecclesiastical seasons, and candlesticks and a cross upon or over it; choral services, and weekly celebration of the communion, were all that had hitherto been attempted. To these comparatively small alterations important additions were subsequently made, bringing the usages of the Church of England nearer those of the Roman communion, such as special vestments at the celebration of the holy communion, and at certain other times—for the celebrant an alb, stoles of different colour, according to the seasons, and chasuble, and for the assisting ministers albs with tunicles; lighted candles on the altar at holy communion; incense burned either in a 'thurible' or in a standing vessel; the mixing of water with wine for the communion; the use of wafer-bread;

elevation of the elements either during or after consecration; and processions with crosses, banners, and vested attendants.

The Public Worship Regulation Act (1874), passed after fierce discussion in both Houses of Parliament, was expressly designed, as Disraeli admitted, for the repression of ritualistic practices, and constituting a new judgship for offences against the rubrics (see ECCLESIASTICAL COURTS). Numerous trials (see ENGLAND, CHURCH OF) took place, and several clergymen charged with ritualistic practices were imprisoned (as A. Tooth, 1877; Pelham Dale and Enraght, 1880; S. F. Green, 1882; J. C. Cox, 1887; see also MACKONOCHE). In 1889-90 proceedings were taken in the Archbishop of Canterbury's court against the Bishop of Lincoln. The decision was given in November 1890, and related to nine heads: (1) The mixing of the cup during the service is to be discontinued; (2) but the use of a cup already mixed is not an ecclesiastical offence; (3) the court dismissed the charge as to ablutio after service, holding that all the bishop had done was the reverent consumption of what remain of the consecrated elements; (4) as to the eastward position, the court decided that there is liberty as to using the north end of the altar or the north end of the west side; (5) the breaking of the bread must be performed so as to be visible to the people; (6) the singing of the anthem 'O Lamb of God' is not prohibited; (7) candles which are kept lighted throughout the service are not an offence; (8, 9) the sign of the cross must be discontinued both in absolution and in benediction. In 1899 the two archbishops pronounced against the use of incense and processional lights, and in 1900 against reservation of the consecrated elements. A royal commission was appointed in 1904 and reported in 1906, singling out certain practices as grave enough to call for immediate suppression. The movement meanwhile went on; decisions were given from time to time against ritualists; and the thoughts of many on both sides were turned to Prayer-book revision. See the articles ALTAR, CHASUBLE, LIGHTS, VESTMENTS, &c.; ENGLAND (CHURCH OF), and PRAYER (BOOK OF COMMON).

Riukiu. See RYŪKYŪ.

Rivarol, ANTOINE, French writer, was born at Bagnols in Languedoc, 26th June 1753. Though but the son of an innkeeper, when he appeared in Paris in 1780 he laid dubious claim to rank, and soon worked his way by his wit into the best society of the time. Already he had written his treatise, *Sur l'Universalité de la Langue Française* (1784), and paraphrased rather than translated the *Inferno*, when in 1788 he set all Paris laughing at the sarcasms in his *Petit Almanach de nos grands Hommes pour 1788*. At the Revolution he took his place in the royalist ranks, and saved his head by emigrating in June 1792. Supported by royalist pensions, the 'Tacitus of the Revolution,' as Burke styled him in one of the least happy of hyperboles, employed himself fitfully in writing pamphlets and weaving dreams of books to be written, in Brussels, London, Hamburg, and Berlin. He had married an English wife, but she quarrelled with him, and not without reason. He died at Berlin, 13th April 1801.

His works were collected by Chénédollé and Fayolle (5 vols. 1805), but their terse epigrammatic quality shows better by compression in the *Esprit de Rivarol* (2 vols. 1808) and the *Œuvres Choiesies*, edited by Lescure (1862; new ed. 1880). See books by Lescure (1883) and Le Breton (1895), Remy de Gourmont's *Promenades Littéraires* (iii. 1909), and Louis Latzarus, *La Vie Paresseuse de Rivarol* (1926).

Rivas, a decayed town of Nicaragua (q.v.), 6 miles from Lake Nicaragua, capital of the fertile

department of Rivas, between the lake and the Pacific Ocean; pop. 16,000.

Rivaux Abbey. See RIEVAULX.

Rive-de-Gier, a town of France (dept. Loire), stands on the Gier, in the middle of the best coal-field in France, 13 miles NE. of St Etienne by rail. It was formerly a stronghold, surrounded by high walls, and defended by a castle. In 1815 it had less than 4000 inhabitants; now about 16,000. Around the town are coal-mines, and in it are glass-works, works for railway material, and iron and steel factories.

River. Water falling on the land in the form of rain, or resulting from melting snow, or rising to the surface in springs, flows over the surface to a lower level. Where two slopes of land dip together the surface drainage collects to form a stream, and when evaporation is not very rapid several such streams ultimately unite and the volume of water they carry flows to the sea or to a salt lake. Small streams are termed runnels, rivulets, rills, brooks, becks, or burns; large streams are termed rivers, but the word has no precise reference to the magnitude of the stream to which it is applied. Dr Johnson gives as definitions: 'Brook, a running water less than a river;' and 'River, a land current of water bigger than a brook,' and this fairly illustrates the use of the words as popularly applied.

The beginning of a stream—whether brook or river—is called its source, and may be a spring issuing from underground, a lake or marsh in which rainfall accumulates, melting snow, or simply the gathering tricklings from falling rain. The path of a stream is its course, and is the line of lowest level from the source to the end, which if occurring in a lake or the sea is termed its mouth. The connected streams which unite in one river form a river-system. The series of convergent slopes down which a river-system flows—the land which it drains—forms its basin or catchment area, and the name watershed is also sometimes erroneously applied to it. The names watershed, water-parting, and divide are used to designate the boundary line separating adjacent basins. A watershed is always the meeting-place of the highest part of divergent slopes, and from the characteristic form of continents the main watershed of a continent is almost always the crest of a range of mountains. In many cases, however, the diverging slopes meet in a low plain the summit of which may be occupied by a great marsh whence rivers creep away in opposite directions. The basins of all the rivers draining into the same ocean are called collectively the drainage area of that ocean. The main river to which the others are said to be tributary gives its name to the whole river-system. It is often difficult to decide which of several converging streams is entitled to carry the name of the main river to its source. Some geographers give this distinction to the longest, others to that with the highest source, and others to that with the most direct course. This diversity of opinion is increased when the name of a river leaving a large lake is given to one of several nearly equal streams which enter it. Hence it is that different computers disagree as to the length of rivers. The course of a typical river has been divided into three parts, although these are not represented in all cases. The *torrential* or mountain track is the steepest, its gradient usually exceeding 50 feet in a mile, and the velocity of its current being very great. The *valley* or middle track has a gradient which is rarely greater than 10 feet and often less than 2 feet in a mile. The *plain* track nearest the mouth of a river has a gradient of only a few inches in a mile. Rivers such as the Amazon, Mississippi, Ganges, Volga, and the long rivers of

Siberia, in which the plain track is of very great length, are the most valuable for navigation, the limit of easy navigability being a gradient of about 1 foot in a mile.

The velocity of a river is proportional to the slope of the bed, but it also bears a relation to the depth of the channel and the volume of water flowing in it. On account of friction on the bottom and sides of the channel retarding the stream, the water flows fastest on the surface and in the middle. The carrying power of a river for suspended solid particles and for stones and gravel pushed along the bed depends on the velocity alone. The following table shows how rapidly the carrying power falls off as the velocity diminishes.

0.170 mile per hour	will just begin to work on fine clay.
0.340 " " "	lift fine sand.
0.454 " " "	lift sand as coarse as linseed.
0.682 " " "	sweep along fine gravel.
1.364 " " "	roll along rounded pebbles 1 inch in diameter.
2.045 " " "	sweep along slippery angular stones as large as an egg.

Rivers in flood, even in the plain track, sometimes attain a velocity of over 5 miles an hour, and torrents may even flow as fast as 20 miles an hour. The course of a river is gradually carved out and shaped by the flow of the water. The sediment and stones carried along are powerful erosive agents in the torrential and valley tracts, and the character of the valleys or gorges produced depends largely on the geological structure of the region. The course of a river is frequently determined by lines of faults, but perhaps more often it appears to be independent of the nature of the strata. Some great rivers, notably the Volga, press against the right bank, cutting it into a steep cliff, while the left bank is left as a very gentle slope. This is explained by the directive influence of the earth's rotation (see EARTH).

Rivers are of very great importance as agents of change in dynamic geology; the form of valley they excavate being determined partly by the nature of the rocks, partly by the climate. In rainless or arid regions steep-walled Canyons (q.v.) are cut to a great depth across high plateaus; in rainy regions subaerial denudation leads to the formation of wide valleys of much gentler slopes. Bars of more durable rock crossing the course of a stream lead to the formation of Waterfalls (q.v.) or rapids from the rapid erosion of the softer strata below. The river above the obstruction is reduced to what is termed the base-level of erosion; the velocity of the current is checked, and wide alluvial deposits are laid down on either side. In course of time the bar of hard rock is completely cut through by a gorge, and the gradient of the stream is ultimately rendered uniform. In this way the common features of gorge and meadow are produced again and again along the course of a stream. The deposits of alluvium form terraces along the valley track of a river, and as the stream cuts its channel deeper they are left at various heights as monuments of its erosive power. When a river is fairly established in its valley it is, geologically speaking, a more permanent feature than lakes or mountains. Upheaval, which acts very slowly, may even elevate a range of mountains across its course, yet all the while the river, cutting its way downward, remains at the same absolute level. The Uintal Mountains, as they were upheaved, were divided in this way by the Green River, the chief tributary of the Colorado. In limestone regions the solvent power of river-water on carbonate of lime leads to the formation of Caves (q.v.) and underground rivers, which as a rule emerge from their subterranean channels on lower ground. Sometimes they do not reappear on land, but discharge their fresh water through openings in the

bed of the sea. Such submarine river entrances are not uncommon along the shores of the Adriatic, off the coast of Florida, and in other calcareous regions. When a river advances along a nearly level plain toward the sea its carrying power falls off; gravel, sand, and finally mud are deposited on its margin, and the stream pursues a peculiar winding course. During a flood the swift and muddy stream rises, overflows its banks, and widens out on the level land. The current is at once checked and a long bar of deposit forms along each margin. These are increased in height by each successive flood, and, the river-bed being simultaneously silted up, broad muddy rivers like the Mississippi, Po, and Hoang-ho come in time to flow along the top of a gently sloping natural embankment, the sides of which are termed levees in Louisiana. Professor Lapparent, taking Sir John Murray's data regarding the amount of sediment carried down by rivers, finds that they would suffice to wear the entire surface of the land down to sea-level in four million years. The entrances of rivers into lakes or the sea are usually marked by great banks of deposit (see DELTA), or by bars of gravel or sand. In some cases, however, such as the River Plate, the Thames, and Tay, the mixture of river and sea water is gradual, and the sandbanks are spread over a very large area, but not built up into a delta at any one place. Professor Osborne Reynolds has shown, by a remarkable series of experiments, that the form of the sandbanks is due to the outline of the coasts of the estuary and to the tides. In a few instances, such as the Forth, rivers enter deep arms of the sea in which neither banks nor bars are formed. The Congo sweeps directly into the ocean, throwing down great banks of deposit along the continental slope to right and left, but leaving a deep cañon-like gully for the bed of the stream itself; a similar condition occurs where the Rhone enters the Lake of Geneva.

The ultimate source of all rivers is the condensation of water-vapour from the atmosphere in the form of rain, snow, and even dew. If the land were composed of impermeable rocks all the rain-water not lost by evaporation would run off directly over the surface, and rivers would only flow during and immediately after showers. A large part of the rainfall, however, soaks into the soil, which retains it as in a sponge, especially if the land be marshy, and allows it to flow off gradually as superficial springs. Some also percolates deeply into the rocks, ultimately emerging as deep-seated springs at a great distance. The indirect and permanent supply of water to rivers by springs and by the outflow of lakes is independent of local rainfall at the time, and serves to maintain the volume of the river at a certain minimum during the dry seasons. When a river flows toward a region of great evaporation and small rainfall, such as exists in the interior of each of the great continents, evaporation removes more water than is supplied by the remote tributaries, and the stream may fail to fill the hollow it enters, and therefore cannot overflow into the sea. This is the case with the Oxus entering the Aral Sea, and the Volga entering the Caspian. It may be that evaporation is so far in excess of contributions from distant rainfall or snow-melting that the river dries up as it flows, and its last remnant is absorbed in the desert sand. This is the fate of the Murghab, the Heri-rud, the Zerafshan, and many other rivers of central Asia.

Contrasted with these cases are those in which the periodical or occasional increments of direct inflow increase the volume so much as to cause a great rise of level or even extensive inundations. The annual inundations of the Nile are due to

the monsoon rainfall on the great mountains of Abyssinia, which increases the discharge at Assouan to fifteen times the amount of the river at its lowest. The Orinoco is another instance of seasonal rains producing tremendous inundations, over 40,000 square miles of the Llanos being said to be laid under water by the summer rains. The Amazon is an instance of a river which is always more or less in flood as the various tributaries attain their greatest height at different seasons. In June, when the highest level occurs in the main river, 20 or 30 miles of forest on each side of its banks are laid under water for hundreds of miles. The Ganges overflows its banks in summer when the monsoon rainfall is reinforced by the melting of snow on the Himalayas. Where the seasons of maximum rainfall and of snow-melting are different, as in the Mississippi, the Tigris, and Euphrates, there are two regular floods in the year.

The danger of flooded rivers arises from the suddenness with which the water rises and overflows narrow valleys or even plains. Frightful devastation follows the bursting of glacier obstruction lakes in mountain-valleys (see LAKE). The great rivers of Siberia remain frozen at their mouths long after the ice and snow have been melted in the interior, and broad strips on their margins are necessarily laid under water by the natural outflow being stopped. The most serious floods in the Danube and Theiss have resulted from the constriction of the channel at the Iron Gates, which prevents the flood water from passing away as rapidly as it comes down; the current of the Theiss is sometimes reversed for many miles. The widening of the channel has been repeatedly attempted as a remedy by increasing the outlet; and an elaborate system for regulating the river here, to be completed in 1895, was begun in 1890. In other cases, such as the tributaries of the Loire, and the southern rivers of the Argentine Republic, the melting snow swells the torrential track, and, on account of the abrupt change of level and the flatness of the plain, the lower part of the rivers cannot carry away the immense volume of water rapidly enough, and floods result. In some instances torrential rivers have been successfully diverted into lakes, which regulate their outflow, preventing either dangerously high or extremely low water. Great rivers which have embanked their course above the level of the plain are the most dangerous of all when flooded. The damage caused by the bursting of the levees on the lower Mississippi necessitates a great expenditure in strengthening the embankments, and the most disastrous inundations recorded in history have followed the bursting of the banks of the Hoang-ho (q.v.) and its consequent changes of course.

River-water is spoken of as fresh, but it always contains a certain amount of solid matter in solution, varying from two grains in the gallon or less in rivers draining hard crystalline rocks to fifty grains in the gallon or more in limestone districts. The nature of the salts dissolved naturally differs according to the geological character of the country traversed, but all samples of river-water differ from sea-water in containing a much smaller proportion of chlorides, and a very much larger proportion of carbonates and of silica.

The temperature of rivers as a rule follows that of the air, but is subject to variations on account of the effect of rain. During sudden floods in summer the temperature of the water may fall many degrees in a few hours as the melted snow or hail precipitated on the lofty mountains is carried toward the sea.

The great rivers of Europe and Asia, such as the Rhine, Danube, Volga, Indus, Ganges, Brahmaputra, Yang-tze-kiang, afford access to the sea to

enormous populations. The Amazon, with its plain track extending for nearly 3000 miles, is in many ways less like a river than a fresh inland sea; but the Mississippi and St Lawrence, although less extensive, are of greater value for carrying sea traffic to inland places. In their torrential and upper valley tracks rivers are of use chiefly for transporting timber and driving machinery. It is interesting to note that in Switzerland, Norway, and Sweden, where there is no coal, there exist exceptional facilities for the use of water-power on account of numerous mountain-torrents. In hot countries rivers are of the utmost service in irrigating agricultural land; the Zerafshan and Murghab are entirely consumed in that service, and since the completion in 1890 of the barrage on the Nile no water escapes to the Mediterranean in the low Nile months except along irrigation canals.

THE LARGEST RIVER-SYSTEMS.

River.	Area of Basin, sq. m.	Length, miles.	Annual Rainfall of Basin, cu. miles.	Mean Annual Discharge, cu. miles.
Amazon.....	2,280,000	3400	2834	528.0
Congo.....	1,540,000	2600	1213	419.0
Nile.....	1,290,000	3700	892	24.3
Mississippi.....	1,290,000	4100	673	126.0
Niger.....	1,060,000	2600	..	..
Ob.....	1,190,000	3200	..	..
La Plata.....	995,000	2800	905	189.0
Lenä.....	942,000	2900	..	..
Yenisei.....	880,000	3200	..	..
Yang-tze-kiang.....	689,000	3200	409	125.0
Mackenzie.....	607,000	2300	..	..
Volga.....	592,000	2200	152	43.7
Ganges and Brahmaputra.....	583,000	1800	549	43.3
Zambesi.....	570,000	1600	..	..
St Lawrence.....	565,000	2400	389	87.3
Winnipeg-Nelson.....	504,000	1500	..	..
Yukon.....	433,000	2200	..	..
Orinoco.....	430,000	1400	603	122.2
Amur.....	403,000	2800	..	..
Hoang-ho.....	387,000	2500	118	23.6
Indus.....	380,000	1900	104	26.0
Danube.....	820,000	1700	199	67.5
Murray.....	800,000	1500	..	..

The statistics of this table, in which account is taken of rainfall and discharge, are taken from Sir John Murray's paper in *Soot. Geog. Mag.* iii. (1887) p. 65. The lengths in all cases and the areas of basins in those for which no rainfall statistics are available are according to the statistical tables in Justus Perthes' *Taschen-Atlas*.

Rivers in Law.—A tidal navigable river, that is to say, the portion of a river which is subject to the ebb and flow of the ordinary tides, and which is in fact navigable, is subject to the public right of navigation. The ownership of the foreshore and bed of a river, where the tide flows and reflows, is *primâ facie* vested in the crown for behoof of the public, and cannot be used in any manner so as to derogate from or interfere with the right of navigation. The public right of navigation carries with it the rights necessarily attendant on it, such as the right of anchoring and of mooring. The right of navigation, which is a right of passage by water for boats or vessels, does not involve a right in the public to use the banks, e.g. to land themselves or their goods thereon, or to set up a towing-path. Such rights, which exist in the case of many navigable rivers, depend not on common law right but on usage or prescription. In addition to the right of navigation, the public have *primâ facie* a right of fishing in the tidal waters. Prior to Magna Carta the crown had power to exclude the public from this right and to grant an exclusive right of fishing to individual subjects. But it is now settled that since Magna Carta no new exclusive fishery could be created by royal grant in tidal waters and that no public right of fishing in such waters, then existing, can be taken away otherwise than by act of parliament. The public right of fishing does not entitle the public to use the adjoining land above high water mark for the

purposes of fishery, either in the way of fixing nets by stakes, or drying nets, or drawing them ashore, or of drawing up or leaving boats for future use.

Rivers above the point to which the ebb and flow of the tide extends are *primâ facie* private; but as in the case of many English rivers, a public right of navigation in the non-tidal waters has been acquired by immemorial use or by act of parliament. The public right of navigation in non-tidal waters, where such a right exists, does not carry with it the right of public fishery. The bed of non-tidal waters is presumed to belong to the owner of the land through which the river flows. If the river separates the lands of two owners, the presumption is that each of them is owner of the bed up to the middle of the stream (*ad medium filum*). Where in a river with well-defined banks an island divides a river into a main and subsidiary channel, the *medium filum* of the river is the centre line of the bed from bank to bank at the ordinary level of the water, and not the centre line of the main channel. Each owner of land abutting on a non-tidal river is presumed to have the right of fishing in front of his land *ad medium filum*; and where a man possesses the land on both sides of the water the presumption is that he has the sole right of fishing. The flowing water of a river is public and common in the sense that all may reasonably use it who have a right of access to it, and that none can have any property in the water itself, except in the particular portion which he may abstract from the stream and take into his possession. Riparian proprietors, i.e. the proprietors of land on the banks of a stream, have certain natural rights and duties in respect of the water of the stream. Thus every riparian proprietor has a right to use the water for his ordinary domestic purposes and for his cattle. Further, he has a right, under certain circumstances, to the reasonable use of the water for other purposes, e.g. irrigation or manufacturing purposes, provided he does not interfere thereby with the rights of other proprietors, either above or below. Subject to the ordinary use of the flowing water by upper proprietors and to such further use, if any, on their part, in connection with their property as may be reasonable in the circumstances, every riparian proprietor is entitled to have the water of the stream flow down as it has been accustomed to flow down to his property, in its natural flow, without sensible diminution or increase, and without sensible alteration in its character or quality. Accordingly, while a riparian owner may divert the water of a river for a reasonable purpose in connection with his land, e.g. erect a mill-dam across the stream within his own property and divert the water into a mill-lade, he, unless he has acquired a prescriptive right so to do, is not entitled to obstruct the water from flowing as freely as it was wont from the land of the proprietors above him, and must take care to restore the water into the stream before it leaves his land, so that the stream shall pass onwards to the land of the proprietors below him in its original channel and at its natural level. So, while a riparian owner is entitled to protect his property from the invasion of the water by erecting a bulwark, he is not at liberty to conduct his operations so as to throw the force of the current upon, or do any actual injury to, the property on the other side of the river. The right to the flow of running water, without deviation or alteration, being common to all those through whose land it flows, each of them is entitled to prevent any unauthorised interference with or use of the water inconsistent with their common rights in it, or to bring an action for loss sustained by such unauthorised interference or use.

There is no distinction between the law of England and the law of Scotland as regards questions relating to the common interests and rights of upper and lower proprietors on the banks of a river. In addition to these natural rights there may exist in relation to a river certain acquired rights. Thus rights may be acquired to interfere with a river, e.g. by diverting or obstructing or diminishing its flow, or by polluting the water, in a manner, or to an extent, not justified by natural right. Such acquired rights may be founded on grant, prescription, or act of parliament. (See EASEMENT, SERVITUDE.)

The pollution of rivers is a matter of concern not only to riparian proprietors but also to the public. If the water be polluted, a riparian proprietor, having a right to the flow of the stream in its natural state through or by his land, has, without proof of actual injury, a right to restrain the fouling of the water, unless a right to pollute the stream has been acquired by the person causing the pollution. In England the pollution of a stream may amount to a public nuisance, if it affects the health, comfort, or convenience of the public or of persons generally who come within its operation, and in that case the party causing the pollution may be prosecuted by indictment or proceeded against by information at the suit of the Attorney-general. The Public Health Acts contain provisions designed to prevent the fouling of streams. The most important statutes, however, relating to the pollution of rivers are the River Pollution Prevention Acts, 1876 and 1893, applicable both to England and to Scotland, which make special provision, regulative and administrative, for the prevention of the pollution of rivers by solid matters, by sewage, and by noxious liquids from mines and manufacturing processes, and also for the prevention of new sources of pollution. For English Law see Coulson and Forbes, *Law Relating to Water* (4th ed. 1924, by Moore); for Scots Law: Ferguson, *Law of Water and Water Rights*.

Engineering works on rivers are designed for various purposes, such as navigation, drainage and flood protection, irrigation, and water power and supply. Many British rivers have been deepened in the interests of navigation, of which the most successful instance is perhaps the river Clyde, which before 1760 was an insignificant tidal stream so encumbered by shoals that barges drawing 4 feet could reach Glasgow only on a high spring-tide. That river has been deepened to give about 38 feet depth of water at high-water springs—the deepening having been carried out by training-walls in the upper reaches and by dredging the river-bed throughout its whole course of 20 miles from Glasgow to Greenock. The Grand Sluice built across the river Witham at Boston excludes the tides, thus assisting in draining the fen-lands and preventing flooding, and in the interests of navigation the sluice also holds up the water-level inside. The existence of the English fens is dependent on such sluices placed across the draining-channels to avoid the flooding resulting from high tides. The river Witham has had its lower course through sand-banks fixed by training-walls, so that its navigable depth is maintained by tidal scour. The rivers Lune and Cheshire Dee are also instances of the beneficial effect of training-walls for navigation of rivers. Large sums are spent annually in dredging the bar at the mouth of the Mersey to maintain the navigable depth. The flood waters of the Nile are impounded for the benefit of irrigation. Large reservoirs have been formed by building dams across many American, Australian, and South African rivers for the purposes of water power and supply or in order to impound flood waters, and thus reduce the height of floods in the lower reaches.

See Harcourt, *Rivers and Canals*; D. and C. Stevenson, *Canal and River Engineering*; W. H. Wheeler, *Tidal Rivers*; Proc. Inst. Civ. Eng.

Riverina, originally the pastoral area between the Murray and the Darling, but now usually restricted to the lands between the Lachlan and the Murray. The Riverina division of New South Wales lies between these rivers to the west of a line roughly drawn from Condobolin to Albury. Erection into a state has been proposed.

Rivers, RICHARD WOODVILLE, or WIDVILE, EARL, was esquire to Henry V., and during his son's reign was made Governor of the Tower (1424) and knighted (1425). He fought in France and in England, in the Wars of the Roses for the Lancastrians. He took to wife Jaquetta of Luxemburg, widow of the Duke of Bedford, and it was their daughter Elizabeth whom Edward IV. married. This led Sir Richard Woodville to change over to the Yorkish side, and his royal father-in-law made him successively Constable of England, Baron Rivers (1448), and Earl Rivers (1466). But the favours shown to the Rivers family offended the old nobility, and their avarice aroused the enmity of the people. In 1469 Earl Rivers was seized and beheaded at Northampton, but accounts differ as to who were his executioners—whether Robin of Redesdale or the officers of the Duke of Clarence and the Earl of Warwick.—His son ANTHONY, previously known as Lord Scales, succeeded him. He stuck closely to his royal brother-in-law, who made him captain-general of the forces. After Edward's death he acted on the council of regency for his infant son, but was seized by order of Richard, Duke of Gloucester, and put to death at Pontefract in 1483.

Rivers, WILLIAM HALSE RIVERS, psychologist and anthropologist, was born in 1864, and educated at Tonbridge and Bartholomew's. From 1893 he was lecturer at Cambridge on psychology of the senses, physiological and experimental psychology (1897), and physiology of the senses (1907). He went to Torres Straits in 1898 as psychologist of the Cambridge expedition, and there discovered the great value of the genealogical method, which in 1902 he employed among the Todas. His important book on that people appeared in 1906, and in 1914 his *Kinship and Social Organisation*. Since 1908 he had been studying the Melanesians, and in 1915 his great work *The History of Melanesian Society* showed how the way in which the elements in a culture are linked together can be made to yield up the story of long past migration. This book did much to persuade anthropologists to see transmission of culture where they had before seen independent developments. Hospital war work sent him to psychopathology, and produced *Instinct and the Unconscious* (1920) and *Conflict and Dream* (1923), which show him a modified Freudian. Willing to apply psychology and scientific method to the solution of political problems, he was about to contest London University constituency as a Labour candidate when he died, 4th June 1922. His *Psychology and Ethnology* appeared in 1926.

Riviera ('seashore'), a term applied to the narrow strip of coast-land bordering the Gulf of Genoa, strictly from Nice to Spezzia, but generally understood to include the whole coast of the department of the Alpes Maritimes, and the Italian coast as far as Leghorn. West of Genoa it is called the Riviera di Ponente, or western coast, and beyond Genoa the Riviera di Levante, or eastern coast. From Hyères to Genoa is 203 miles; from Genoa to Leghorn, 112; sheltered on the north by mountains, the district enjoys an exceptionally favoured climate, no other region north of Palermo and Valencia being so mild in

winter. The western section is the mildest and most frequented. It abounds in the most striking and beautiful scenery, and is planted with numerous health and fashion resorts—Nice, Monaco, Mentone, Ventimiglia, Bordighera, Ospedaletti, San Remo, Alassio, &c.; and west of Nice are Hyères, Fréjus, Cannes, Grasse, Antibes. The various sections of the coast of 'La Provence Maritime' have each certain distinctive peculiarities, but none of them are entirely exempt from occasional cold winds. The Saracens held posts on this coast, and levied blackmail for centuries. The famous *Corniche* (Ital. *Cornice*) road leads along the coast from Nice to Genoa.

Rivière, BRITON, was born in London, 14th August 1840, son of a drawing-master at Cheltenham College, and afterwards at Oxford. His ancestors were French Huguenot refugees. He studied at Cheltenham College, and at Oxford, where he graduated B.A. in 1867. He had exhibited at the Royal Academy as early as 1858, and again in 1864, but from the appearance of 'The Poacher's Nurse' in 1866 he was continuously represented by a succession of pictures, which grew in vigour and impressiveness, in dramatic power, in humour, in pathos, and in technique. As a painter of wild animals he reached the widest popularity through engravings. A.R.A. in 1878, R.A. in 1881, he died 20th April 1920.

Rivingtons. See LONGMANS.

Rivoli, a town of Northern Italy, 8 miles W. of Turin, with two royal castles and some industry. Pop. 9000. It was not near this place, but near Rivoli, 12 miles NW. of Verona, that Napoleon won on 14th and 15th January 1797 one of his most decisive victories over the Austrians.

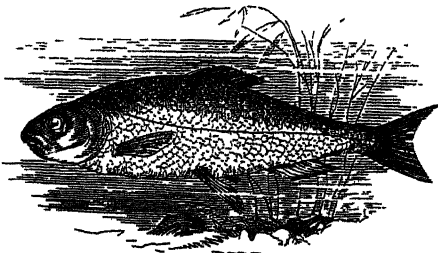
Riza, a Persian trooper who became war minister in 1921, prime minister in 1923, and on the deposition of the Kajar dynasty, king of Persia in 1925. See PERSIA (*History*).

Rizal, JOSÉ (1861-96), Filipino writer and organiser, was born, a Tagalog, at Calamba in Luzón, studied medicine in Europe, and wrote Spanish novels (*Noli me tangere*, *El Filibusterismo*) directed against political oppression and the friars. His books were prohibited and he himself banished and shot.

Rizeh, a town of Asia Minor, on the coast of the Black Sea, 40 miles E. from Trebizond, manufactures linen and copper utensils; pop. 3000.

Rizzio. See MARY, QUEEN OF SCOTS.

Roach (*Leuciscus rutilus*), a fish of the family Cyprinidae, abundant in England, the south of Scotland, and many countries of Europe. It measures from 10 to 15 inches; the body generally has a silvery appearance, the back is a dull green, the



Roach (*Leuciscus rutilus*).

lower fins are red, and there are no barbels. The roach is gregarious in habit, and large shoals are found usually in lakes, but towards the breeding season they migrate up streams and rivers to spawn. The flesh is white and firm, but without much flavour. For the Blue Roach, see AZURINE.

Road, Rule of. See RULE OF THE ROAD.

Roads form a primary element in the material advancement of a nation, being essential to the development of the country. The condition in which the roads of an old settled country are maintained is a fair indication of the state of industry and trade, and one of the earliest steps in the development of a newly-settled country is the construction of roads.

Historical Sketch.—The Romans were great road-builders, having probably learned the art from the Carthaginians. The highways they constructed were regarded as of vital importance in connection with their military conquests and the maintenance of their world-wide empire. Except when some insuperable natural barrier made it impossible, Roman roads preserved a straight line from point to point, crossing marshes, ravines, and hills which might in many cases have been avoided by moderate deviations. The substantial way in which the Romans built these roads is demonstrated by the fact that they have in some instances borne the traffic of two thousand years without material injury. The plan of construction of these great military roads was generally that adopted in the case of the famous Appian Way (q.v.). The whole empire was ultimately intersected by roads. In Britain there were four main groups of roads radiating from London—one south-easterly through Canterbury to the Kentish ports; a second westerly to Silchester and thence onwards to the south-western districts; a third through St Albans to Chester, afterwards known as Watling Street; a fourth north-eastwards through Colchester to Lincoln and York; a fifth road ran diagonally across the country. The roads known respectively by the names Watling Street, Ermine Street, and the Foss Way were not, however, especially important in the Roman system of roads in Britain; in certain cases the Roman roads followed more or less ancient prehistoric lines of communication.

During the Middle Ages these Roman roads, which had up to that time been the only means of internal communication, were allowed to fall out of repair until they became in a worse condition than the roads in most other European countries. In 1285 owners of land were ordered to cut down all trees and shrubs to the distance of 200 feet on either side of the roads between market towns in order to prevent the concealment of robbers in them. In 1346, in the reign of Edward III., the first toll was levied for the repair of some of the roads leading out of London, which were reported to be impassable. In the reign of Henry VIII. an act was passed requiring each parish to elect two surveyors of highways whose duty it was to keep them in repair by compulsory labour; at a later period the 'statute labour-tax' was substituted for compulsory labour. No serious attempt at road maintenance resulted from these enactments, and it was not till the introduction of the turnpike system in the reign of Charles II. that a few of the more important arterial roads were made even passable by vehicles. The deplorable condition of the roads in Great Britain, even at as late a period as 1770, is attested by the description given by Young in his *Six Months' Tour*.

In Scotland between 1726 and 1737 General Wade constructed some 250 miles of roads of 16 to 18 feet width, mainly with the view of opening up the Highlands to trade and of facilitating the pacifying of the country after the 1715 Rebellion.

Modern methods of road-making largely owe their inception to the labours of two Scotsmen—Macadam and Telford—who between them constructed many hundreds of miles of main roads, including such important lines of communication as the Glasgow and Carlisle road and the Shrews-

bury and Holyhead road, this latter involving the erection of the famous Conway and Menai Strait bridges. Macadam originated the idea of putting upon the road 'broken stone which shall unite by its own angles to form a solid hard surface.' His plan was briefly this: after the formation level had been properly drained and levelled, a bed of about 10 inches thick of stone broken to a 2-inch gauge was spread equally over the prepared surface, sufficient convexity being given to the surface in a transverse section to allow rain-water to flow off readily into the side drains. He maintained that the subsoil, if properly drained, would carry without subsidence any weight likely to come upon it from the wheel traffic if protected by his layer of impervious broken stone. His name has been immortalised in the expression 'macadamised roads.' Telford, on the other hand, insisted that a strong foundation of large stones, varying in the case of a roadway of 30 feet width from 9 inches in depth in the centre to 3 inches at the sides, was essential, and upon this foundation a layer about 6 inches thick of smaller broken stone was spread. Telford provided for ample drainage: he realised like Macadam that no road could stand up to its work unless the foundation was kept dry by a carefully-arranged drainage system. Upon these two systems, with various modifications, all modern road construction has been based, though recent developments have more and more emphasised the need of a strong foundation if the road surface is to be kept level and free from distortion.

About 1907 the ever-increasing volume of self-propelled traffic—with speeds and wheel-loads never contemplated by road engineers—focused public opinion upon the question of road construction and road maintenance. In the year 1908 the first International Road Congress was held in Paris, attended by two thousand delegates from all over the world, and in 1909 a Road Board came into being under the provisions of the Development and Road Improvement Funds Act, 1909. This Board was given powers (a) to make advances to County Councils and other highway bodies in respect of the construction of new roads or the improvement of existing roads, (b) to construct and maintain new roads to facilitate road traffic; its funds consisted of motor-spirit duties and carriage-licence duties. The Board appointed an Advisory Engineering Committee in 1910, and carried out much important work till its activities and funds came to an end at the outbreak of the Great War in 1914; during the four preceding years they made grants amounting to £2,118,043 for improvement of road crusts, widening, and road diversions. The cost of improvement of road crusts had averaged about £1876 per mile of road.

In 1919 approval was given to the Ministry of Transport Act, 1919; under this act a Ministry of Transport was created; under section 2 (e) all powers or duties of any government department with regard to 'roads, bridges and ferries, and vehicles and traffic thereon' were to be transferred to the new Ministry, and under section 22 (1) authority was given to the Minister to appoint a 'Roads Committee' to give advice and assistance in regard to the powers under section 2 (e). Under the provisions of The Roads Act, 1920, which amended previous acts, a fund was established, a 'Road Fund,' derived from licences on mechanically-propelled vehicles imposed by section 13 of the Finance Act, 1920, as amended by this act, and from the excise duties on licences for carriages imposed by section 4 of the Customs and Inland Revenue Act, 1888—all these duties to be levied in future by County Councils and paid by them into the Exchequer. Out of this Road Fund, subject to the prior payment of certain other specified sums,

the Ministry of Transport was authorised to make payments for the purposes of Part II. of the Development and Road Improvement Funds Act of 1909, as amended by this act, the amount to be devoted to the construction of new roads not to exceed in any one year one-third of the estimated amount to be paid into the Road Fund in that year after deduction of the prior payments mentioned above.

The Road Fund receipts have risen from £9,432,302 in 1921 to £16,150,554 in 1925, and the payments from £5,179,375 to £15,234,225, while the balance standing to the credit of the fund on 31st March 1925 was £18,140,386. These figures show what a large sum is now available annually from the Exchequer for road purposes, and how it has been possible to carry out such a big programme of new road construction and to make such a thorough improvement in the roads of this country in such a short period. In the case of roads of Class I. the grants made amount to 50 per cent. of the approved cost, and for roads of Class II. the amount of the grant is 25 per cent. of the approved cost, the total of these two grants for 1924-25 amounting to £9,548,182. Where, as in Scotland, there are roads of these two classes running through sparsely-populated areas and where the highway rates are exceptionally high, grants are made up to 75 per cent. of the approved cost. Another important piece of work made possible by the Road Fund has been the construction of arterial roads in the metropolitan area directly by the Ministry, involving an estimated expenditure of £6,315,000.

The number of motor licences in 1924 was 1,335,600, an increase of nearly 200,000 over the figure for 1923; on the basis of the 1921 census the 1924 licences work out at one motor vehicle for every thirty-two persons in Great Britain. These figures make clear the necessity of the heavy expenditure on road construction and road maintenance which has been so marked a feature of national and local expenditure. The Finance Act of 1926 diverted a portion of the money raised from these licenses by powers conferred by previous Finance acts from the Road Fund to the general revenue of the country.

Road Construction.—In laying out a new road certain general principles have to be kept in mind. Motive power is economised by easy gradients; at the same time it is not desirable to deviate more than is absolutely necessary from the direct route between the fixed points (towns and villages) through which the road must pass. Since excavation and embankment works are expensive, these must be kept as small as possible, and should, as in railway construction, be equalised as much as possible. A careful reconnaissance and survey of two or three trial lines should be made before the route is finally decided upon; this involves also an examination of the geological features of the district and of the beds of streams which have to be crossed by bridges. In fact, the formation of an extended line of road involves generally the construction of bridges, viaducts, and other important works, which require the greatest engineering skill.

In the days of horse-traction the ruling gradient which was permissible was practically fixed by the power which an ordinary team of horses could exert in hauling heavy loaded wagons or coaches. On a level macadamised road in first-rate order the tractive force to move a load of 1 ton varied from about 38 to 45 lb.; on a road of the same nature, with a gradient of 1 in 50, the tractive force would be doubled. As soon as the surface of the roadway deteriorates, the tractive force required rapidly increases, being nearly doubled when the surface is loose and muddy. The kind of material with

which the surface of a road is covered also affects the amount of gradient which can be allowed. For example, an ordinary water-bound macadam road can have a steeper gradient than a roadway covered with asphalt, which becomes under certain climatic conditions very slippery. The steepest gradient allowed in France is 1 in 20, and in the United States the same rule is adopted for important roads; the Road Board suggested that for impervious surfaces of any material the maximum gradient should not exceed 1 in 18. Briefly, every case must be carefully considered, and the engineer must use his own judgment, bearing in mind that horse traffic has still to be provided for, though it is daily becoming a less important factor in road-construction problems. Telford's rule was that 1 in 30 should be the ruling gradient in an important main road, and that rule has been generally maintained in most of the later road-construction work.

What is the best transverse form for a road has been a much-debated question. The only object of 'camber' is to facilitate the rapid flow of rain-water off the road surface into the side drains; much less camber is therefore required in modern roads with their smooth surface than was necessary with the old water-bound macadam roadway; excessive camber is one of the contributory causes to a slippery condition of roadways. On comparatively level roads a fall from crown to side of $\frac{1}{2}$ inch to $\frac{3}{4}$ inch per yard width of road is ample; hence on a 24-foot-wide carriage-way a fall of 3 inches from the crown to the water-channel at the side is sufficient for drainage purposes; on gradients this camber should be reduced. Whenever the camber is excessive, there is a pronounced tendency for traffic to keep to the crown of the roadway, causing excessive wear on the central part of the carriage-way.

The width of a road has to be fixed by consideration of the volume and character of the traffic which will pass over it; traffic census records have been made by the Ministry of Transport, which indicate a vast increase of traffic since 1914, especially in heavy vehicles; further, while in 1912-14 the horse-drawn traffic was 63 per cent. of the whole, by 1923 it had fallen to 15 per cent.; hence it is obvious that the widths of roads must be fixed now at figures suitable for self-propelled vehicles. A roadway of 24 feet width would provide ample room for three lines of horse-drawn traffic, allowing a width of 8 feet per line; but as the width of many types of motor vehicles is as much as 7 feet 6 inches, involving at least 10 feet of width per line of traffic, a carriage-way of 30 feet for three lines of traffic is now necessary. It must be remembered that motor traffic moves much more rapidly than horse traffic, and that the modern tendency is to use larger goods vans, thus reducing the number of vehicles on the roadway at any one time; both of these factors tend to increase the carrying capacity of a road in relation to its width. In the reconstruction of the Perth-Inverness road a width of 18 feet for the carriage-way has been adopted; on the trunk road from London to Folkestone the carriage-way is to be 30 feet, and the same width has been selected for the new Edinburgh-Glasgow road; this is increased to 40 feet in the city of Edinburgh, and two 30-foot roadways have been provided in the city of Glasgow.

Water-bound macadam will probably still be employed where the traffic is light and the roads pass through sparsely-populated areas, the dust nuisance being overcome by coating the surface with a skin of some bituminous mixture. With a good foundation on the lines of Telford's methods and careful drainage, such roads will last for a long time with but very moderate expenditure on maintenance. The best stone to adopt, and the

size to which it should be broken, require very careful consideration, as the life of the road will depend to a great extent on a wise decision on these two matters. For ordinary work the stone should be broken to a 2-inch gauge; the thickness of the macadam after consolidation by a 10-ton roller should be about 4 inches; the binding material should when it is possible be the same kind of material as the macadam or similar material, not exceeding $\frac{3}{4}$ inch in its greatest dimension. It should be applied only after the macadam has been tightly rolled, being spread evenly over the surface, watered, and then finally rolled. Such roads, in order to keep down the dust nuisance, are tar-sprayed; specially prepared tar should be used, and care must be taken to ascertain that the road surface is absolutely dry to a depth of at least $\frac{1}{2}$ inch below the surface before spraying work is undertaken.

Tar and Bituminous Macadam.—When heavy motor traffic was only a small proportion of the vehicular traffic, ordinary tar-macadam was one of the most commonly used materials for road-construction. The foundation is generally prepared as for water-bound macadam, and the rolled surface of this is floated or flushed with well-boiled tar; the previously prepared tar-macadam is then spread over this foundation to a depth of 4 or 5 inches and rolled, the top-dressing consisting of small stones of about $\frac{3}{4}$ inch gauge; this work should be carried out only in dry weather. To prepare the tar-macadam, good hard stone is broken to the selected gauge, thoroughly dried by heat, and then well-boiled tar is poured over the broken stone, 8 to 12 gallons per cubic yard, the heap being turned over with hot shovels; if not used at once, it must be stored under cover. Instead of tar-macadam, road-engineers now use bituminous macadam, since this material is better able to resist the distortion effects of heavily-laden motor vehicles. Tar-macadam requires a longer time to acquire hardness, and is inclined to be softened by the heat of the sun in summer. In making bituminous macadam the tar is replaced by a bituminous mixture which may contain a percentage of tar, and the macadam may be laid hot. It is a particularly useful coating for old water-bound macadamised roads which require re-surfacing. A first coat of 2½-inch gauge, followed by a second coat of 1½-inch gauge, and a surface-coat, which may be an asphaltic composition of $\frac{1}{2}$ to 1 inch in thickness, is good practice; this gives, when rolled, a total thickness of about 3½ inches.

It is necessary to point out that there is some confusion in the nomenclature of bitumen, asphalt, and tars; full information on this matter is contained in a Report of the British Engineering Standards Committee, published in 1918. Tar and pitch are derived from the destructive distillation of hydrocarbon matter, coal, oil, &c. Bitumen is a substance which occurs in nature, or is obtained by the evaporation of asphaltic oils. Asphalt is a road material consisting of a mixture of bitumen and finely-graded mineral matter; rock-asphalt is a rock naturally impregnated with bitumen.

It is impossible to describe in any detail the many systems which have been tried, and the various special road-materials, such as 'tarmac,' which have been put upon the market in connection with the construction of bituminous roads; for information on these points, reference must be made to the text-books dealing with road-engineering.

Surface Treatment.—For water-bound macadam, tar is the best material; for tar-macadam, a bituminous surface treatment is most satisfactory. In every case the surface to be treated must be brushed free from all dust, and be dry. The better plan of applying the material is by brushing rather than

by any spraying method. Where there is a sound foundation, and the traffic is heavy enough to justify the expense, a surface or carpet of a mixture of bitumen and small chips of granite, clinker, or slag heated and dried forms a fine road-surface; it may be applied in a single thickness of 1 to 1½ inches, or in two coats, the lower coat having larger chips, rolled to about 1 inch thickness, the upper thinner coat having smaller chips, the rolling being done with 10-ton rollers, and continued till the treatment is cold.

Concrete Roads.—The construction of unsurfaced concrete roads has made little advance in this country, and probably never will, except possibly in the case of entirely new roads. In the United States, however, this system of road-construction has been adopted very extensively; by 1921 over 62,000,000 square yards of such roads were in use, and in most cases were proving satisfactory. Where the subsoil is weak, or where the traffic is exceptionally heavy, the concrete should be reinforced with some form of steel wire mesh, placed at about one-third the thickness of the concrete above the bottom of the concrete; the thickness of the concrete may be about 7 inches, and it is advisable to lay it in two layers. One of the chief drawbacks to the use of concrete roads is the comparatively long interval of time that must be allowed to elapse after finishing the road before it is safe to permit traffic upon it; another difficulty is the liability to crack.

Many of the recently-constructed trunk roads in this country have been built upon a reinforced concrete foundation, this foundation being naturally much stronger and more durable against deformation than the older Telford type of broken-stone foundation, though, of course, it is a more expensive class of work. Any of the ordinary types of road-surfacing may be used in conjunction with this form of foundation, which was first adopted for foundations of streets and roads having street tramways.

The construction of paved streets is dealt with under PAVEMENT, but it may be desirable to state that in London and many other large cities, where the vehicular traffic is abnormally heavy and congested, the type of covering over the 7-inch to 10-inch thick concrete foundation which has proved in practice to be the most satisfactory is a 2-inch layer of asphalt. The asphalt used has been mainly the natural carbonaceous limestone found in various localities in France, Tyrol, &c. These pavements fulfil practically every requirement of a first-class roadway except as regards slipperiness. Under certain weather conditions, unless regularly washed down, the asphalt surface is dangerously slippery both for horse traffic and for motor traffic, leading in this latter case to skidding.

In conclusion, it is desirable to emphasise again the necessity of thorough drainage arrangements if a road is to be kept in good order. Except for unimportant country roads, side-ditches are not sufficient; properly constructed side-channels connected to pipe-drains, with suitable sand-traps, are essential, and subsoil drainage must also be provided where the natural soil is damp and liable to become water-logged.

See the following text-books: Aitken, *Road Making and Maintenance*; Boulnois, *Modern Roads*; Whyatt, *Highway Engineer's Year-Book*; Wakelam, *Practical Roadwork*; Blanchard and Browne, *Highway Engineering as presented at Brussels International Road Congress, 1910*; Morrison, *Highway Engineering*; and the publications of the Ministry of Transport (Roads Department); also papers in the *Transactions* of the Institution of Civil Engineers.

Roads in Law.—Roads are included under the general name of highways, a highway being defined as a place over which a right of walking, riding, or

driving is enjoyed by the public generally. Where a Right of Way (q.v.) belongs not to the public generally, but to the owners or occupiers of land or house property, the way in question is private, not public, and the right to use it is classed among Easements (q.v.), or, in Scotland, Servitudes (q.v.). A public way may exist over a place which is not a thoroughfare, as, for example, a street closed at one end. Highways are created by an express or implied grant, whereby the owner of the land dedicates it to the use of the public, by the necessity of things or by act of parliament. If an owner permits the public to pass and repass over his land without interruption, it is presumed that he intends to grant a public right of way; he loses his right to exclude the public, and the way is a highway for ever, unless it should be closed by a public authority under an act of parliament. Public rights may be limited to a particular purpose, as where the inhabitants of a parish have the right to use a way in going to or coming from church. If a highway be out of repair passengers may go over adjacent land; but this is a right to be exercised with caution. Any obstruction placed upon a public way is a nuisance, and may be abated or removed by any person aggrieved. Every part of a highway is equally open to the public; a foot passenger may walk on the carriage-way, and a blind or aged person has as good a legal right to be on the road as any one else. But passengers must use ordinary care to guard themselves against accident, and they must comply with the well-known 'Rules of the Road' (q.v.)—a person driving must keep to the left on meeting another vehicle, and to the right on passing another vehicle; and if he transgresses these rules without justification he will be liable for the consequences. No person is justified in using a highway for any purpose, however useful, which interferes with the general right of the public to pass and repass. Thus it has been held that a local authority cannot lay down tramway lines so constructed as to damage the wheels of carriages using the street, although the tramway might be for the convenience of the public generally. On the same principle it was held an indictable nuisance for a telegraph company to place its posts on a strip of land adjoining the road. Nothing but an act of parliament can legalise such uses of a public way.

Subject to the rights which he has conferred on the public, the owner retains his right of property in the land. If the land on both sides of a highway belongs to the same owner, it is to be presumed that his rights extend over and under the road; if the land on one side belongs to A and on the other side to B, each is presumed to be owner up to the middle line of the way. If, for example, a mine should be opened in the neighbourhood of the road, the adjoining owner or owners would have the right to mine under it, so long as sufficient support is left for the surface of the road. If a gas or water company without authority of parliament takes up a road to lay its pipes, this is not only a nuisance but a trespass, for which damages may be recovered by the owner of the land. It has been held that a person loitering on a highway for the purpose of poaching may be indicted for trespassing on the land of the adjoining owner.

The repair of a carriage-way involves a regular outlay, and there are some cases in which this burden is imposed upon the owner of the land, *ratione tenuræ*, as a part of the service by which he holds his estate. But the general rule of common law is that the inhabitants of a parish must repair the highways within the same; they are liable to indictment if they fail to perform this duty, and no agreement they can enter into will

relieve them of their liability. Many townships, &c., which are not separate poor-law parishes are separate highway parishes by ancient custom. The management of highways separately maintained by the parish was regulated by an act passed in 1835, and amending acts; a parish surveyor was elected by the ratepayers; in parishes over 5000 population a board might be elected. Under an act of 1862 many parishes were grouped in districts. The highway board of a district consisted of waywardens elected for the parishes therein, and of the acting justices who reside in the district. Under the Public Health Act an urban sanitary authority was made the highway authority within its district. Many of the main roads throughout England were constructed or improved under Turnpike trusts, constituted by acts of parliament. Turnpike trusts and highway boards have alike been superseded by the provisions of the Local Government Act of 1878 and subsequent acts. The control of the main roads of a county now rests with the county council, and the burden of their maintenance is a county charge. The rural district councils are the highway authorities for highways other than main roads, and have the powers of the surveyor of highways. In boroughs the powers of the county council are exercised by the corporation. The parish councils take charge of the repair of footpaths. Tolls had been generally abolished before these sweeping changes in road management; see TOLL. See also TRACTION-ENGINES.

The national authority for roads is now the Ministry of Transport, on whom have been conferred the powers in this behalf of every government department, including the Road Board. The Minister of Transport may make advances to county councils and other highway authorities to construct new roads, or to maintain or improve existing ones.

In the law of Scotland a highway is said to be *inter regalia*; but it seems that the presumption is that the land over which a road passes belongs to the adjoining owner or owners. Public rights of way are acquired by actual use for the prescriptive period of forty years. There were formerly two classes of roads—statute-labour and turnpike; by the Roads and Bridges Act, 1878, the management of all roads was vested in county road trustees; by the Local Government Act of 1889 the powers of the road trustees were transferred to the county council; in the burghs they are managed by the town council or the commissioners of police.

For an outline of the English law, see Wright and Hobhouse, *Local Government in England*; for the Scots law, Ferguson, *Roads, Streets and Rights of Way* (1904).

Roanne, a town of France (dept. Loire), 52 miles by rail NW. of Lyons, stands on the left bank of the Loire, which becomes navigable here, and is crossed by a stone bridge (1820). The principal church is St Stephen's (16th to 17th century). Roanne has besides an old castle with antiquarian collections, a modern hôtel-de-ville with a museum, and some manufactures. Pop. (1872) 18,615; (1891) 30,996; (1921) 37,752.

Roanoke, a river of Virginia and North Carolina, formed by the union, a mile above Clarksville, Virginia, of the Dan and Staunton rivers, which rise in the Alleghanies, flows south-east through the north-eastern portion of North Carolina, and empties into Albemarle Sound. It is navigable for steamboats to Weldon (130 miles); its length is 230 miles.

Roanoke, a city of Virginia, on the Roanoke River, 258 miles by rail W. of Norfolk, at a junction of railways. In 1880 a secluded hamlet, by 1890 it was a bustling city, with a court-house,

opera-house, large machine-shops, steel and iron and other works. Pop. (1920) 50,842.

Roaring in horses is a loud sound emitted during the act of inspiration. Whistling is a modification. The cause, in the great majority of cases, is paralysis with wasting, atrophy, and fatty degeneration of the muscles of the larynx, more particularly those of the left side. It often follows catarrh, strangles, or some other disease affecting the respiratory organs; but it is generally concluded that these diseases are not sufficient of themselves to cause it, provided there be no hereditary taint, this hereditary taint alone being sufficient in many instances to induce roaring. There is no certain cure. In 1887 an operation was reintroduced by Dr Fleming. Similar operations had been performed by Günther, in Hanover, so far back as 1834. It consists in making a long incision into the larynx, the animal being under chloroform, and removing the arytenoid cartilage and vocal chord of the paralysed side. Some horses were slightly benefited, but many became worse and had to be destroyed. A somewhat different operation, introduced by Professor Williams of Cornell University, has almost superseded the others. But unfortunately it also often leads to disappointment.

Roaring is now included by the Boards of Agriculture of England and Scotland, and the Royal Agricultural Society of England, among hereditary unsoundnesses.

Roaring Forties, a sailor's term for a region of the great Southern Ocean lying south of 40° S. lat. (especially south of 45°), where the prevailing winds are strong WNW. and NW. winds, often stormy. The same name is sometimes given by analogy to a belt of the North Atlantic about 40°-50° N.

Robben Island (Dutch, 'seal island'), an islet at the entrance of Table Bay, 10 miles NW. of Capetown, about 4 miles long by 2 broad, with great quarries. It contains a leper colony.

Robber Council. See EUTYCHES.

Robbery is an aggravated species of larceny. The gist of the offence is that property is taken from the person of some one against his will by force, or by putting him to fear by threats of any kind of injury. The force or terror must be used either before or at the time of the taking of the property; for even the use of actual force, if it does not begin until after the taking, will not make a larceny become a robbery. To constitute the crime the robber must actually obtain possession of the goods; but it does not matter how short the time was during which they were in his possession. The property must be taken from the person, or in the presence of the party robbed. The maximum punishment for robbery is fourteen years' penal servitude. But for robberies that are further aggravated in particular ways (as by the robber being armed with any offensive weapon, or being together with one or more persons) the punishment may be penal servitude for life, and, in the case of a male, whipping—Larceny Act, 1916 (6 and 7 Geo. V., chap. 50), sect. 23 (1). Under this statute, too, even if no article be actually taken and so no robbery be effected, the mere assault with intent to rob is a felony, and punishable with five years' penal servitude. Further, the act (sect. 30) provides that demanding a thing by menaces or by force, with intent to steal it, is a felony punishable with five years' penal servitude. If on an indictment for robbery the jury are of opinion that the accused did not commit robbery, but did commit an assault with intent to rob, they may find him guilty of the latter offence. In Scotland, by the Criminal Procedure Act, 1887 (50 and 51 Vict. chap. 34),

it is now competent, under an indictment for robbery, to convict of reset, or theft, or attempt to rob.

Robbia, LUCA DELLA, sculptor and modeller of figures in relief, was born at Florence in 1399 or 1400, worked all his life there, and died there on 20th February 1482. He designed and executed between 1431 and 1440 ten panels of Angels and Dancing Boys for the cathedral, which Professor J. H. Middleton calls one of the greatest pieces of sculptured work in the 15th century. Another great work by him was a bronze door, with ten panels of figures in relief, for the sacristy of the cathedral, made between 1448 and 1467. In marble he sculptured, in 1457-58, the tomb of Frederighi, Bishop of Fiesole (now in the church of San Francesco outside the city). The frame that surrounds this monument is made of exquisitely painted majolica tiles. His name is closely associated with the production of figures in glazed or enamelled terra-cotta, made by a process which, though he did not invent it, he yet improved greatly. Amongst the works he executed by this process are numerous medallions, some white, some polychrome, and reliefs.—His principal pupil was his nephew ANDREA (1435-1525), who worked chiefly at the production of enamelled reliefs, retables, and medallions, these last for the most part reproductions of the Madonna and Child. Nearly all his works were of religious subjects; they were made chiefly for Florence, Arezzo, and Prato.—His son GIOVANNI (1469-1529?) continued the activity of the family in this style of work; his best productions are the frieze, representing the Seven Works of Mercy, outside a hospital at Pistoja, and a fountain in the sacristy of Sta Maria Novella in Florence.

See Cavallucci and Molinier, *Les Della Robbia* (1884); Leader Scott, *Luca Della Robbia* (1883); Raymond, *Les Della Robbia* (1897); and a number of books by Allan Marquand (1912, &c.); the book on Luca by the Marchesa Burlamacchi (1901); and the larger work on Luca and Andrea by Maud Cruttwell (1903).

Rob Donn. See MACKAY (ROBERT).

Robert I. (OF SCOTLAND). See BRUCE.

Robert II., king of Scotland 1371-90, was born 2d March 1316, two years after the battle of Bannockburn. His father was Walter Stewart (q.v.), his mother Marjory, only daughter of Robert the Bruce; and both parents he lost in infancy. Throughout the disastrous reign of his uncle, David II., he was one of the most prominent of the patriotic nobles of Scotland, twice acting as regent during his exile and captivity, and fighting at Halidon Hill (1333) and Neville's Cross (1346). On David's death (22d February 1371) he obtained the crown, and became the founder of the Stewart dynasty, in virtue of the law of succession settled by the Council of Estates at Ayr in 1315. 'A man not valiant,' Froissart describes him, 'with red blear eyes, who would rather lie still than ride;' and partly from disposition, partly from the infirmities of age, Robert proved a peaceable, if not exactly a pusillanimous ruler. Such wars as were waged with England were not only conducted, but organised, by his powerful and intractable barons, particularly the Earls of Douglas, Mar, March, and Moray, who shaped the policy of the country very much according to their pleasure. The misery inflicted on both sides of the Border by the raids of these warlike chiefs, and the reprisals of the English wardens—the Percies and others—were frightful; famine and pestilence became chronic; but the most celebrated incidents of Robert's reign were the invasions of Scotland by an English military and naval force under the command of the Duke of Lancaster ('old John of Gaunt, time-honoured Lancaster') in 1384, and again by King

Richard II. himself in 1385, which wasted the land as far as Edinburgh and Fife, and the grand retaliatory expedition of the Scotch in 1388, which culminated in the battle of Otterburn (q.v.). Robert died at his castle of Dundonald in Ayrshire, 19th April 1390. He married first, in 1349, his mistress, Elizabeth Mure of Rowallan, and secondly, in 1355, Euphemia, daughter of the Earl of Ross and widow of the Earl of Moray.

Robert III., king of Scotland 1390-1406, son of the preceding, was born about 1340. His baptismal name was John, but this name, out of hatred to the memory of John Baliol, was changed on his accession to the throne by an act of the Scottish Estates. His imbecility as a ruler virtually placed the reins of government in the hands of his ambitious brother, Robert, Earl of Menteith and Fife, in 1398 created Duke of Albany, during whose regime the Scottish barons first began to exercise that anarchic and disloyal authority which, in the reigns of the first three Jameses, threatened to destroy the power of the sovereign altogether. The principal events in Robert's reign were the invasion of Scotland in 1400 by Henry IV. of England, who, at the head of a large army, penetrated as far as Edinburgh, but did not inflict much injury on the country—more, however, from clemency than impotence—and the retaliatory expedition of the Scotch, two years after, under Archibald Douglas, which resulted in the terrible disaster at Homildon Hill (q.v.). Robert had two sons, the eldest of whom was David, Duke of Rothesay (1378-1402), a youth not destitute of parts, but shockingly licentious. As long as his mother lived he kept within bounds, comparatively speaking; but after her death, says Buchanan, 'he gave an unbridled license to his passions; laying aside fear and shame, he not only seduced married ladies and virgins of good family, but those whom he could not entice he forced to his embraces.' Albany received orders from the king to act as his guardian, and after a short time starved him to death at Falkland; for which he underwent a mock-trial by his own creatures, and was of course declared innocent. Robert now became anxious for the safety of his younger son, James, and, after consulting with Bishop Wardlaw of St Andrews, he resolved to send him to France; but, while proceeding thither, the vessel in which he sailed was intercepted by an English cruiser, and James was taken prisoner. When his father received the melancholy news he gave way to paroxysms of grief, and died 4th April 1406.

Robert of Brunne. See BRUNNE.

Robert of Gloucester. See GLOUCESTER.

Roberts, DAVID, landscape and architectural painter, was born at Edinburgh (in Stockbridge) on 24th October 1796, and was apprenticed to a house-painter. In 1818 he advanced to the grade of scene-painter, and in 1821 went to London to paint scenery for the stage of Drury Lane. All this while he was studying artistic drawing and painting, and in 1826 and 1827 he attracted the attention of the public with pictures of Rouen and Amiens cathedrals in the Royal Academy exhibitions. Then for several years he travelled in Spain, Morocco, Egypt, Palestine, Italy, Belgium, making drawings of grand and impressive buildings and landscapes with picturesque edifices, and working them up into pictures. From among this work the following stand out—the drawings from Spain for the illustrations to the *Landscape Annual* (1835-38); the magnificent volumes of *The Holy Land, Syria, Idumea, Arabia, Egypt, and Nubia* (1842); numerous interiors of churches, as St Miguel at Xeres, Holy Nativity at Bethlehem, St Jean at Caen, St Paul at Antwerp, St Peter's at Rome,

the cathedrals of Milan and Seville; and the grandiose pictures, 'Departure of the Israelites from Egypt' (1829), 'Ruins of the Great Temple at Carnac' (1845), 'Jerusalem from the South-east' (1845), 'Destruction of Jerusalem' (1849), 'Rome,' (1855), and 'Grand Canal at Venice' (1856). Roberts's style is essentially spectacular, producing grand broad effects, with magnificent architectural arrangements, to which the details are of course generally sacrificed. He was elected an A.R.A. in 1839, an R.A. in 1841; and died 25th November 1864. See Life by James Ballantine (1866).

Roberts, FREDERICK SLEIGH ROBERTS, EARL, was born at Cawnpore, 30th September 1832, the son of General Sir Abraham Roberts. He was brought to England when two years old, educated at Clifton, Eton, Sandhurst, and Addiscombe, and entered the Bengal artillery in 1851. His first taste of actual warfare was got in the hot time of the siege of Delhi, during the Mutiny, and he took an active part in the subsequent operations down to the relief of Lucknow, acting on the staff, in the quartermaster-general's department, and he won the V.C. He discharged the duties of assistant quartermaster-general in the Abyssinian expedition of 1868, and in the Lushai expedition of 1871-72. On the outbreak of the Afghan war in 1878, Roberts, now major-general, was appointed to command the Kurram division of the army. He forced in brilliant fashion the Afghan position on the peak of Peiwar Kotul (8500 feet above sea-level), and was rewarded with a knight-commandership of the Bath (1879). After the murder of Sir Louis Cavagnari and the escort of the British mission at Kabul, he was given the command of the force sent to avenge them. He defeated the Afghans at Charasia on 6th October, took possession of Kabul on the 12th, and assumed the government of the country, Yákub Khan having abdicated. Events followed quickly: the fortified cantonment of Sherpur was occupied by the British army, the fortress of Bala Hissar in Kabul was dismantled, Yákub Khan was sent a prisoner to India, the Afghans began to concentrate on Kabul, General Roberts sought to check them, and there was much sharp fighting round the city, Abdul Rahman was proclaimed Amir, and General Burrows was crushingly defeated at Maiwand, and the British garrison of Kandahar besieged by the followers of Ayub Khan. On 9th August Sir F. Roberts set out with 10,148 troops, 8143 native followers, and 11,224 baggage animals on his memorable march through the heart of Afghanistan to the relief of Kandahar, which he reached three weeks later. He immediately gave battle to Ayub Khan, and routed him completely, capturing all his artillery and his camp. When he visited England towards the close of the year he was honoured with a baronetcy, and on his return to India was appointed commander-in-chief of the Madras army (1881), and from 1885 till he resigned the post in 1893, held the rank of commander-in-chief in India. In 1895 he was made Field-marshal and Commander of the Forces in Ireland. In December 1899 he was sent to South Africa to take chief command in the Transvaal War, with Lord Kitchener (q.v.) as chief of his staff. Here he had eventually nearly 200,000 men under his command, the largest British army that had ever engaged in any war. After a brilliant series of engagements (capturing Commandant Cronje and 4000 men) he occupied Bloemfontein and hoisted the British flag in Pretoria (5th June 1900); and the South African Republic and the Orange Free State were proclaimed British colonies. In December 1900 he returned to England, and was commander-in-chief till the office was abolished in 1904. He strenuously insisted on the necessity of universal military service for the safety of Britain, as set

forth in *Fallacies and Facts* (1911). He died, 14th November 1914, at the headquarters of the British Army in France, whither he had gone to visit the Indian troops. He had been made a baron in 1892, an earl in 1901. See his own *Forty-one Years in India* (1896), and his *Letters written during the Indian Mutiny* (1924). He wrote also *The Rise of Wellington* (1895).

Roberts, MORLEY, born at London in 1857, a son of an income-tax inspector, studied at Owens College, went to Australia in 1876, and after an adventurous life as railwayman, cattle-tender, and seaman in Australia, the United States, and Canada, with intervals of work in public offices, made himself known by a long series of novels. *The Private Life of Henry Maillard* (1912) is the sad story of George Gissing's life.

Robertson, ALEXANDER (1668-1749), of Strowan, a Perthshire laird and irreconcilable Jacobite, who was 'out' in almost every rebellion from 1689 to 1745, was reckoned a poet on the strength of poor verses of some historic interest.

Robertson, FREDERICK WILLIAM, was born, eldest of the seven children of an artillery captain, in London on 3d February 1816, and spent his first five years at Leith Fort. He went to school at Beverley, Tours, and Edinburgh, was in a solicitor's office, qualified for an army commission, but after much misgiving, persuaded of his vocation for the church, went to Brasenose, Oxford, in 1837. Ordained in 1840, he held a curacy at Winchester for a year, fell into ill-health, recovered, and married. In 1842 he became curate to the incumbent of Christ Church, Cheltenham, and here for nearly five years he laboured with unbroken devotion, and, despite depression of spirits, fought his way to certainty in his grasp of Christian truth, his faith in Evangelicalism being shaken by the intolerance of its partisans. In 1846, after three months of travel and preaching at Heidelberg, he returned a follower of no school to accept the curacy of St Ebbe's in Oxford. The power of his preaching had already made itself felt among his poor and even among the undergraduates, when in 1847 he accepted an invitation to Trinity Chapel, Brighton. There his rare union of imaginative with dialectic power, the beauty and freshness of his thought, his earnestness, originality, wide sympathy, and knowledge of the human heart at once arrested public attention. He established the Working-men's Institute there, and flung himself with a passionate and chivalrous enthusiasm into every battle waged in his day against tyranny and wrong. He himself summed up the cardinal principles of his teaching under these heads: (1) The establishment of positive truth, instead of the negative destruction of error; (2) That truth is made up of two opposite propositions, and not found in a *via media* between the two; (3) That spiritual truth is discerned by the spirit, instead of intellectually in propositions; and therefore truth should be taught suggestively, not dogmatically; (4) That belief in the human character of Christ's humanity must be antecedent to belief in his divine origin; (5) That Christianity, as its teachers showed, works from the inward to the outward, and not *vice versa*; (6) The soul of goodness in things evil. He resigned in June 1853 because the vicar of Brighton had refused to confirm his nomination of a curate, and died two months later. He published but one sermon—the five series (1855-90) so called are really recollections in abbreviated form. Expository lectures on the Epistle to the Corinthians (1859) and notes on Genesis (1877) were printed, and a volume of *Lectures and Addresses* (1858), reissued with additions as *Literary Remains* (1876). He translated

Lessing's *Education of the Human Race* (1858), and prepared an admirable analysis of *In Memoriam* (1862). His letters are hardly inferior to his sermons in charm and power; and the *Life and Letters* by Stopford Brooke (1865) at once took a place amongst classic English biographies.

Robertson, GEORGE CROOM (1842-92), born at Aberdeen, studied at Aberdeen under Professor Alexander Bain (q.v.), from whom his philosophical system derived its main impulse. He continued his studies at University College, London, as well as in France and Germany; and in 1866 became professor of Mental Philosophy and Logic at University College, London. He wrote on Hobbes, and started (1876) and edited *Mind*. See memoir by Professor Bain prefixed to his *Philosophical Remains* (1894). Two volumes of lectures were also published from notes by Mr Rhys Davids, as *Elements of General Philosophy and Elements of Psychology* (1896). His general position was akin to that of Bain and the two Mills.

Robertson, JAMES (1725-88), born in Fifeshire, served in America in the French and Indian wars, and then in the British army in the Revolutionary war, being (in 1779), when major, made governor of New York. He was regarded as arbitrary and unscrupulous.

Robertson, JAMES CRAIGIE (1813-82), born at Aberdeen, studied at Trinity College, Cambridge, and became vicar of Bekebourne, Kent (1846), canon of Canterbury (1859), and professor of Ecclesiastical History at King's College, London (1864-74). His chief work was *Materials for the History of Becket* (6 vols. Rolls series, 1875-82); but he wrote also a *History of the Christian Church* and lectures on the growth of the papal power.

Robertson, JOSEPH, Scottish antiquary, was born, a small shopkeeper's son, at Aberdeen, 17th May 1810, and was educated at Udnv Academy, and the grammar-school and Marischal College of his native city. An Episcopalian and Conservative, he was apprenticed to a lawyer, but took early to writing, and, after six years of literary work at Edinburgh, was a newspaper editor at Aberdeen, Glasgow, and Edinburgh from 1839 to 1853. He was in that year appointed curator of the historical department of the Edinburgh Register House, and died 13th December 1866. He was an originator of the Aberdeen Spalding Club (1839-70), for which he edited four works; and for the first edition of this encyclopædia he wrote eighty articles. Of his other works may be noticed *The Book of Bon-Accord, or a Guide to the City of Aberdeen* (1839), *Catalogues of the Jewels, Dresses, Books, and Paintings of Mary Queen of Scots* (Bannatyne Club, 1863), the invaluable *Concilia Scotiæ: Ecclesiæ Scotiæ Statuta, 1225-1559* (2 vols. Bannatyne Club, 1866), and an admirable article in the *Quarterly Review* for June 1849 on 'Scottish Abbeys and Cathedrals.' See the Memoir prefixed to a reprint of the last (Aberdeen, 1891).

Robertson, THOMAS WILLIAM, dramatist, was born at Newark-on-Trent, on 9th January 1829, of a family of actors. About the middle of the century the Lincoln circuit, with which his father was connected, ceased to pay; the company was broken up, and 'Tom' proceeded to London. There he struggled for a living, acting as prompter and stage manager, writing unsuccessful plays, acting himself, writing for newspapers and magazines, *Fun* amongst them, translating French plays, and so forth; but Robertson was never an actor of any mark. His first success as a dramatist was with *David Garrick*, in 1864, the title rôle of which was one of Sothorn's great things. This was followed by the production of the comedy *Society* (1865) at Liverpool, where, as later in

London, it was received with the warmest approval. His next comedy, *Ours* (1866), produced by the Bancrofts at the Prince of Wales's Theatre, London, thoroughly established Robertson's fame; and from that time his pen was kept incessantly busy. *Caste* (1867), *Play* (1868), *School* (1869), *M.P.* (1870)—all brought out by the Kendals at the Prince of Wales's—and *Home* (1869) and *Dreams* (1869), the former at the Haymarket, the latter at the Gaiety, were all equally successful. But in the midst of his triumphs Tom Robertson died, in London, on 3d February 1871. His best comedies long retained their popularity owing to the excellence of their construction and stagecraft, their bright and merry humour, their wholesome, healthy tone, their happy contrasts, and the sunny spirit that shimes through them. See his *Principal Dramatic Works*, with Memoir by his son (2 vols. 1889), and the *Life and Writings*, by Pemberton (1893).

Robertson, WILLIAM, the historian, was born 19th September 1721, at Borthwick in Midlothian, of which parish his father was minister. He went to school at Dalkeith, at twelve entered the university of Edinburgh, and at twenty-two was ordained as minister of Gladsmuir. On the sudden death of his father and mother soon after, the care of a younger brother and six sisters devolved upon him, and this duty he at once cheerfully undertook, although his income was but £100 a year. At the same time he was assiduous in preaching, in catechising, and in all the duties of his office. His vigour and patriotism he showed by joining a body of volunteers formed for the defence of Edinburgh against the Jacobite rebels in 1745, and after the surrender of the city he offered his services to the commander at Haddington. As early as 1751 we find Robertson taking a prominent part in the debates of the General Assembly, and indeed his influence soon became supreme as leader of the 'Moderate' party in the church. He carried the deposition of Gillespie in the Assembly in 1752, and in 1757 the acquittal of Carlyle of Inveresk before the Synod for having been present at the performance of Home's tragedy of *Douglas* on the Edinburgh stage. From 1759 till his death he was joint-minister with Dr Erskine of Greyfriars Church, Edinburgh, and in the same year he was appointed chaplain of Stirling Castle. Still further, in 1761 he became a royal chaplain, in 1762 principal of the university of Edinburgh, and in 1764 the office of king's historiographer was revived in his favour, with a salary of £200 a year. Tempting offers of golden preferment in the English church were held out to him, but these he was too sensible and honest to accept. All this was because of the splendid and immediate success of his *History of Scotland* (1753-59), which earned the warmest praises from Hume, Horace Walpole, Lord Chesterfield, Bishop Warburton, David Garrick, and Baron d'Holbach, if not Dr Johnson—'Sir, I love Robertson; and I won't talk of his book,' said the doctor to Boswell. Next followed the *History of the Reign of the Emperor Charles V.* (3 vols. 1769), to which was prefixed an admirably synthetic and suggestive *View of the State of Society in Europe from the subversion of the Roman Empire to the beginning of the Sixteenth Century*. He received £4500 for the copyright, and was gratified by the most flattering praises from Voltaire and Gibbon. The *History of America* appeared in 1777; *An Historical Disquisition concerning the Knowledge which the Ancients had of India* in 1791. Robertson died near Edinburgh, 11th June 1793, and was buried in the Greyfriars churchyard.

Robertson's Histories are still excellent reading, although in every case they have been left behind by the more valuable works of a later day. Their merit is great, considering the slenderness of the

materials then available and the fact that he lived almost half a century before the modern conception of the scope and method of history awoke. None of his contemporaries philosophised on defective data with greater dignity or less unconsciousness of 18th-century limitations; but it is true that many of the remarks in his review of the state of Europe display a quite remarkable sagacity and power of generalisation. His style is clear and correct, but is formal, and lacks idiomatic vigour and spontaneity.

See short lives by Dugald Stewart, prefixed to his works, and by Bishop Gleig; also the sketch by Lord Brougham (a grand-nephew) in his *Lives of Men of Letters of the Time of George III.*; 'Jupiter' Carlyle's *Autobiography*; and Cockburn's *Memorials*.

Robes, MISTRESS OF THE. See **HOUSEHOLD.**

Robespierre, MAXIMILIEN MARIE ISIDORE, was born of a legal family, originally of Irish origin, at Arras, 6th May 1758. His mother died in 1767, his broken-hearted father two years later, and the four children were brought up by their maternal grandfather, an Arras brewer. Maximilien, the eldest, early showed unusual promise, and was educated at Arras and at the Collège Louis-le-Grand at Paris, where Camille Desmoulins was a fellow-student. He was admitted *avocat* in 1781, and next year was named criminal judge by the bishop of Arras, but resigned his place soon after to avoid passing a sentence of death. All through life a fanatical devotee of the gospel according to Rousseau, his sentimentality and taste for verses made him popular among the *Rosati* at Arras. He drew up the *cahier* or list of grievances for the guild of cobblers, and was elected to the States-general in 1789 as one of the deputies for the *tiers état* of Artois. He soon attached himself to the extreme Left—the 'thirty voices,' and though his first speeches excited ridicule, it was not long before his earnestness and his high-sounding phrases commanded attention. 'That young man believes what he says; he will go far,' said Mirabeau, forecasting his future with the divination of genius. Indeed his influence grew daily, both in the Jacobin Club and in the Assembly, and thousands amongst the mob of patriots outside became fanatical in their admiration of his sincere cant and his boasted incorruptibility. Three days after the death of Mirabeau he called upon the Assembly to prevent any deputy from taking office as minister for four years, and in the following month (May 1791) carried the motion that no member of the present Assembly should be eligible for the next. This policy grew out of the narrow and acrid suspiciousness of his own nature, and reveals the inherent meanness of his aims and his failure to grasp that grand idea of real parliamentary government by a responsible ministry, which had been the dearest dream of Mirabeau. Next followed Robespierre's appointment as public accuser, the king's flight to Varennes (June 21st), Lafayette's last effort to control the sacred right of Insurrection on the Champ-de-Mars (17th July), the abject terror of Robespierre, his sheltering himself in the house of Duplay, a carpenter, his hysterical appeal to the Club, the theatrical oath taken by every member to defend his life, and his being crowned with chaplets, along with Pétion, and carried home in triumph by the mob at the close of the Constituent Assembly (30th September).

After seven weeks of quiet he sold his small patrimony and returned to Paris, to the house of Duplay, where he remained to the last day of his life. He was much beloved in the family, and a passion quickly sprung up betwixt himself and his host's eldest daughter Éléonore, a romantic girl of twenty-five. His room was a humble chamber

in which he worked and slept; its decorations, a few busts and portraits of himself. Alone amongst the patriots he was noted for the carefulness of his dress, which never varied in the slightest—powdered hair, a bright blue coat, white waistcoat, short yellow breeches, with white stockings and shoes with silver buckles. Small and feeble in frame, solitary and reserved in habits, he ever wore an anxious look upon his straitened and spectacled face; his complexion was atrabilious, even *verdâtre*; and he retained to the last the sobriety of the cynic, drinking only water.

Meantime the Girondist party had been formed in the new Legislative Assembly, its leaders—the loudest, Brissot—eager for war. Robespierre, who ever feared and disliked war, offered a strenuous opposition in the debates of the Jacobin Club, and sometimes, if seldom, in his endless and windy harangues rose into the region of real eloquence. He headed the Jacobin wing of 'the Mountain,'—the party in the Assembly which, sitting on the higher benches, opposed the Girondists—as Danton headed the Cordelier wing. In April 1792 he resigned his post of public prosecutor. He was invisible during the crisis of the 10th August, but he joined the Hôtel-de-Ville faction, and on the 16th August we find him presenting to the Legislative Assembly its petition for a Revolutionary Tribunal and a new Convention. It does not appear, however, that he was in any sense directly responsible for the atrocious September massacres in the prisons, or more than a mere accessory after the fact. For his reward he was elected first deputy for Paris to the National Convention, which opened on the 21st September. The bitter attacks upon him by the Girondists were renewed only to throw Robespierre into a closer union with Danton and his party, but the final struggle was interrupted for a little by the momentous question of the king's trial. Robespierre opposed vigorously the Girondist idea of a special appeal to the people on the king's death, and his execution (21st January 1793) opened up the final stage of the struggle, which ended in a complete triumph of the Jacobins on the 2d June of the same year. The first Committee of Public Safety—a permanent Cabinet of Revolution—was decreed in April 1793, but Robespierre was not elected till the 27th July. He was now for the first time one of the actual rulers of France, but it is open to question whether for the whole twelve months from this time to the end he was not merely the stalking-horse for the more resolute party within the Twelve. His vaunted respectability, his great popularity with the mob, and his gift of fluent, if vague and windy, oratory made an admirable cover for the truculent designs of strong and completely unscrupulous men like Billand-Varennes and Collet d'Herbois, and at least it is certainly the case that Conthon and Saint-Just were the only members whose political and social ideals coincided with his own. Destitute of political intuition, without foresight or sagacity, himself the mere dupe of a few borrowed phrases, he was strong because within his narrow limits he was honest, and because he actually had a horizon of social ideals, not nakedly identical with his own advantage. He was astute enough, moreover, to play off one force against another—the Convention, the Commune, and the Committee, while he derived his strength from the constant worship of the Club.

The next scenes in the great drama of Revolution were the dark intrigues and desperate struggles that sent Hébert and his friends to the scaffold on the 24th March 1794, and Danton and Robespierre's school-fellow, Camille Desmoulins, on the 5th of April after. Hébert Robespierre had

long disliked, and Chaumette's crazy deification of the Goddess of Reason had filled him with disgust; Danton he at once hated and feared with that fierce and spiteful hatred he ever felt instinctively for men like the great Tribune and Vergniaud with natural gifts beyond his own. 'Robespierre will follow me: I drag down Robespierre,' said Danton with prophetic truth. The next three months he reigned supreme, but his supremacy prepared the way for his inevitable fall. He nominated all the members of the Government Committees, placed his creatures in all places of influence in the commune of Paris, sent his henchman Saint-Just on a mission to the armies on the frontier, assumed supreme control of the Revolutionary Tribunal, and completely revolutionised its method of operation by the atrocious measure introduced by his creature Couthon on the 22d Prairial (10th June), to the effect that neither council nor witnesses need be heard if the jury had come otherwise to a conclusion. The fatal significance of this change—a complete abrogation of all law—is seen in the fact that from this time till the day of Robespierre's death the daily tale of victims of the guillotine averaged almost thirty. But, in accordance with the law that governs all human things, as Robespierre's power increased his popularity decreased, and still further he had committed the fatal folly of making himself publicly ridiculous. Already his voluntary bodyguard of *Tappe-durs* had excited derision and resentment, but his declaration on 7th May of a new religion for the state—the foundation of a new regime of public morality—awakened in the mind of Paris the slumbering sense of humour. The Convention at Robespierre's instance agreed to compliment the Supreme Being with an acknowledgment of His existence and themselves with the Consolatory Principle of the Immortality of the Soul, to be celebrated in thirty-six annual festivals. The first of these was held on the 8th of June, when Robespierre, glorious in a new violet-blue coat, walked in front of the procession and delivered his soul of a vapid harangue, and set fire to pasteboard figures representing Atheism, Selfishness, Annihilation, Crime, and Vice. An old mad woman named Catherine Theot, who thought herself the mother of God, now declared Robespierre to be the new divine Saviour of the world, and drew down upon him still further ridicule in the Convention. Meantime the pace of the guillotine grew faster, although apparently Robespierre hoped to bring it to a close as soon as all his more dangerous enemies, like Tallien, Fouché, and Vadier, were cut off. Meantime the public finance and the work of government generally drifted to ruin, and Saint-Just openly demanded the creation of a Dictatorship in the person of Robespierre as alone possessing intellect, energy, patriotism, and revolutionary experience enough. On the 26th July (8th Thermidor), after about a month's absence, the Dictator delivered a long harangue complaining that he was being accused of crimes unjustly. He was listened to in deep and unsympathetic silence, and the Convention, after at first obediently passing his decrees, next rescinded them and referred his proposals to the committees, and the sitting ended without anything being concluded. That night at the Jacobin Club his party again triumphed, and the Tallien party in despair hurried to the members of the Right, the Girondist remnant, and implored their help against the common enemy at this desperate juncture. Next day at the Convention Saint-Just could not obtain a hearing. Tallien, Billaud-Varennes, and Vadier vehemently attacked Robespierre, and the voice of the Dictator himself was drowned with cries of 'Down with the tyrant!' Turning to the Right, 'I appeal to you whose hands are clean,' he cried, but the Right sat

in stony silence. 'President of Assassins, I demand to be heard,' he cried, but his voice died down in his throat.—'The blood of Danton chokes him,' cried Garnier. An unknown deputy named Louchet proposed that Robespierre should be arrested, and at the fatal words his power crumbled into ruins. His younger brother and Lebas demanded to be included in the honourable sentence. Vain attempts were made by the Jacobin Club and the Commune to save their hero, but Paris refused to move, and even Henriot's artillerymen to obey. Robespierre broke his arrest and flew to the Common Hall, whereupon the Convention at once declared him out of the law. The National Guard under Barras turned out to protect the Convention, and Robespierre had his lower jaw broken by a shot fired by a gendarme named Merda, or, as many believed, by his own hand. Next day (28th July; 10th Thermidor 1794), still in his sky-blue coat, the miserable, trembling wretch died with Saint-Just, Couthon, and nineteen others by the guillotine; the day after seventy-one members of the municipality followed, twelve more on the third day, and the Reign of Terror was extinguished in a sea of blood.

See the histories of the Revolution by Lamartine, Michelet, Louis Blanc, Carlyle, Von Sybel, H. Morse Stephens, Taine, and A. Mathiez, whose *Fall of Robespierre* (trans. from Fr., 1927) is a well-reasoned defence of the tyrant; the Life by G. H. Lewes (1849); Hamel's exhaustive but too eulogistic *Vie de Robespierre* (3 vols. 1865-67), also his *Thermidor* (1891); works by Hilaire Belloc (1902), Clauzel (1912), and Warwick (1909).

Robin. See REDBREAST. The American Robin is a thrush—the *Turdus migratorius*; and the Golden Robin is the Baltimore Bird (q.v.).

Robin Goodfellow. See PUCK.

Robin Hood, the hero of a group of old English ballads, represented as an outlaw and a robber, but of a gallant and generous nature, whose familiar haunts are the forests of Sherwood and Barnsdale, where he fleets the time carelessly in the merry greenwood. He is ever genial and good-natured, religious, respectful to the Virgin and to all women for her sake, with a kind of gracious and noble dignity in his bearing. He lives by the king's deer, although personally most loyal, and wages ceaseless warfare on all proud bishops, abbots, and knights, taking of their superfluity, and giving liberally to the poor and to all honest men in distress, of whatever degree. He is unrivalled with the bow and quarter-staff; but in as many as eight of the extant ballads comes off the worse in the combat with some stout fellow, whom he thereupon induces to join his company. His chief comrades are Little John, Scathelok (Scarlet), and Much; to these the *Gest* adds Gilbert of the White Hand and Reynold. A stalwart curial friar, called Friar Tuck in the title though not in the ballad, fights with Robin Hood, and apparently joins his company, as he appears later in two broadsides, which also mention Maid Marian. Such is the romantic figure of the greatest of English popular heroes—a yeoman-counterpart to the knightly Arthur.

The earliest notice of Robin Hood yet found is that pointed out by Percy in *Piers Plouman*, which, according to Skeat, cannot be older than about 1377. Here Sloth says in his shrift that, though but little acquainted with his paternoster, he knows 'rymes of Robyn Hood and Randolf, erle of Chestre.' In the next century we find him mentioned in Wyntoun's *Chronicle of Scotland* (c. 1420); a petition to parliament in the year 1439 represents a broken man in Derbyshire taking to the woods 'like as it hadde be Robyn-hode and his meyné'; Bower, in his *Scottichronicon* (1441-47), describes the lower orders of his time as entertaining themselves with ballads both merry and serious

about Robin Hood, Little John, and their mates, and preferring them to all others; and Major or Mair (c. 1470-1550) says in his *Historia Maioris Britanniae* that Robin Hood ballads were sung all over Britain. The last passage gives apparently the earliest mention of those more romantic and redeeming features of Robin Hood which earned him a place in Fuller's *Worthies of England*, under his proper county, sweet Nottinghamshire, 'not for his thievery but for his gentleness.' Yet another 15th-century mention occurs in the *Paston Letters*, where Sir John Paston writes in 1473 of a servant whom he had kept to play Robin Hood and the Sheriff of Nottingham.

Fragments of two Robin Hood plays exist, one dating from 1475, the other printed by Copland with the *Gest* about 1550. The latter is described in the title as 'very proper to be played in May-games.' Robin Hood was a popular figure in these during the 16th century, as we find from Stow, Hall, and other writers, and there is evidence that in this connection he was known as far north as Aberdeen. In place-names again we find traces of him in cairns, mounds, hills, rocks, crosses, fountains, caves, and oaks from Somerset to Whitby. In the *Gest* the localities around Barnsdale are topographically correct, down to the place of his death at the priory of Kirkless between Wakefield and Halifax. Here the valiant outlaw is treacherously bled to death by his kinswoman the prioress, to whom he had gone for relief in his sickness. His last charge to Little John is completely true to his character, and is expressed in lines of touching simplicity:

Lay me a green sod under my head,
And another at my feet;
And lay my bent bow by my side,
Which was my music sweet;
And make my grave of gravel and green,
Which is most right and meet.

There is no evidence worth anything that Robin Hood was ever more than a mere creation of the popular imagination, but in due time the yeoman became a political personage, and was transformed into an Earl of Huntingdon for whom a suitable pedigree was constructed. Both Sir Walter Scott, in *Ivanhoe*, and Thierry, in his *Conquête de l'Angleterre*, make him a Saxon chief holding out like Hereward against the Normans; Bower, the continuator of Fordun, distinctly calls him one of the proscribed followers of Simon de Montfort; Joseph Hunter (1852) makes him an adherent of the Earl of Lancaster in the insurrection of 1322. The last scholar discovered a still further and exceptionally amusing mare's nest in the name of one Robyn Hode, who entered the service of King Edward II. about Christmas 1323 as one of the 'vadlets, porteurs de la chambre,' and was eleven months later found unfit for his duties, and paid off with a gift of five shillings. 'To detect "a remarkable coincidence between the ballad and the record" requires,' says Professor Child, 'not only a theoretical prepossession, but an uncommon insensibility to the ludicrous.' Kuhn again identifies our outlaw with Woden; others with a sun-god, a woodland deity, and the like—all which subtleties of speculation are unnecessary if we readily admit that the hero of popular creative imagination may well have formed a peg round which to hang much old-world wood-lore even then fast fading into forgetfulness.

Of Robin Hood ballads there have come down to us in more or less ancient form as many as forty, of which eight may be said to be of the first importance, and of almost the finest quality of ballad poetry. Of the remaining thirty-two, as Professor Child points out, about half a dozen have in them something of the old popular quality; as many more not the least snatch of it. Fully a dozen

are variations, sometimes wearisome, sometimes sickening, upon the theme 'Robin Hood met with his Match.' The best of all the cycle are perhaps 'Robin Hood and the Monk,' and 'Robin Hood and Guy of Gisborne,' and both open with a delightful glimpse of the green wood a century and more before its time in English poetry—

In somer, when the shawes be sheyne,
And leves be large and long,
Hit is full mery in feyre foreste
To here the foulis song:

To se the dere draw to the dale,
And leve the hilles hee,
And shadow hem in the levés grene,
Under the grene-wode tre.

The second begins no less beautifully—

When shawes beene sheene, and shradde full fayre,
And leaves both large and longe,
Itt is mery, walking in the fayre fforrest,
To hear the small birds songe.

The *Lytell Geste of Robyn Hode* was printed by Wynken de Worde, most probably before 1500, a long poem of over 1800 lines, arranged in eight *fyttes*, being a not unskilful redaction of at least four earlier distinct ballads.

See Ritson's collection of Robin Hood ballads (2 vols. 1795); J. M. Gutch's *Lytell Geste of Robyn Hode* (2 vols. 1847); the *Percy Folio Manuscript*, vol. i. (1867), and the Introduction to the Robin Hood ballads there by Professor Hales; and especially part v. (Boston, 1888) of Professor Child's magisterial *English and Scottish Popular Ballads*. The first known 'Garland' was printed in 1670, and in 1678 there appeared a prose version of it, reprinted by Thoms in his *Early English Prose Romances*. See also BALLADS; and Sidney Lee in *Dict. Nat. Biog.*

Robin Hood's Bay, a fishing-village in the North Riding of Yorkshire, 6½ miles S.E. of Whitby. The bay itself is picturesquely fringed by lofty cliffs, rising in the Old Peak, its southern horn, to a height of 585 feet. It owes its name to traditions of Robin Hood, whose arrows shot from the tower of Whitby Priory reached Hawkser, 3 miles distant.

Robinia, a genus of trees and shrubs of the family Leguminosæ, sub-family Papilionaceæ. The most important species is the Locust Tree (q.v.), also known as the False Acacia, or Thorn Acacia, often simply designated Acacia. It is a native of North America, extending from Canada to the southern states, and is there much valued for the hardness and durability of its timber. With it, it is alleged, the houses of the Pilgrim Fathers were built, and the city of Boston founded. When green it is of soft texture, but when mature and seasoned it rivals the oak for strength and durability. It is close grained and finely veined, and in America is the most valued of all timbers for cabinet-work. On account of its quick growth, its spines, and its property of submitting to be clipped into any form, it is very suitable for hedges. In the south of Europe it succeeds well as a timber-tree, but in more northern regions it suffers from frost in severe winters; and in Britain it often suffers from frost, owing to the imperfect ripening of the wood in summer. It does not readily rot in water, and has been used for shipbuilding. The tree is very ornamental, and of rapid growth. The flowers are fragrant and white, in large pendulous racemes. In San Domingo its flowers are used for making a distilled liquor and a syrup. The roots throw up many suckers, and are very sweet, affording an extract resembling liquorice.—*R. viscosa* is a smaller tree, but even more ornamental, a native of the south-western parts of the Alleghany Mountains. It has rose-coloured scentless flowers. The young branches are viscid.—The Rose Acacia (*R. hispida*) is a native of the south-western ranges of the Alleghanies, and is a highly ornamental shrub, with hispid branches, and large rose-coloured scentless flowers.

Robins, BENJAMIN, mathematician, the father of the military art of gunnery, was born at Bath in 1707 of a poor Quaker family. Having obtained a little instruction in mathematics, he prosecuted this branch of science with great zest, and, having removed to London, set up for a teacher of mathematics, and published several mathematical treatises which gained for him considerable reputation. Robins next commenced his great series of experiments on the resisting force of the air to projectiles, varying his labours by the study of fortification, and invented the Ballistic Pendulum. In 1735 he demolished, in a treatise entitled *A Discourse concerning the Certainty of Sir I. Newton's Method of Fluxions*, Berkeley's objections against Newton's principle of ultimate ratios. His great and valuable work, the *New Principles of Gunnery*, upon the preparation of which he had spent an enormous amount of labour, appeared in 1742, and produced a complete revolution in the art of gunnery. In consideration of his able defence of the policy of the government, by means of pamphlets which he wrote and published from time to time, he received (1749) the post of 'Engineer-in-general to the East India Company'; but his first undertaking, the planning of the defences of Madras, was no sooner accomplished than he was seized with a fever, and he died July 29, 1751. His works were collected and published in 1761.

Robinson, EDWARD, philologist and biblical scholar, was born at Southington, Connecticut, April 10, 1794, graduated at Hamilton College, New York, in 1816, and there remained till 1821, when he went to Andover, Massachusetts, to see through the press an edition of part of the *Iliad*. Here he studied Hebrew under Professor Stuart, but in 1826 went to Germany, where he studied under Gesenius and Neander, and married as his second wife Therese A. L. von Jakob, daughter of a professor at Halle. In 1830 he became extraordinary professor of Sacred Literature at Andover, in 1837 professor of Biblical Literature in the Union Theological Seminary, New York. He now made an extensive survey of Palestine, collecting materials for *Biblical Researches in Palestine and Adjacent Countries* (3 vols. 1841). A second visit in 1852 yielded fruit for its second edition (1856). Robinson died in New York, 27th January 1863.

His other works are a translation of Buttmann's *Greek Grammar* (1832); *Greek and English Lexicon of the New Testament* (1836; 1850); *Harmony of the Gospels*, in Greek (1845), and in English (1846). He was also editor of the *Biblical Repository*, *Bibliotheca Sacra*, *Cainet's Bible Dictionary*, and a translation of Gesenius' *Hebrew Lexicon*.

His wife, **THERESE ALBERTINE LOUISE VON JAKOB**, well known to the world of letters as 'Talvi,' a name composed of her initials, was born at Halle, January 26, 1797. At ten she went to Kharkoff in Russia, where her father had become professor, but in 1810 they removed to St Petersburg. In 1816 they returned to Halle, and here she studied Latin, and wrote her volume of tales, *Psyche* (1825). As 'Ernest Berthold' she published translations of Scott's *Black Dwarf* and *Old Mortality*, and also two volumes of Serbian popular songs, *Volkslieder der Serben* (1825-26). In 1828 she married Robinson, and in 1830 accompanied him to America. After his death she lived mostly at Hamburg, where she died 13th April 1869.

Robinson, EDWIN ARLINGTON, poet, was born 22d December 1869, near Gardiner, Maine, and studied at Harvard. From 1896 on he published verses. *Captain Craig* (1902) gained him President Roosevelt's admiration and a place in the Custom House at New York (1905-10). *The Town*

down the River (1910) and *The Man Against the Sky* (1916) placed him in the front rank of American poets. It was followed by *Merlin* (1917), *Lancelot* (1920), *The Three Taverns* (1920), *The Man who died Twice* (1924), and *Tristram* (1927). His poems were collected in 1922 with an introduction by John Drinkwater. Mr Robinson's poetry is intellectual, pale in its tones, technically of very high accomplishment, with an epigrammatic justness that could not be bettered.

Robinson, HENRY CRABBE, born of middle-class parentage at Bury St Edmunds on 13th May 1775, was educated there and at Devizes, and then was articled to a Colchester attorney (1790-95). He studied five years at Jena, Weimar, &c. (1800-5), making friends or acquaintances of nearly all the great German spirits of the day, and during 1807-9 was engaged on the *Times*—in Spain, the first war-correspondent. In 1813, at the age of thirty-eight, he was called to the bar, from which, having risen to be leader of the Norfolk circuit, he retired in 1828 with £500 a year. 'In looking back on his life, Mr Robinson used to say that two of the wisest acts he had done were going to the bar and quitting the bar.' Thenceforth he lived chiefly in London, with frequent tours both at home and abroad till 1863, giving and receiving much hospitality, until at the ripe age of ninety-one he died unmarried on 5th February 1867. A dissenter and a Liberal, he was one of the founders of the London University (1828), an early member of the Athenæum Club (1824). Withal he was a splendid talker, who 'talked about everything but his own good deeds,' a buoyant companion, an earnest thinker, a prodigious reader, content not to publish but to keep a diary. 'I early found,' he says, 'that I had not the literary ability to give me such a place among English authors as I should have desired; but I thought that I had an opportunity of gaining a knowledge of many of the most distinguished men of the age, and that I might do some good by keeping a record of my interviews with them. True [which was not quite true], I want in an eminent degree the Boswell faculty; still, the names recorded in his great work are not so important as Goethe, Schiller, Herder, Wieland, the Duchesses Amelia [Amalia] and Louisa of Weimar, Tieck, as Madame de Staël, La Fayette, Abbé Grégoire, Benjamin Constant, as Wordsworth, Southey, Coleridge, Lamb, Rogers, Hazlitt, Mrs Barbauld, Clarkson, &c., &c., for I could add a great number of minor stars. And yet what has come of all this? Nothing. What will come of it? Perhaps nothing.' Yes, something has come of it—the three delightful volumes, edited in 1869 by Dr Sadler, of his *Diary, Reminiscences and Correspondence*, which will last as long as literature itself, and Professor Edith Morley's selections, *Blake, Coleridge, Wordsworth, Lamb, &c.* (1922), *Correspondence* (1927).

Robinson, JOHN, pastor of the Pilgrim Fathers, was born, probably in Lincolnshire, about 1575, was a Fellow of Corpus Christi, Cambridge, and ministered to a church near Norwich, until he was suspended for his Puritan tendencies. In 1604 he resigned his fellowship and all connection with the Church of England, and gathered a congregation of dissenters at Gainsborough. He was afterwards a minister at Scrooby, but in 1608 he and his flock escaped to Amsterdam; in 1609 he passed to Leyden, and there in 1611 he established a church, and in 1613 met Episcopius, Arminius's successor, in debate. In 1620, after a memorable sermon, he saw the younger members of his congregation set sail in the *Speedwell* (which vessel they afterwards changed for the *Mayflower*). He himself intended to, and his son in 1631 did, follow them to Massachusetts. He died at Ley-

den in March 1625. His works, with a memoir by R. Ashton, were collected in 3 vols. (Lond. and Boston) in 1851. In 1891 a large bronze tablet to his memory was placed by the American Congregational churches on the outer wall of St Peter's, Leyden, in one of whose vaults he is buried. See *Lives* by Davis (Boston, 1903), and Powicke (1920).

Robinson, MARY, 'Perdita' (1758-1800), born at Bristol, played 'Perdita' and other Shakespearian parts at Drury Lane 1776-80, and became mistress in 1779 to the future George IV. (q.v.), who gave her a bond (never paid) for £20,000. Long a conspicuous personality, she wrote poems, plays, and novels; in 1783 got a pension of £500, but died poor and palsied. See her *Memoirs*, edited by her daughter (1801).

Robinson, MARY. See DARMESTETER.

Robison, JOHN, was born at Boghall in Stirlingshire in 1739, and educated at Glasgow grammar-school and university. He devoted himself early to physical science, became acquainted with James Watt and Dr Black, and succeeded to the latter's chair on his transference to Edinburgh in 1766. Four years later he went to Russia as secretary to Admiral Knowles, who had been appointed president of the Russian Board of Admiralty. In 1774, he accepted the chair of Natural Philosophy at Edinburgh, but he made an indifferent lecturer, and disliked experiments. He died January 28, 1805. His *Elements of Mechanical Philosophy* was edited by Sir D. Brewster (4 vols. 1822). His foolish *Proofs of a Conspiracy against all the Religions and Governments of Europe, carried on in the Secret Meetings of Freemasons, Illuminati, and Reading Societies* (1797) is a lasting monument of fatuous credulity.

Rob Roy (Gaelic, 'Red Robert'), the Scottish Robin Hood, was born in the year 1671, the second son of Lieut.-colonel Donald Macgregor of Glen-gyle. Till 1661 the 'wicked clan Gregor' had for more than a century been constantly pursued with fire and sword; the very name was proscribed. But from that year until the Revolution the severe laws against them were somewhat relaxed; and Rob Roy, who married a kinswoman, Mary Macgregor, lived quietly enough as a grazier on the Braes of Balquhider. From youth, however, he was a master of the claymore, the uncommon length of his arms giving him much advantage, for without stooping he could tie the garters of his Highland hose, 2 inches below the knee. Then his herds were so often plundered by 'broken men' from the north that he had to maintain a band of armed followers to protect both himself and such of his neighbours as paid him blackmail. And so with those followers, espousing in 1691 the Jacobite cause, he did a little plundering for himself, and, two or three years later having purchased from his nephew the lands of Craigroyston and Inversnaid, laid claim thenceforth to be chief of the clan. In consequence of losses incurred about 1712 in unsuccessful speculations in cattle, for which he had borrowed money from the Duke of Montrose, his lands were seized, his houses plundered, and his wife shamefully used, turned adrift with her children in midwinter. Madened by these misfortunes, Rob Roy gathered his clansmen and made open war on the duke, sweeping away the whole cattle of a district, and kidnapping his factor with rents to the value of more than £3000 Scots. This was in 1716, the year after the Jacobite rebellion, in which at Sheriffmuir Rob Roy had 'stood watch' for the booty, and had been sent by the Earl of Mar to raise some of the clan Gregor at Aberdeen, where he lodged with a kinsman, Professor Gregory. Marvellous stories are current round Loch Katrine and Loch Lomond (where a cave near Inversnaid still bears his name)

of his hairbreadth escapes from capture, of his evasions when captured, and of his generosity to the poor, whose wants he supplied at the expense of the rich. They in return gave him timely warning of the designs of his two arch-foes, the Dukes of Montrose and Athole, and of the red-coats they called to their aid from Dumbarton and Stirling; besides, Rob Roy enjoyed the protection of the Duke of Argyll, having assumed the name Campbell, his mother's. Late in life he is said to have turned Catholic, but in the list of subscribers to the Episcopalian church history of Bishop Keith occurs the name 'Robert Macgregor *alias* Rob Roy.' The history came out in 1734, and on the 28th December of that same year Rob Roy died in his own house at Balquhider. He left five sons, two of whom died in 1754—James, an outlaw, in Paris; and Robin, the youngest, on the gallows at Edinburgh for abduction.

See the introduction and notes to Scott's *Rob Roy* (1817); Dorothy Wordsworth's *Tour in Scotland in 1803*, with her brother's poem; and the *Lives* of Rob Roy by K. Macleay (1818; new ed. 1881) and A. H. Millar (1883).

Robsart, AMY. See LEICESTER, EARL OF.

Robson, FREDERICK, whose real name was F. R. BROWNBILL, low comedian, was born at Margate in 1821. He was apprenticed to a London copper-plate engraver; but became smitten with stage fever and took to the actor's life (1844). From 1853 he was inseparably associated with the Olympic Theatre of London, where he attracted large audiences for years by his representations in comedy, farce, and burlesque. An actor of original genius, Robson excelled in parts that were grotesque, eccentric, quaintly humorous or droll; he was particularly effective in sudden transitions from comicality to pathos, and the reverse, and in the delineation of violent and tumultuous passion. He gave a vivid portrait of the street outcast as Jem Baggins in the *Wandering Minstrel*, in which he sang the once celebrated 'Villikins and his Dinah.' He burlesqued Macbeth and Shylock, uniting in his playing the ludicrous and the terrible. One of his principal characters was Desmurets, a spy of Fouché's, in the play *Plot and Passion*; others were the dwarf in Planché's *Yellow Dwarf*, and Uncle Zachary in *Peter and Paul*. He died 12th August 1864.

See Dutton Cook in *Gentleman's Magazine* (1882), and the sketch by G. A. Sala (1864).

Robson, MOUNT, a magnificent peak of the Rocky Mountains in British Columbia, next the Fraser River and the Canadian National Railway, over 13,000 feet high, with great glaciers.

Roburite, a flameless explosive, composed of chlorinated dinitro-benzene mixed with enough ammonium nitrate to oxidise it completely.

Roc, or RUKH, a fabulous bird of immense size, able to carry off an elephant in its talons. The idea is familiar in the East, and every reader will remember it in the *Arabian Nights' Entertainments*. Colonel Yule pointed out that the huge fronds of the Raphia (q.v.) palms were brought from Madagascar as roc's feathers. Mythical birds of similar size and strength were the Arabian 'anká' and the Persian *simurgh*. The *amru* or *sinamru* was an older Persian supernatural bird; the Indian *garuda*, which bears Vishnu, is the king of birds.

Rocambole (*Allium Scorodoprasum*), a plant of the same genus with garlic, onion, leek, &c., and nearly allied to garlic, which it resembles in its habit, although larger in all its parts. The root forms rounder cloves than those of garlic, and of much milder flavour; the umbels are also bulbiferous. Rocambole has long been cultivated in kitchen-gardens. It is a native of sandy

soils in Denmark and other countries near the Baltic.

Roccella. See ARCHIL.

Rocha, a south-eastern department of Uruguay, on the Atlantic; hilly in the south, in the north a swamp. Area, 4280 sq. m.; pop. 54,000.

Rochambeau, JEAN BAPTISTE DONATIEN DE VIMEURE, COMTE DE, was born at Vendôme, 1st July 1725, entered the army in 1742, was at the siege of Maestricht, and distinguished himself at Minorca in 1756. In 1780 he was sent out in command of an army of 6000 men to support the Americans, and in 1781 he rendered effective help at Yorktown. He became marshal in 1791, and in 1804 Napoleon made him a grand officer of the Legion of Honour. He died 10th May 1807. See his *Mémoires* (2 vols. 1809; Eng. trans. 1838).

Rochdale, a thriving manufacturing town of Lancashire, a municipal, parliamentary, and county borough, on the Roche, 11 miles N. by E. of Manchester and 202 NNW. of London. St Chad's parish church, on an eminence approached by a flight of 122 steps, dates from the 12th century, but is mainly Perpendicular in style. It is a handsome edifice, on which £10,000 was expended in 1884-85. The town-hall, erected in 1866-71, is a very fine Gothic building. The town besides has an infirmary (1883), a library (1884), a post-office (1875), an art gallery and museum (1903), public baths (1868), a statue of John Bright, technical and other schools, parks and playgrounds. Many improvements have been effected, in particular the covering over of the river. The town derives its importance wholly from its extensive and varied manufactures. To the growing of wool was added a trade in woollen goods in the days of Elizabeth, when cotton goods also were sold, and coal-pits worked. Under the Stuarts the woollen manufacture was in full activity; but it was not till 1795 that the first cotton-mill was built, in which in 1802 the father of John Bright began his career as a weaver. Cotton spinning and weaving is now the staple industry, but there are also flannel-mills, foundries, engineering works, &c. Rochdale is the birthplace of Co-operation (q.v.). Since 1832 Rochdale has returned one member to parliament, and in 1856 it was incorporated as a municipal borough. The county borough is coterminous with the parliamentary borough. The manor of Rochdale (*Recedam* in Domesday) was originally held by the Lacys of Pontefract, and through their descendants, the Dukes of Lancaster, passed to the crown. In 1628 it was sold to Sir John Byron, whose descendant, the poet Lord Byron (of Rochdale), sold it in 1823. Pop. (1851) 29,195; (1911) as extended in 1900, 91,428; (1921) 92,700.

Roche, SIR BOYLE (1743-1807), an Irish bull-making M.P., created a baronet in 1782.

Rochefort, HENRI, whose full style was Victor Henri, Marquis de Rochefort-Lugay, a storm-petrel of French politics, was born in Paris, 29th July 1832. He studied medicine, and became a clerk in the hôtel-de-ville, but was dismissed for neglecting his duties, and cast himself entirely upon journalism, contributing to the *Charivari*, the *Figaro*, and other papers, until in 1868 he started his own notorious weekly, *La Lanterne*, which was quickly suppressed by the government. To avoid fine and imprisonment Rochefort fled to Brussels, but returned in 1869 on his election to the Chamber of Deputies for Paris. He now started the *Marseillaise*, in which he renewed his bitter attacks on the imperial regime. One consequence of the cowardly murder of its contributor, Victor Noir, by Prince Pierre Bonaparte, was the suppression of the paper and the imprisonment of its editor. The fall of

the empire gave him his release. In 1871 he was elected by Paris to the National Assembly, soon sided with the Communards, but, fleeing from Paris before the fall of the Commune, was by the Versailles government sentenced to imprisonment for life, and later deported to New Caledonia, whence he escaped in 1874. From London and Geneva he returned after the amnesty of 1880, in his *L'Intransigeant* showed himself as impracticable as ever, sat in the National Assembly (1885-86), took up Boulangism, went into exile with Boulanger, and made the most of the Panamá scandals. Returning to France in 1895, he published *Les Aventures de ma Vie* (trans. 1896), and goaded on the anti-Dreyfus party. He died 30th June 1913.

Rochefort, a small town of Belgium in Namur province at the foot of the Ardennes, with remarkable grottoes.

Rochefort-sur-mer, a French seaport, naval arsenal, and fortress, in Charente-Inférieure, stands on the right bank of the Charente, 9 miles from its mouth, and 18 miles SSE. of La Rochelle. It was founded in 1665 as a naval station by Colbert, Louis XIV.'s minister, and fortified by Vauban, being covered now on the sea side by strong forts; and it is a modern, clean, well-built place, with which few French towns can compare for the number and importance of its public works. The most celebrated of these is the naval hospital (1783-88), with an artesian well 2758 feet deep. There are both a naval harbour and, higher up the river, a commercial harbour with three basins; and Rochefort besides possesses establishments for the manufacture and preservation of naval stores and marine apparatus of every kind. From 1777 till 1852 it was the seat of a great convict prison. Napoleon meant to take ship for America at Rochefort, but instead had to surrender to Captain Maitland of the *Bellerophon*, 15th July 1815. Pop. (1872) 26,619; (1911) 35,019; (1921) 29,473.

Rochefoucauld. See LA ROCHEFOUCAULD.

Rochejacquelein. See LAROCHEJACQUELEIN.

Rochelle, LA, an important seaport and fortress of western France, capital of the department of Charente-Inférieure, on an inlet of the Bay of Biscay, formed by the islands Ré and Oléron, 91 miles WSW. of Poitiers and 297 SW. of Paris. Its harbour, which consists of an outer harbour and inner basins, is still sheltered by the remains of Richelieu's famous dyke. Large ships use the harbour at La Pallice, 3 miles WSW., inaugurated in 1891. Many of the streets and squares are regular and well built, and present a handsome appearance from the number of houses which are adorned with porticoes and balconies. The most noteworthy public buildings are the hôtel-de-ville (1486-1607), the palais-de-justice (1614), and the heavy Grecian cathedral (1742-1862). Besides the fine promenade of the Place du Château, there are, outside the city, two extensive public gardens, known as the Promenade du Mail and the Champs de Mars. La Rochelle is transforming itself into a great fishing port. There is some shipbuilding, especially for the Newfoundland fishery; tinning of sardines and tunny fish; manufacture of textiles, briquettes, porcelain, and glass ware, with refineries of sugar and petroleum, and brandy distilleries. Pop. (1872) 19,070; (1911) 36,371; (1921) 39,770. La Rochelle was known till the 12th century under its Latin name of *Rupella*, 'Little Rock,' of which its present name is a translation. It originated in a colony of serfs of Lower Poitou, who, fleeing from the persecution of their lord, settled on the rocky promontory between the ocean and the neighbouring marshes. On the marriage of Eleanor of Aquitaine

with Henry II. of England, La Rochelle, as part of her dowry, came into the possession of the English kings, by whom it was retained till 1224, when it was taken by Louis VIII.; and, although it was ceded to England at the treaty of Breigny in 1360, in the subsequent wars it was retaken by France, under whose sway it has remained since 1372. A stronghold of the Huguenots (q.v.), it was unsuccessfully besieged in 1573, and in 1627-28 it for fourteen months again offered a heroic though unavailing resistance, under its mayor Guiton, to Cardinal Richelieu. Buckingham's expedition to relieve it failed, and at last the defenders, reduced from 27,000 to 5000, had to surrender to the troops of Louis XIII. With the exception of three towers (1384-1476) its old fortifications were destroyed, and new lines of defences subsequently erected by the great Vauban. Réaumur, Bonpland, Billaud-Varenne, Fromentin, Bouguereau, and Admiral Duperré (1775-1846) were natives.

Rochelle Salt is the popular name of the tartrate of soda and potash ($\text{KNaC}_4\text{H}_4\text{O}_6 + 4\text{H}_2\text{O}$), this salt having been discovered in 1672 by a Rochelle apothecary named Seignette. It occurs, when pure, in colourless transparent prisms, generally eight-sided; and in taste it resembles common salt. It is prepared by neutralising cream of tartar (bitartrate of potash) with carbonate of soda. After a neutral solution has been obtained, it is boiled and filtered, and the resulting fluid is concentrated till a pellicle forms on the surface, when it is set aside to crystallise. This salt is a mild and efficient laxative, and is less disagreeable to the taste than most of the saline purgatives. From half an ounce to an ounce, dissolved in eight or ten parts of water, forms an average dose. A drachm of Rochelle Salt added to one of the ingredients of an effervescing draught (bicarbonate of soda or tartaric acid, for example) forms one of the varieties of what are called Seidlitz powders.

Roches moutonnées, smooth, rounded, hummocky bosses and undulating surfaces of rock, of common occurrence in regions which have been overflowed by glacier-ice. Those which have not been much acted upon by the weather generally show the scratches and groovings which are the characteristic markings of glacial action. Sometimes roches moutonnées are smoothed and polished all over, and have the appearance of whales' or dolphins' backs. At other times they are smoothed only on one side—that side, namely, which faces the direction from which the glaciating agent flowed; the other side, protected from abrasion, being left in its original rough, unpolished condition. The name is said to have been applied by De Saussure from the resemblance of the rocks to the wigs of his day, known as moutonnées, rather than to a flock of sheep lying down.

Rochester, a city of Kent, 29 miles ESE. of London, lies on the banks of the tidal Medway, here crossed by a steel girder bridge (1914), and is continuous with Chatham. The castle or keep, which crowns a steep eminence near the bridge, was the work of Archbishop William de Corbeil (1126); but the wall overlooking the river contains Norman masonry of earlier date, built upon Roman foundations. The castle is 104 feet high and 70 feet square, with walls 12 feet thick, and is a very fine specimen of Norman architecture; it was taken by John (1215, the south-east corner being rebuilt shortly afterwards), vainly attacked by De Montfort (1264), and taken again by Tyler (1381). Both castle and grounds were purchased in 1883 by the corporation from the Earl of Jersey. The episcopal see was founded in 604 by St Augustine, and the foundations of the cathedral then built were discovered in 1891. Bishop Gundulf (1077-1107) built

a new cathedral, of which part of the crypt remains. This cathedral was rebuilt by Ernulf and John of Canterbury (1115-37), whose nave remains; and the choir was again rebuilt and enlarged in the 13th century in part out of offerings of pilgrims at the shrine of St William of Perth, a Scottish baker, who, on a pilgrimage to the Holy Land, was murdered near Chatham by his companion and adopted son; the tower rebuilt in 1825 and in 1904, the choir and transepts restored by Scott (1871-77), and the west front by Pearson in 1891; and extensive work has been done in the chapter-room, choir aisles, and organ. The cathedral measures 306 feet in length, and has double transepts; and special features of interest are the Norman west doorway and nave, the Early English choir, of singular plan and early character, the spacious crypt, and a fine decorated doorway leading to the modern library. The ruins of an early Norman tower (once used as a bell tower) built by Gundulf, the architect of the Tower of London, stand on the north side of the choir. Of Rochester's bishops since 604 may be mentioned Paulinus (previously first bishop of York), Gundulf, Walter de Merton, Fisher, Ridley, Atterbury, and Horsley. St Bartholomew's Hospital, founded by Gundulf in 1078 for lepers, was refounded in 1863; the Norman chapel remains. Watts' Charity House, founded in 1579 to lodge 'six poor travellers, not being rogues or proctors,' has been immortalised by Dickens, whose home, Gadshill (q.v.), is 3 miles distant. The cathedral grammar-school dates from Henry VIII., Williamson's mathematical school from 1701; other buildings are Satis House, Restoration House, the guild-hall (1687), and the corn exchange (1871). There is some shipping, an oyster fishery, and manufactures of oil, oil-cake, cement, and agricultural implements; Chatham government works employ many of the inhabitants. Rochester—the Roman station *Durobrivæ* and Old English *Hrofe-ceastre*—was made a municipal borough by Henry II. It lost one of its two members in 1885; and the parliamentary borough of 1918 includes Chatham and Gillingham. James II. embarked here in his flight (1688). Pop. (1851) 16,508; (1871) 18,352; (1891) 26,170; (1921) 31,261.

Rochester, (1) capital of Monroe county, New York, is on both sides of the Genesee River, 7 miles above its entrance into Lake Ontario, and on the Genesee Valley canal, by rail 67 miles ENE. of Buffalo and 360 NW. of New York. The river has here three perpendicular falls of 96, 26, and 83 feet, and affords immense water-power. The city is well built, and laid out with almost unbroken regularity. Among the principal buildings are the city hall, of blue limestone, and the court-house; a state industrial school (formerly a 'house of refuge'); numerous churches, including a Roman Catholic cathedral; the Free Academy, and the university (founded 1850, and under Baptist control), and a Baptist theological seminary (whose library includes that of Neander). There are also many public and private schools, libraries, asylums, hospitals, &c. But the most noteworthy structure in the city is the handsome stone aqueduct of seven arches (850 feet long) by which the Erie Canal crossed the river. When the canal became part of the New York State Barge Canal, which now runs through the south of Rochester, the deserted loop in the centre of the city (including the aqueduct) was acquired by the municipality (1921) for conversion into a system of rapid road and rail transport. The industries include flour-milling, which has always been extensively carried on here, the manufacture of clothing, boots and shoes, furniture, carriages, iron bridges, cutlery, photographic, optical, and other apparatus, and fruit-canning. In the neighbourhood there are great nurseries, and in the

city large seed-packing establishments. Rochester is a port of entry, and has a considerable trade both by lake and rail. It was settled in 1810, incorporated in 1834. Pop. (1840) 20,191; (1860) 48,204; (1880) 89,366; (1900) 162,608; (1910) 218,149; (1920) 295,750.—(2) Capital of a county in Minnesota, on the Zumbro River, 347 miles by rail NW. of Chicago, with flour-mills and a state asylum. Pop. 14,000.—(3) A city of New Hampshire, 11 miles NW. of Portsmouth, with manufactures of woollen and paper goods, shoes, &c. Pop. 10,000.

Rochester, JOHN WILMOT, EARL OF, the wittiest reprobate at the court of Charles II., was born at Ditchley in Oxfordshire, 10th April 1647, and was educated at Burford school and Wadham College, Oxford. He next travelled in France and Italy, and on his return repaired to court, where his handsome person and lively wit quickly made him a prominent figure. In 1665 he showed conspicuous courage serving under Sandwich against the Dutch, as well as the summer after under Sir Edward Spragge—facts which agree but ill with the stories that he would slink away in street quarrels and evade duels which he had himself provoked. With a friend, Mr Windham, he had entered into a formal engagement that, 'if either of them died, he should appear and give the other notice of the future state, if there was any.' Windham was killed in an attack upon Bergen, but did not afterwards disturb the rest of his friend, who now plunged into a life of the grossest debauchery, was for five years together continually drunk, and diverted himself constantly with extravagant frolics and buffoonery, such as the pursuit of low amours in mean disguises, and the acting of assumed characters, as a mountebank, a quack doctor, and the like. In the scarce intervals of intemperance he wrote excellent letters to his wife and son, and devoted himself to literature, writing personal satires, bacchanalian and amatory songs, and too often obscene and licentious verses. Many of these, however, were doubtless fathered on him after his day. In these wild excesses he blazed out his youth and his health, till at the age of one and thirty he had exhausted the fund of life. On his death-bed he was convinced of the necessity of repentance by the arguments of Bishop Burnet, who writes: 'I do verily believe he was so entirely changed, that if he had recovered he would have made good all his resolutions.' He died 26th July 1680. His last conversations are touchingly described by Burnet in *Some passages of the Life and Death of John, Earl of Rochester* (1680; in vol. iv. of Wordsworth's *Ecclesiastical Biography*), a book, says Dr Johnson, 'which the critic ought to read for its elegance, the philosopher for its arguments, and the saint for its piety. It were an injury to the reader to offer him an abridgment.'

Rochester's verses show more wit than poetry, but he possessed in rich measure the gift of satire. An excellent example of this is his memorable epitaph on Charles II.:

Here lies our sovereign lord the king,
Whose word no man relies on;
He never said a foolish thing,
Nor ever did a wise one.

Equally well known is the description—'a merry monarch, scandalous and poor,' the line rhyming with which it is characteristically impossible to quote. Horace Walpole's judgment of his work is thus expressed in *Royal and Noble Authors*: 'Lord Rochester's poems have much more obscenity than wit, more wit than poetry, more poetry than politeness.' Before his death he expressed a wish that his indecent verses should be suppressed. Among his most famous poems are, 'When wearied with a world of woe,' Verses to Lord Mulgrave,

a Satire against Man (adapted from Boileau) and Verses upon Nothing. 'Why dost thou shade thy lovely face,' universally credited to him, was shown by Mr Tutin to come from Quarles's *Emblems*. Swinburne said that Dryden, 'greatest and best representative of the age at its best and worst, is not for a moment to compare as a song-writer to Rochester.' See *Rochester and other Literary Rakes*, by 'the author of *Sir Kenelm Digby*' (1902).—For Viscount Rochester, see KER, and OVBURY.

Roche-sur-Yon, LA, capital of the French department of Vendée, on the Yon, 50 miles SSE. of Nantes. In 1815–48 it was called *Bourbon-Vendée*, in 1848–70 *Napoléon-Vendée*. Pop. 14,000.

Rochet (Low Lat. *rochettus*; Old High Ger. *rocch*, 'coat'; Ger. *rock*), a fine linen or lawn vestment proper to bishops and abbots, and worn also by canons of certain privileged chapters, and some other dignitaries. It is of the form of a surplice, but with sleeves fastened at the wrist; these formerly fitted more tightly to the arm than do the 'balloon sleeves' still commonly worn by Anglican bishops. In the Latin Church its use is very ancient. Formerly it appears to have been worn by clerics serving mass and by priests baptising, because it left their arms free (Lyndwood, quoted by Du Cange); but those priests who are privileged to wear the rochet are now commanded to regard it as a choir vestment, and are strictly forbidden to use it in the administration of the sacraments. In the First Prayer-book of Edward VI. the rochet was ordered to be worn by bishops at all public ministrations, and beside—i.e. over it—a surplice or alb. It is prescribed in the present Book of Common Prayer as part of the episcopal habit. The old 18th-century Anglican fashion of fastening the sleeves of the rochet to the chimere—leaving the rochet itself sleeveless—is almost gone out.

Rock. Though popularly restricted to masses of indurated matter, this term is extended by geologists to all substances which make up the crust of the earth, whether they be loose and friable like soil and sand, or compact and indurated like limestone and granite. The rocks of the earth's crust are described under their several headings; see also PETROGRAPHY, GEOLOGY, DENUDATION, BUILDING STONE, BLASTING, BORING.

Rockall, on a deeply covered sandbank in the Atlantic 50 miles long and 25 broad, 160 miles W. of St Kilda, and 260 from the north of Ireland. It is an isolated conical granitic rock on stratified masses, rising 70 feet above the sea, and about 100 yards in circumference.

Rock-butter, an impure alum efflorescence found oozing from some alum slates.

Rock-crystal. See QUARTZ.

Rockefeller, JOHN DAVIDSON, American millionaire, was born at Richford, N.Y., in 1839. He made his fortune in oil; reorganising the whole industry, securing monopolies, absorbing rival enterprises, and in 1870 founding the Standard Oil Company. He retired from business in 1911. He is credited with having altogether given more than 500 million dollars for charitable or educational purposes, much of this being devoted to medical research and other university work. In 1909 he published *Random Reminiscences of Men and Events*.

Rocket is a cylindrical case of paper or metal partially filled, under heavy pressure, with an inflammable composition similar to gunpowder, but with a smaller proportion of saltpetre, so that a large conical hollow is left inside. The base is open or has vents in it, and the head closed. On being ignited this composition, burning over the whole surface of the hollow portion, at once causes

a great rush of gas out of the base, thus driving the rocket forward with great and increasing velocity. Rockets are used for Signalling (q.v.) and to carry a light line for life-saving purposes (see LIFE-SAVING APPARATUS). Early in the 19th century they began also to be used in war. Sir William Congreve in 1808 introduced iron war-rockets up to 24 lb. in weight, with thick iron heads adapted to act like a shell. They were fired from a tube, and steadied in their flight by means of long sticks. In the more modern Hale rocket a rotary motion is given by causing the gas to pass out of vents in the base bored between three projecting shields, shaped somewhat like the blades of a screw-propeller, against which it presses. This keeps the rocket travelling point first, and the cumbersome stick being therefore no longer needed, the rocket is fired from a low trough with tripod stand, or even from the ground, by raising the head to the height necessary to give the required range, which may be as much as 4000 yards. Though extremely portable, as compared with other missile weapons of similar power, rockets are so uncertain in their flight that they are not much used, except for incendiary purposes and against savages, who greatly dread them. Against cavalry they would be very useful if they could be depended on. Congreve's rockets were very effective at Leipzig in 1813, and were used in the Peninsular and second American wars, and at Waterloo. At one time there were two rocket troops of the Royal Horse Artillery. See PYROTECHNY.

Rocket, a name given to a number of plants of the family Cruciferae, belonging to the genera *Brassica*, *Sisymbrium*, *Erysimum*, *Barbarea*, *Hesperis*, &c. Garden Rocket (*Brassica Eruca*, or *Eruca sativa*) is an annual plant of the Mediterranean region, with stem 2 feet high, upright and branching; the leaves smooth, succulent, cut and toothed. When in flower it has a strong, peculiar, and disagreeable smell; but when it is very young this smell is almost imperceptible, and the leaves are used as a salad, for which it is frequently sown on the continent of Europe, and was formerly cultivated also in Britain. The name Garden Rocket is given also to *Hesperis matronalis*, also called Dame's Violet (q.v.). The Yellow Rocket of our flower-borders is a double-flowered variety of *Barbarea vulgaris* (see CRESS). The Wild Rocket (*Sisymbrium officinale*) is common in Britain, and is sometimes sown and used as a spring potherb.

Rock-fish. See WRASSE.

Rockford, capital of Winnebago county, Illinois, is on both sides of the Rock River, 86 miles by rail WNW. of Chicago. It is a well-built town, with shady streets, contains many furniture factories, and also makes hosiery, agricultural implements, machinery, and a great variety of other goods. Pop. (1880) 13,129; (1890) 23,584; (1910) 45,401; (1920) 65,651.

Rockhampton, a town of Queensland, on the south bank of the Fitzroy, 35 miles from its mouth, and 420 NW. of Brisbane. It has wide streets, lined with trees, and many substantial buildings. It owes its beginning (1858) to an unsuccessful gold-rush, after which, being at the head of navigation on the Fitzroy, it became the natural port of the great pastoral district behind it. Many years later (in 1888) a hill saturated with gold was discovered at Mount Morgan, 20 miles away. Extensive coal-beds are found not far off; and much copper is produced in the neighbourhood. Rockhampton is connected by rail with Brisbane and south, with Longreach in central Queensland, and with Mackay and the northern coast districts. As a port it is the third in Queensland, in spite of its winding tidal river. A bridge across the

Fitzroy, with five spans of 232 feet each, connects Rockhampton with its suburb North Rockhampton. Pop. 24,000.

Rockingham, CHARLES WATSON WENTWORTH, MARQUIS OF, a statesman of importance beyond his abilities, was born in 1730, the only son of Thomas Watson Wentworth, sixth Lord Rockingham, and first marquis (1746); and he succeeded his father as second marquis in 1750. In 1751 he was nominated lord-lieutenant of the North and West Ridings of Yorkshire; but as opposed to the policy of George III. and Bute, he was dismissed in 1762. He found himself leader of the combination of Whig opposition, after the Duke of Devonshire's death in 1764, and in July 1765 was called on to form his first ministry. He repealed the Stamp Act, and would have done more for progress but for the secret intrigues of the court, added to the defection of the Duke of Grafton and his own want of influence in parliament. Rockingham resigned in August 1766, and remained out of office sixteen years in opposition to Lord North and the ruinous policy that lost America. He again became prime minister in March 1782, with Fox and Shelburne as his secretaries, but died 1st July of the same year. See the *Memoirs* by Lord Albemarle (2 vols. 1852).

Rocking-stones, or LOGANS, are large masses of rock so finely poised as to move backwards and forwards with the slightest impulse. They occur in nearly every country. Some of them appear to be natural, others artificial; the latter seem to have been formed by cutting away a mass of rock round the centre-point of its base. The former are chiefly granitic rocks, in which felspar is abundantly present; for, this mineral being readily decomposed, the rock becomes disintegrated to grit, sand, and dust, which are carried away by rains and wind, so that what was formerly a solid rock soon assumes the appearance of a group of irregularly-shaped pillars, separated into portions by horizontal and vertical fissures. As decay proceeds, the edges of the blocks forming the pillar are first attacked and disappear, and the pillar now becomes a pile of two or more spheroidal rocks, resting one upon the other. Should a mass of rock be so situated as to preserve its equilibrium in spite of the gradual diminution of its base or point of support, a rocking-stone or logan is the result. Although rocking-stones are most frequently of a granitic nature, they occur also among basalts and other crystalline igneous masses. For the principle regulating the stability of equilibrium of rocking-stones, see STABILITY. Various explanations have been given of the uses of these singular objects. They are supposed to have been used in very early times for purposes of divination, the number of vibrations determining the oracle; hence it came to be believed that sanctity was acquired by walking round them.

Some rocking-stones occur near to remains of ancient fortifications, which seems to bear out a statement in one of the poems of Ossian, that the bards walked round the stone singing, and made it move as an oracle of the fate of battle. In Greece rocking-stones occur as funeral monuments, and are generally found on conspicuous places near the sea. Rocking-stones are numerous in Yorkshire, Derbyshire, Cornwall, and Wales. The famous Logan Rock, near Land's End, in Cornwall, is computed to weigh over 70 tons. It was wantonly displaced in 1824 by Lieutenant Goldsmith, R.N., and his boat's crew of nine men. He had to replace it at a cost to himself of £2000; but whether it has since rocked as well as ever is a moot point. Near Warton Crag, Lancashire, are no less than seven of these stones; and in Scotland they occur in the

parishes of Kirkmichael, Dron, and Abernethy, Perthshire, and Kells, Kirkcudbrightshire. In Ireland they are found in many places; one situated at a place called Islandmagee, on Brown's Bay, County Antim, is popularly believed to acquire a rocking tremulous motion at the approach of sinners and malefactors. At Andaford (Faeroe Islands) a large block of basalt, measuring some 16 feet in length by 10 feet in breadth, and rising for about 10 feet out of the water, swings to and fro with the motion of the sea, which is about seven fathoms



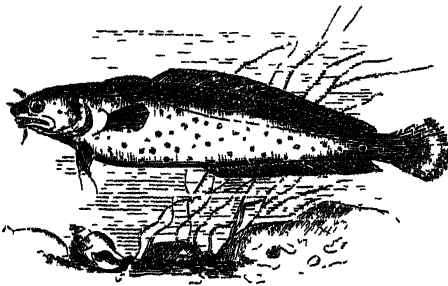
Rocking-stone of Tandil.

deep. The rocking-stone of Tandil in the Argentine Republic, 250 miles S. of Buenos Aires, weighs over 700 tons, yet is so nicely poised that it rocks in the wind, and may be made to crack a walnut. See Frank Vincent's *Around and About South America* (1890), from which our illustration is copied.

Rock Island, capital of a county of that name in Illinois, on the Mississippi, opposite Davenport, Iowa (the two are connected by bridges), 181 miles by rail WSW. of Chicago. The island from which the town is named has a great arsenal and armoury. The channel to the east of the island has been dammed so as to furnish immense water-power, and the city has saw-mills, besides steel-works, soap-works, &c. Pop. 35,000.

Rockland, (1) capital of Knox county, Maine, on the west side of Penobscot Bay, 88 miles by rail ENE. of Portland. The city has granite quarries, many lime-kilns, and shipyards. Pop. 8000. — (2) Rockland, Massachusetts, 19 miles by rail SSE. of Boston, has large boot and shoe factories, and a pop. of 7500.

Rockling (*Onus*), a genus of fishes of the Cod family Gadidae, represented on the British coasts



Three-bearded Rockling or Sea Loach.

by several species distinguished among other things by the number (3-5) of barbels. The larger species reach a length of 17 inches; but none are of any value as food, their flesh acquiring an unpleasant

smell a few hours after being taken out of the water.

Rock-oil. See PETROLEUM.

Rock River rises in the south-eastern portion of Wisconsin, and flows south into Illinois, thence south-west, and empties itself into the Mississippi 3 miles below Rock Island. Its course of 375 miles, much broken by falls, is through a region noted for its beauty and fertility.

Rock-rose. See CISTUS.

Rock-salt. See SALT.

Rock-soap, a dark unctuous clay containing a small percentage of iron oxide and about 24 per cent. of water. It is a variety of bole, and has sometimes been classed as a mineral. It is earthy, easily broken, black or nearly so, very soft, and easily cut with a knife, is greasy to the touch, and adheres strongly to the tongue. It is valued by painters for crayons. It is found in Poland, Thuringia, and Bohemia, and occurs in basaltic-rocks in the Isle of Skye and Antim, in the form of nodules of a greenish-gray or brown colour. It is only found massive.

Rock-temples. In many parts of Western India, as at Ellora, Elephanta, Karli, and Salsette Island, natural rocks have been cut into temples; as also into caves and forts (see the articles mentioned). Out of India well-known instances of the same kind occur at Petra (q.v.) in the Arabian Desert, at Abu Simbel (q.v.) in Egypt, and in China and Siam. There are remarkable cave-temples in the United States, one in Missouri, between the Salt River and Otter Creek, and another near Manchester in Ohio.

Rocky Mountain Goat (*Oreamnus montanus*), a heavily built goatlike animal of the mountains from Alaska to Montana and Washington. It is marked by its shaggy white hair, its humped shoulders, its long head with small black horns. Very sure-footed, deliberate in its movements, with great presence of mind, well protected from the cold, able to thrive on scanty vegetation, it holds its own well and has few enemies. Its haunts are often inaccessible, and this helps its persistence. The flesh is musky and not very palatable. It must be distinguished from the Pronghorn Antelope and from the Rocky Mountain Sheep, for which see SHEEP.

Rocky Mountains, a name formerly somewhat loosely applied to all the mountains of North America between the Great Plains and the Pacific Ocean, is now used to designate only the eastern ranges of the great Cordilleran system, but including the continuations beyond the Canadian frontier. This vast mountain-system acquires its greatest breadth within the limits of the United States, where between the parallels 38° and 42° N. lat. it attains a width of more than 1000 miles. Toward the north and the south the plateaus of this highland gradually diminish in breadth, but they are enclosed on the east and on the west by high mountain-chains. Those forming the western boundary are the Sierra Nevada and the Cascade Ranges (q.v.), and the eastern chains stretching with uninterrupted continuity from the southern borders of the United States through the Dominion of Canada to the Arctic Ocean constitute the Rocky Mountains. Between these eastern and western boundaries the plateau region is greatly diversified by chains which, as a rule, trend in the same general direction as the border ranges.

The name 'Rocky Mountains' is peculiarly appropriate, as there probably exists nowhere else such an extensive region of naked rock almost entirely devoid of vegetation. The geological structure is complex, but the greater part of the

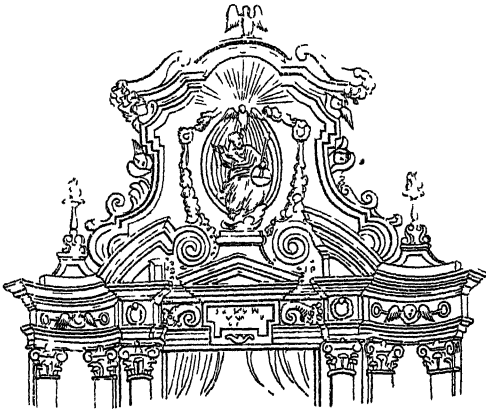
rocks exposed are Mesozoic intermingled with Tertiary and Quaternary deposits. As this system is consequently of much more recent origin than the Appalachians, it is naturally higher, and it presents also a sharper and more rugged outline. Its remarkably barren aspect is due also to other geological peculiarities and to climatic causes. In comparatively recent ages this whole region has been the scene of vast volcanic eruptions, and the lava overflows which have covered the stratified rocks in many places to a depth of thousands of feet have augmented the expanse of sterile surface. By resisting the erosion of the streams and of the atmosphere, these lava beds have also greatly aided in producing the precipitous and deeply furrowed watercourses by which this wonderful plateau region is traversed. The high mountain barrier at the western boundary of the highland robs the winds which sweep across the Pacific of much of their moisture, and the great aridity of this region thus prevents the growth of vegetation, though there is heavy woodland in many sections. Elsewhere the surface is exposed to continued erosive action, the denudation being the more complete as the sand and smaller disintegrated fragments are swept away by the winds, and no opportunity is afforded for the accumulation of a soil. On account of these various causes the erosion of the surface is uneven, and the region displays a labyrinth of naked crags and peaks arising from plateaus crossed by towering cliffs or deep cañons, with here and there an isolated butte. The scenery of the wonderful *mesa* or plateau region which lies between the eastern and western ranges of the Rocky Mountains, and extends from southern Wyoming through western Colorado, eastern Utah, and south into New Mexico and Arizona, is unequalled by that of any other portion of the globe. The country is divided by faults, flexures, and deep cañons into numerous blocks or separate plateaus, and the wonderful carving of the rocks and the brilliant colouring of the exposed strata almost surpass belief.

A high plateau region in Wyoming, over which passes the Union Pacific Railroad, marks a separation of the Rocky Mountains into a northern and a southern group, each of which has its characteristic features. The continental divide which extends north and south with the ranges of the Rocky Mountains culminates in this plateau, where are found the extreme head-waters of the three great river-systems of the United States—the Mississippi, the Columbia, and the Colorado. The ranges of the southern group have a general north and south trend, and are higher than those of the northern group. As there are several elevated valleys known as 'Parks' enclosed between the parallel ranges, this group is sometimes known as the Park System. It extends southward from the Laramie Plains across central Colorado into New Mexico. Its greatest development is in Colorado, where there are nearly forty peaks each over 14,000 feet in height. The Medicine Bow Range and the Colorado or Front Range form the eastern edge of the Rocky Mountain System, and rise abruptly from the gentler slope of the Plains. In this range are the well-known landmarks, Long's Peak (14,271 feet) and Pike's Peak (14,134 feet), as well as Gray's Peak (14,341 feet), its highest point, which is too far west to be visible from the Plains. This range forms the eastern wall of North, Middle, and South Parks, and the Park Range constitutes their western boundary. To the west of the southern end of the Park Range lies the Sawatch Range, with the famous Mount of the Holy Cross (14,176 feet) and Mount Harvard (14,375 feet). Farther south are the San Juan Mountains, which constitute the western boundary of San Luis Park. To

the north and west of this range lies a high broken country merging into the *mesa* region of western Colorado. Uncompagre Peak (14,408 feet) is the culminating point of this section. The eastern border of San Luis Park is formed by the Sangre de Cristo Range, which is almost a continuation of the Sawatch. Its loftiest summit, Blanca Peak (14,463 feet), is the highest point of the 'Rockies.' The Elk Mountains, a series of short parallel ranges with sharp volcanic peaks, lie to the west of the Sawatch Range. In the Parks rise the head-waters of the North and the South Platte, the Arkansas, the Grand, and the Rio Grande. Beside these large parks there are among these ranges many smaller but beautiful valleys. West of the Park Range are the Uintah Mountains, composed of a broad fold of thick strata, of which the Upper Tertiary and Cretaceous layers have been eroded to the depth of more than 3 miles, exposing the underlying Carboniferous rocks. This range has an east and west trend, and connects the eastern and western ranges of the Rocky Mountain System. The most important of the western ranges are the Wahsatch Mountains, which form a part of the eastern rim of the Great Basin (q.v.), and which serve as the connecting link between the northern and southern groups of this system. The greatest development of the northern group is in Wyoming. The Wind River Mountains are the highest of the ranges, with Fremont's Peak (13,790 feet) as the culminating point. To the west are the Teton, Mount Hayden (13,691 feet), and the Snake River Mountains. The mountains of the northern group are wilder and less accessible than those of the southern chains, but not so high. They also present scenery which is less varied; they are not so definitely marked by regular ranges, and there are but few prominent peaks except in the groups already mentioned and in the geyser region of the Yellowstone. In Idaho and Montana there are numerous enclosed mountain valleys, which are called 'Parks' or 'Prairies,' but they are not so high as the 'Parks' of Colorado. The Bitter Root Mountains form the divide between the head-waters of the Missouri and those of the Columbia, and also between the tributaries of Clarke's Fork and of the Snake River. The Lapwai and Cœur d'Alene ranges, which lie to the west and northwest, connect the Rocky Mountains with the Blue Mountains, and between these groups and the Cascade Range are the Great Plains of the Columbia River. Yellowstone Park (q.v.), in the north-western part of Wyoming, is famous for its hot springs, geysers, mud volcanoes, and its wonderful scenery. The disposition of the mountains toward the east is peculiar, as they occur in more or less detached and isolated groups, among which are the Crazy Mountains, Judith Mountains, and the Big Horn Mountains. Still farther east are the Black Hills, completely detached from the main system, and noted for their mineral wealth. Of the Canadian Rockies some forty peaks over 10,000 feet have been climbed, Mount Columbia (12,500) only in 1902. This region is notable for its numerous and often great glaciers. The highland gradually descends towards the north, reaching an elevation of about 800 feet in the vicinity of the Arctic Ocean, and the northern ranges form the divide between the head-waters of the Mackenzie and the Yukon Rivers.

Rococo, or **ROCAILLE**, a name given to the style of architecture and decoration which succeeded the first revival of Italian architecture. The ornament consists of panels with their mouldings broken or curved at the angles, and filled with leafage, shell-work, musical instruments, marks, &c.; but, above all, rococo is characterised by absence of restraint and lack of selection, true signs of de-

cadence in art. It is ornamental design run mad, without principle or taste. The best rococo work dates from the earlier Louis Quinze period, but this



style prevailed in Germany and Belgium during the 18th century, and in France from Henry IV. to the Revolution. The illustration is from an altar in Antwerp. See BAROQUE.

Rocroi, a small town of the French department of Ardennes, 2 miles from the Belgian frontier, where Condé defeated the Spaniards in 1643.

Rod, called also a *pole*, or *perch*, a measure of length—5½ yards, or 16½ feet. The square rod, or *rood*, employed in estimating masonry-work, contains 16½ by 16½ feet, or 272½ square feet.

Rod, ÉDOUARD (1857–1910), born at Nyon in Switzerland, lectured on literature at Geneva in 1887–93, but from 1881 spent most of his life in Paris. Novelist and literary critic, he marked his departure from the school of Zola by *La Course à la Mort* (1885) and *Le Sens de la Vie* (1889), and in more than a dozen later novels dealt largely with moral problems on idealist lines. He wrote also on Goethe, Stendhal, and Rousseau.

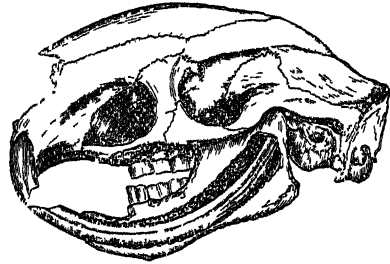
Rodbertus, JOHANN KARL, designated the founder of scientific socialism, was born the son of a professor at Greifswald on 12th August 1805, and studied law at Göttingen and Berlin. For a few years he held law appointments under the Prussian government, but in 1836 settled down on his country estate at Jagetzow in Pomerania, and turned his attention chiefly to economic studies. In 1848 he was elected a member of the Prussian National Assembly, and for a fortnight filled the post of minister of Worship and Education; in the following year he carried the adoption of the Frankfurt constitution for the empire, but retired from public life when the Prussian electors were grouped in three separate classes. He died on 6th December 1875. Rodbertus believed that the socialistic ideal will work itself out gradually according to the natural laws of change and progress. Indeed he fixed upon five centuries as the time it will take to educate the people, the democracy, up to the socialistic ideal. When that ideal is realised the state will be the owner of all the land and capital of a country, and will superintend the distribution of the total products of human labour amongst those who do the labour, apportioning to each a share corresponding to his work. (His fundamental economic principle was of course that labour is the true and only source of wealth.) In the meantime he would not interfere with the working of the established laws of capital and land, nor with the principles of monarchical government. On behalf of the workers he advocated that

the government should fix a normal working-day, a normal day's work, and a maximum and minimum of wages.

Rodd, SIR JAMES RENNELL, born 1858, the son of an officer, held diplomatic appointments in Athens, Rome, Zanibar, Abyssinia, Sweden, and was ambassador to Italy (1908–19), and British delegate to the League of Nations (1921, 1923). He has written half-a-dozen volumes of poetry, including *The Violet Crown*; and books on the Emperor Frederick, Raleigh, Greek folklore, and the history of the Morea. See his *Social and Diplomatic Memoirs* (1922–23).

Rodenbach, GEORGES (1855–98), born at Tournai, became a noted Belgian decadent writer, but spent his last years in Paris on the De Goncourt set; *Bruges la Morte* is his best-known book.

Rodentia (Lat. 'gnawers'), an order of Mammals more rich in species than any of the others, including among its familiar representatives squirrels, marmots, beavers, rats and mice, lemmings, porcupines, guinea-pigs, hares and rabbits. Most are terrestrial, and many are



Skull of Common Porcupine (*Hystrix cristata*): The lower jaw partly in section to show the lower incisor tooth.

burrowers, but a few are arboreal or even semi-aquatic. All are vegetarian, and gnaw their food. They are represented in all parts of the world.

Among the anatomical characteristics of Rodents may be noted the chisel-like edge of the incisor teeth, which wear away in front less rapidly than they do behind, where the enamel coating is thinner or absent; the reduction of the incisors to two above and two below, except in the hares and rabbits, in which there are four above; the fact that the incisors and sometimes the back teeth also are rootless, and continue growing from persistent pulps; the absence of canine teeth, and the presence of a large space between incisors and premolars; the condyle in which the lower jaw works is elongated from before backwards—an adaptation to the peculiar motion of the lower jaw characteristic of rodent gnawing; the cerebral hemispheres are smooth, and leave the cerebellum uncovered; the intestine, as in many herbivorous animals, has a large cæcum; the uterus is two-horned, the placentation discoidal and deciduate; the reproduction is in many cases very prolific.

Classification.—Sub-order *Simplicidentata*—with only one pair of upper incisors, having enamel only in front. This sub-order includes squirrels (*Sciurus*), flying squirrels (*Pteromys* and *Sciuropterus*), marmots (*Arctomys*), beavers (*Castor*), dormice (*Myoxidae*), rats and mice, voles, lemmings, muskrats (*Muridae*), pouched-rats (*Geomyidae*), the capybara (*Hydrochaerus*), porcupines (*Hystriidae*), agoutis (*Dasyprocta*), guinea-pigs (*Cavia*). Sub-order *Duplicidentata*—with two pairs of incisors in the upper jaw, the second pair behind the first, the enamel extending round the teeth, but thinner posteriorly. This sub-order includes only the Picas or tailless hares (*Lagomys*) and the hares and rabbits (*Lepus*).

See Waterhouse, *Mammalia* (1848); Flower and Lydekker, *Mammals Living and Extinct* (1891); Beddard, *Mammalia* (1902); and the *Cambridge Natural History*.

Roderic, 'the last of the Goths,' whose tragic death, coincident with the downfall of the Visigothic monarchy in Spain, has inspired poets and romancers (Scott, Southey, Geibel, Dahn) to throw round him a halo of glory. Next to nothing authentic is known about him; but according to the commonly accepted legend, he was the son of a noble who was blinded by King Witiza. A conspiracy having been formed against the hated Witiza by the clergy and the nobles of Roman blood, Roderic was elevated to the throne (710). The sons of Witiza, however, bided their time, meanwhile submitting to the usurper. At length certain discontent nobles were engaged in a plot to dethrone Roderic by Count Julian, the governor of Ceuta (in North Africa), whose daughter had been outraged by the Visigothic king. Julian brought over with him a Moorish chief named Tarik at the head of 12,000 men. Roderic met the invading army on the banks of the Guadalete, near Xeres de la Frontera, on 26th July 711. The battle raged six days; but the sons of Witiza, who commanded the wings of the Christian army, deserted during the contest, and the rout of the Visigoths was complete. Roderic either died on the field or was drowned in the Guadalete, whilst attempting to swim his horse across. A third version, however, relates that he escaped and passed the rest of his life as a pious hermit. By this victory the Arabs became masters of southern Spain. See Dr A. H. Knappe's monograph (1923).

Rodez, the capital of Aveyron dept. in S. France, stands on a bold bluff encircled by the Aveyron, 148 miles by rail NW. of Montpellier. The Gothic cathedral (1277-1535) has a tower, 260 feet high, crowned by a colossal image of the Virgin. There are several mediæval houses, remains of a Roman amphitheatre, and a restored Roman aqueduct. Pop. 13,000.

Rodgers, JOHN, American naval officer, was born in Maryland, 11th July 1771, the son of a Scots colonel of militia. He was a captain in the merchant service by 1789, and in 1798 entered the navy. In 1805 he extorted from Tripoli and from Tunis treaties abolishing blackmail and forbidding the slavery of Christian captives. On 23d June 1812 he fired with his own hand the first shot in the war with Britain, and during the war he took twenty-three prizes. He died 1st August 1838.—His son, JOHN RODGERS (1812-82), a captain in the navy, captured a Confederate ironclad, and rose to be rear-admiral (1869), and superintendent of the United States naval observatory (1877).

Rodin, AUGUSTE, French sculptor, was born of humble parents at Paris, 12th November 1840. At the age of 14 he began his art studies with Lecocq de Boisbaudran, but was refused admittance three times to the École des Beaux Arts. He worked in the studios of Barye and Carrier-Belleuse, 1864-70, and, after following the latter to Brussels, collaborated with Van Rasbourn, 1870-75, in some of the decorations of the Brussels Bourse. Rodin was much influenced by the work of Donatello and Michelangelo during an Italian tour in 1875, and also by the French cathedrals during a tour in 1877, the impressions of which he afterwards collected into a book. Thereafter, till his death, 17th November 1917, he lived at Meudon, near Paris, or in Paris itself. He paid several visits to London, and in 1914 made over 20 of his works to the British nation as a token of admiration for the British soldiers. In 1916 he gave all his remaining works to the French nation; all the finished pieces of statuary are now collected in his

Paris house, the Hôtel Biron. Rodin's principal works are: *L'Homme au Nez Cassé* (1864); *L'Âge d'airain* (1877), which caused a sensation at the Salon, the unknown sculptor being accused of having taken a cast from a living man; *Saint Jean-Baptiste* (1880); *La Porte d'Enfer*, after Dante's Divine Comedy, containing 186 figures, which occupied Rodin from 1880 for a great part of the rest of his life; *Le Baiser* (1898), *Ugolin* and *Le Penseur* (1904), which were all conceived originally as part of *La Porte d'Enfer*; *Les Bourgeois de Calais* (1884-95), a group of 7, with replicas at Calais, Paris, and London; the statue of Balzac (1898), also a commission but eventually not recognised by the Société des Gens de Lettres; the statue of Victor Hugo; and several busts, including those of Mdmé Rodin, Bastien-Lepage, Puvis de Chavannes, Pope Benedict XV., Clemenceau, and Mr Bernard Shaw. Rodin excels in the expression of action, his art being essentially dramatic. Sometimes his works seem unfinished, in that the hugeness of the conception makes adequate execution almost impossible, but usually the roughnesses and exaggerations deliberately emphasise what the sculptor considers significant. In the conveying of emotion by gesture Rodin is a master.

See the monumental work, *Rodin*, by L. Bénédite (1924), and studies by Rilke (1903-8), Dircks (1904), Maclair (Eng. trans. 1905), Kahn (1909).

Rodney, GEORGE BRYDGES RODNEY, LORD, English admiral, born in February 1719, was the second son of Henry Rodney, a cadet of an ancient Somersetshire family, the elder branch of which had merged in that of Brydges, and was at that time represented by the first Duke of Chandos. Henry Rodney served for a few years as cornet of horse in the wars of William III. and Anne, and afterwards, settling at Walton-on-Thames, obtained an appointment under George I. as commander of one of the royal yachts. In this capacity he was noticed by the king, who offered to stand as godfather to his second son. The Duke of Chandos was the other godfather, and after the two the boy was christened George Brydges. He received his early education at Harrow, which he quitted at the age of twelve to enter the navy as a 'king's letter boy.' After serving chiefly on the Newfoundland station he was made a lieutenant in 1739 in the Mediterranean; in 1742 he was promoted by Admiral Mathews to be post-captain, and was sent home in command of the *Plymouth*, a 64-gun ship. He afterwards successively commanded the *Sheerness*, *Ludlow Castle*, and *Centurion*, and in 1747 the *Eagle*, in which he had a brilliant share in Hawke's victory over L'Etenduere on 14th October. In 1748 Rodney went out in the *Rainbow* as governor of Newfoundland and commander-in-chief on that station, where he remained till 1752; in 1753 he commanded the *Fortuneux*, and from 1751 to 1757 the *Prince George*. He was then appointed to the *Dublin*, one of the fleet under Sir Edward Hawke in the futile expedition against Rochefort, and in 1758 under Boscawen at the capture of Louisbourg. In May 1759 Rodney was promoted to be rear-admiral, and in July commanded the small squadron which bombarded Havre and destroyed the flotilla of flat-bottomed boats collected for the proposed invasion of England. In October 1761 he was appointed commander-in-chief on the Leeward Islands station, where in the early part of 1762, in co-operation with the land forces, he captured Martinique, St Lucia, and Grenada. In October he was promoted to be vice-admiral, and returning to England in August 1763 was created a baronet, 21st January 1764. In November 1765 he was appointed governor of Greenwich Hospital, but in 1771 was recalled to active service,

was promoted to be admiral, nominated rear-admiral of Great Britain, and sent out as commander-in-chief at Jamaica. He hoped that he might succeed to the office of governor, which became vacant in 1773; but in his command he had shown an independence which was distasteful to Lord Sandwich, and his application was unsuccessful. In 1774 he returned to England, and for the next five years was left on half-pay, in very embarrassed circumstances, which compelled him to retire to France. It was not till October 1779 that he was again appointed commander-in-chief at the Leeward Islands, and on 29th December he put to sea with, in addition to the West Indian ships, a powerful squadron and a large convoy of store-ships for the relief of Gibraltar, then besieged by the Spaniards. On 9th January 1780, when broad off Cape Finisterre, he fell in with a convoy of Spanish store-ships under the escort of a 64-gun ship, all of which he captured. Passing Cape St Vincent on the 16th he met the Spanish squadron under Don Juan de Langara, which he attacked with a dash and vigour that carried everything before him. Seven ships out of eleven were taken or destroyed; the others managed to escape into Cadiz. Gibraltar was thus relieved without further difficulty than was caused by the weather; and on 13th February Rodney sailed for the West Indies. He had scarcely reached St Lucia, which he made his headquarters, when he had intelligence that the French fleet under the Count de Guichen had put to sea from Martinique. He immediately followed, and overtaking it on the 17th April fought an action in which, in spite of the fighting instructions, he attempted to concentrate his force on the rear of the enemy's line. Unfortunately his signals were not sufficiently clear, the flag-officers and captains did not understand what was proposed, and the clever attempt resulted in comparative failure. During the following May he again twice met De Guichen, but without being able to bring him to a decisive engagement. In November he was nominated a K.B.; and in January 1781, in obedience to special orders from home, he seized on St Eustatius and the other Dutch settlements; but his health having broken down he was compelled to return to England a few months later. In December 1781 he again sailed for the West Indies; and, as before, shortly after arriving at St Lucia he had intelligence of the French fleet, under Count de Grasse, having sailed, with some 5000 troops on board, for Cape François, where it was to join a strong Spanish fleet for an attack on Jamaica. Abreast of Dominica Rodney came in sight of it, and, after an indecisive skirmish on the 9th April, had the good fortune, on the 12th April 1782, to bring it to close action; and being enabled, by the varying nature of the wind, to pass through the enemy's line, he gained a brilliant victory, rendered still more crushing by the success of a small squadron detached to look out for stragglers in the Mona Passage. The French loss in killed and wounded was extremely severe, and seven of their ships were captured, one of them being the *Ville de Paris*, with the Count de Grasse himself on board. The victory placed the English on a very different footing in the negotiations which had been already commenced; and the terms finally agreed on were much more favourable than might otherwise have been expected. But before the news reached England Admiral Pigot had been sent out by the new administration to supersede Rodney, who was looked on as a partisan of Lord Sandwich; and though an express was sent to stop Pigot on the way it failed to overtake him. Rodney returned to England, where—though raised to the peerage as Baron Rodney, with a pension of £2000 (see PENSIONS)—he was

but coldly received by the government. He had no further employment, and was allowed to live in comparative obscurity, which his shattered health perhaps rendered necessary. He died in London on 24th May 1792.

See his *Life* by General G. B. Mundy (2 vols. 1830), and Hannay's *Rodney* ('Men of Action' series, 1891).

Rodó, JOSÉ ENRIQUE (1872-1917), Spanish prose writer, an Uruguayan born at Montevideo, taught awhile, became a journalist, came to Europe as a correspondent for a periodical, and died at Palermo. He was author of *Ariel*, the appeal of an idealist for the cult of beauty and things spiritual as against ugliness and things material, *Motivos de Proteo*, a philosophic scheme with 'Self-renewal is Life' as motto, and *El Mirador de Próspero*, a collection of essays on economic and literary subjects.

Rodosto (anc. *Rhaïdestos*), a town of European Turkey, stands on the north shore of the Sea of Marmora, 60 miles W. of Constantinople. It sends large quantities of fruits and vegetables to Constantinople. Pop. 42,000.

Rodriguez, or RODRIGUES, a hilly volcanic island (1300 feet), 380 miles E. by N. of Mauritius, of which it is a dependency, being one of the Mascarene group. The soil is fertile, and agriculture is the chief occupation. The exports are mainly animals and salt fish. Hurricanes often cause great damage to the island, which is encircled by a coral-reef. It was discovered by the Portuguese in 1645, and after being held by the Dutch and the French, has been a British colony since 1814. The chief port is Port Mathurin. Owing to its isolation this island is particularly interesting to the botanist and the zoologist. Until near the close of the 17th century it was the home of the Solitaire (q.v.), now an extinct bird. Population, 6700; area, 40 sq. m. See Leguat's voyage thither (Hakluyt Society, 1891) and A. J. Bertuchi, *The Island of Rodriguez* (1923).

Roe (*Capreolus caprea*), a small species of deer inhabiting Europe and some parts of western Asia, chiefly in hilly or mountainous regions which are covered with forests or with scattered bushes and heath. It is seldom found in the higher and more naked mountain tracts, the haunt of the stag or red deer. It was once plentiful in Wales and in the hilly parts of England, as well as in the south of Scotland, but is now very rare south of Perthshire. The roe is about 2 feet 3 inches in height at the shoulder. Its weight is about 50 or 60 lb. Its colour is a shining tawny-brown in summer, more dull and grizzled in winter; on the under surface and around the tail the colour is whitish, but there is considerable variety. The hair is longer than in many deer. The tail is very short, concealed among the hair. The antlers, which are peculiar to the male or *Roebuck*, are 8 or 9 inches long, erect, round, very rough, longitudinally furrowed; having, in mature animals, two or three tines or branches, which, as well as the tip of the horn, are sharp-pointed, so that the antlers form very dangerous weapons. The habits of the roe are somewhat like those of the goat, or even of the chamois. It keeps its footing on rocks with great security, bounds very actively, and takes great leaps. Its usual pace, when not very hard pressed, is, however, a kind of canter. It is not gregarious, not more than a buck and doe with one or two fawns being usually seen together. Contrary to what is usual among deer, the male and female remain attached during life. The voice of the roe-deer, resembling that of a sheep, but shorter and more barking, is often heard through the night. The males are very combative at the breeding season. The roe browses on the tender shoots

of trees and bushes as well as on herbage, and is thus very injurious to young woods. It is never very thoroughly tamed, and when partially so is apt to become mischievous, and the male



Roebuck (*Capreolus caprea*).

dangerous. The venison is superior to that of the stag, but not equal to that of the fallow-deer. The horns are used for handles of carving-knives and similar articles.

Roe, RICHARD. See **DOE, JOHN**.

Roe, SIR THOMAS, diplomatist, was born near Wanstead in Essex about 1568, studied at Oxford, and, after holding court appointments under Elizabeth and James I., was sent as a political agent to the West Indies, Guiana, and Brazil. In 1614 he sat in parliament, but from 1615 to 1618 was ambassador to the Great Mogul Jahangir at Agra. His journal of this mission was partly printed in Purchas and other collections. He was ambassador to the Ottoman Porte in 1621-28, afterwards represented England in Poland, Denmark, and elsewhere, and died in 1644.

Roebeck, JOHN ARTHUR, English politician, was born at Madras in December 1802, but passed his youth in Canada. Coming to England in 1824, he was in 1831 called to the bar at the Inner Temple, and in 1832 elected as a Radical reformer for Bath to the House of Commons. He represented Sheffield from 1849 to 1868, and again from 1874 till his death on 30th November 1879. The vigorous nature of his political warfare earned him the popular nickname of 'Tear 'em.' His greatest political triumph was the moving of a motion for inquiring into the condition of the army before Sebastopol in January 1855, which he carried by a large majority, causing the fall of the administration of the Earl of Aberdeen. He was appointed chairman of the committee which conducted the inquiry moved for. During the civil war in America he displayed a strong leaning towards the Confederates. He supported the Earl of Beaconsfield's policy during the Eastern crisis in 1877-78, and in 1879 was made a member of the Privy-council. He was the author of a work on the *Colonies of England* (1849), and *The Whig Ministry of 1830* (1852). See his *Life and Letters* by Leader (1897).

Roermond, an old town in the Dutch province of Limburg, at the junction of the Roer and the Maas (Meuse), 29 miles by rail N. by E. of Maastricht. The cathedral (1218) is one of the finest Romanesque churches in the Netherlands. The church of St Christopher contains good paintings by Dutch masters. Principal industries are weaving woollen cloths and cottons and making paper. During the middle ages Roermond was on several occasions besieged and taken; its walls were demolished in 1819. Pop. 14,000

Roeskilde, a city on the Danish island of Zealand, is situated at the southern end of the Roeskilder Fjord, 20 miles by rail W. by S. of Copenhagen. In the middle ages this city, founded in 980, was the capital of the Danish kings and the seat of powerful bishops. The cathedral, built in the middle of the 13th century, contains the tombs of most of the kings of Denmark. Here peace was signed between Sweden and Denmark on 8th March 1658. Pop. 13,000 (formerly 100,000).

Roe-stone, a name locally given to those lime-stones which are formed of small globules like the roe of fishes. It has been translated into the scientific term *Oolite* (q.v.).

Rogation Days, the Monday, Tuesday, and Wednesday before Ascension-day, so called because on these days the Litany (q.v.) is appointed to be sung or recited by the clergy and people in public procession. The practice of public supplications on occasion of public danger or calamity is traceable very early in Christian use; but the fixing of the days before Ascension for the purpose is ascribed to Mamertus, Bishop of Vienne, in the middle of the 5th century. In England the usage dates from perhaps the 7th century; after the Reformation the recitation of the Litany upon these days was discontinued; but a memorial of the old processions long survived in the so-called Perambulation of Parishes (see **BOUNDS, BEATING OF THE**).

Roger I., count of Sicily, the youngest of the twelve sons of Tancred de Hauteville of Normandy, was born in that duchy in 1031. When twenty-seven years of age he joined his famous brother Robert Guiscard (q.v.) in South Italy; but at first he seems to have fought against Robert more than he helped him. At length they became reconciled, and Roger helped Robert to complete the conquest of Calabria. In 1060 Roger was invited to Sicily to fight against the Saracens: he took Messina, and settled a garrison there. Everywhere the Normans were welcomed by the Christians of Sicily as their deliverers from the Moslem yoke, and they won town after town, until in 1072 the Saracen capital, Palermo, was captured. Robert then invested Roger with the countship of Sicily. Count Roger spent the rest of his life, apart from his numerous expeditions undertaken for the support of his brother, in completing the conquest of Sicily, which was finally effected in 1091. Already as early as 1060 Duke Robert had given his brother the half of Calabria, with the title of count. After Robert's death (1085) Roger succeeded to his Italian possessions, and became the head of the Norman power in southern Europe. Pope Urban II. granted him special ecclesiastical privileges, such as the power to appoint the bishops, and made him papal legate of Sicily (1098). Roger died at Mileto, in Calabria, in June 1101. See **SICILY**.

Roger II., king of Sicily, the second son of Count Roger I., was born in 1097, and by the death of his elder brother Simon in 1105 became count of Sicily. On the death (1127) of Duke William of Apulia, grandson of Robert Guiscard, his duchy passed to Roger, who thereupon proceeded to weld together a strong Norman kingdom in Sicily and South Italy; the Antipope Anacletus crowned him king of Sicily, Apulia, and Calabria in 1130. He next added to his dominions the Norman principality of Capua (1136), the duchy of Naples, and the territories of the Abruzzi (1140). In the year prior to this last acquisition he managed to take prisoner Pope Innocent II., with whom he concluded an advantageous bargain: Innocent recognised him as king of Sicily, whilst Roger acknowledged Innocent as pope, gave him his liberty, and held his kingdom as a fief of the holy see. The Byzantine emperor Manuel having

insulted Roger's ambassador, Roger's admiral, George of Antioch, ravaged the coasts of Dalmatia and Epirus, took Corfu, and plundered Corinth and Athens (1146). He carried off silk-workers from the Peloponnesus to Sicily, and so introduced that industry into the kingdom. Roger then crossed the Mediterranean (1147) and won a large province from the Saracens in North Africa—Tripolis, Tunis, and Algeria. His court was one of the most magnificent in Europe; he was tolerant to all the creeds of the various peoples under his rule; his government was firm and enlightened; his name a terror to both Greeks and Moslems. Roger died in February 1154. See SICILY; and *Roger the Great*, by E. Curtis (1913).

Roger of Wendover (d. 1236), Benedictine prior of St Albans, completed the work of Matthew Paris (q.v.).

Rogers, JAMES EDWIN THOROLD, economist, was born at the village of West Meon, Hampshire, in 1823, and educated at King's College, London, and Magdalen Hall, Oxford, graduating with a first-class in 1846. At first an ardent Puseyite, he took orders, but soon returned to Oxford and became a successful 'coach,' and renounced his orders formally, together with Dr Congreve and Leslie Stephen, after the Clerical Disabilities Act of 1870. In 1862 he was elected professor of Political Economy, but made so many enemies by his outspoken zeal for reforms that he was not re-elected in 1868, nor until the death of Bonamy Price in 1888. An advanced Liberal in politics, he represented Southwark, 1880-85, and Bermondsey, 1885-86. He died October 12, 1890. His greatest work is his painful and laborious *History of Agriculture and Prices in England* (8 vols. 1866-93), and its abridgment, *Six Centuries of Work and Wages* (1885). Besides these he wrote a study on Cobden (1873), edited the *Speeches* (1868) and *Public Addresses of Bright* (1879), the *Wealth of Nations* (2 vols. 1880), and the *Collection of Protests of the Lords* [1624-1874] (3 vols. 1875).

Other books are *Education in Oxford* (1861); *Historical Gleanings* (2 series, 1869-70); *The First Nine Years of the Bank of England* (1887); *The Economic Interpretation of History* (1888); and, ed. by his son, *The Industrial and Commercial History of England* (1892).

Rogers, JOHN, the first of the Marian martyrs, was born near Birmingham in 1505, graduated in 1523 from Pembroke Hall, Cambridge, was a London rector (1532-34), and then lived for some years abroad, at Antwerp and Wittenberg, where he embraced the Reformed doctrines. He prepared a revised translation of the Bible (q.v., p. 127), which was published as 'Matthew's Bible' in 1537, and, returning to England in 1548, preached at St Paul's Cross in 1553, just after Queen Mary's accession, against Romanism. After a long imprisonment he was tried as a heretic, and burned at Smithfield on 4th February 1555. See his *Life* by Colonel J. L. Chester (1861).

Rogers, SAMUEL, the poet, was born at the suburban village of Stoke-Newington on 30th July 1763, the third son in a family of nine. His father, a City banker, was a Whig and dissenter, a member of the congregation of Dr Price (q.v.); his mother, Mary Radford, was the great-granddaughter of Philip Henry. After a private education, at sixteen or seventeen he entered the bank, in 1784 was taken into partnership, and on his father's death in 1793 became head of the firm. His taste for literature and for the company of literary men awoke at an early period, and one day with a friend he had gone to call upon Dr Johnson at his house in Bolt Court, but his courage failed him when his hand was on the knocker. In 1781 he contributed eight short essays to the *Gentleman's Magazine*;

next year wrote a comic opera, containing a score of songs; and in 1786 (the year of Burns's first volume) published *An Ode to Superstition, with some other Poems*. In 1792 appeared *The Pleasures of Memory*, on which his poetical fame was chiefly based, and which in 1816 reached a nineteenth edition (more than 23,000 copies). There followed, 'written with laborious slowness,' *An Epistle to a Friend* (Richard Sharp, 1798), the fragmentary *Voyage of Columbus* (1812), *Jacqueline* (1814, bound up with Byron's *Lara*), and the 'inimitable' *Italy* (1822-28). The last, in blank verse, proved a monetary failure; but the loss was recouped by the splendid edition of it and his earlier poems, brought out at a cost of £15,000 (2 vols. 1830-34), with 114 illustrations by Turner and Stothard.

Meanwhile he had left the old home on Newington Green, and in 1803 (in which year, with £5000 a year, he withdrew from the bank as a sleeping partner) had given up the chambers in the Temple, and settled down finally to bachelor life in his exquisite house, 22 St James's Place, looking into the Green Park. He had had his affairs of the heart, had proposed, indeed, to a daughter of Banks the sculptor. She refused him, and left him free to cultivate his muse and caustic wit, to raise breakfast-giving to a fine art, to make little tours at home and on the Continent, and to gather an art-collection which sold at his death for £50,000. With Rogers one cannot help harping upon money, for he was rich as no poet perhaps before or after him. At least he made a good use of his riches, for he was quietly generous to Moore and Campbell, and others, unknown ones, whom it was no such credit to have aided. But with the kindest heart he had the unkindest tongue. 'I have a very weak voice,' he explained once to Sir Henry Taylor; 'if I did not say ill-natured things no one would hear me.' With which, however, Campbell's saying should be coupled: 'Borrow five hundred pounds of Rogers, and he will never say a word against you till you want to repay him.' Anyhow it has come to pass that 'melodious Rogers,' whom Byron ranked above Wordsworth and Coleridge, as we too might rank him if only his works had perished, is better remembered to-day by a few of those ill-natured things (e.g. by his witty couplet upon Ward; see EPIGRAM) than by his poetry, which, chaste though it be, and elegant and cultured, with 'no such thing as a vulgar line in it,' is dead and mummified. It is no more a pleasure of memory, but unread, not even forgotten. One is reconciled somewhat to such oblivion by remembering how, when in his old age Fanny Kemble used to go and sit with Rogers, she never asked what she should read to him without his putting into her hands his own poems, which always lay by him on his table. For this was the Rogers who had announced his intention of being 'read to, when old and bedridden, by young people—Scott's novels perhaps.' There is not much more to tell of him—the bank-robbery (£47,000, 1844); the proffer by Prince Albert of the laureateship (1850); the street accident—knocking down by a carriage (1850)—which crippled him for the rest of his life; and the peaceful ending of that life (*æt.* ninety-two) on 18th December 1855. He is buried at Hornsey.

See Alexander Dyce's *Recollections of the Table-talk of Samuel Rogers* (1856); *Recollections by Rogers*, edited by his nephew William Sharpe (1859); Hayward's article in the *Edinburgh Review* for July 1856 (reprinted in his *Essays*, 1879); P. W. Clavden's *Early Life of Rogers* (1887) and *Rogers and his Contemporaries* (2 vols. 1889), and R. E. Roberts's *Samuel Rogers and his Circle* (1910).

Roget, PETER MARK, was born in London in 1779, the only son of a Genevan who had settled as

minister of a French church in London and married the sister of Sir Samuel Romilly. He was educated at Edinburgh, became physician to the Manchester Infirmary in 1804, and in 1808 settled in London, where he became physician to the Northern Dispensary; F.R.S. (1815), and afterwards for over twenty years its secretary; Fullerian professor of Physiology at the Royal Institution; and an original member of senate of the University of London, surviving till 17th September 1869. He wrote one of the 'Bridgewater Treatises,' *On Animal and Vegetable Physiology considered with Reference to Natural Theology* (1834), and the more famous *Thesaurus of English Words and Phrases* (1852), passed through 28 editions in his lifetime.

Rogue-money, an assessment formerly levied on every county in Scotland 'for defraying the charges of apprehending criminals, or subsisting them when apprehended, and of carrying on prosecutions against them.' This tax was first imposed by statute, 11 Geo. I. chap. 26, on the narrative that criminals were in the habit of escaping punishment for lack of the funds necessary to bring them to justice. The freeholders in each shire were directed to fix the assessment at any of the head courts yearly, and to appoint collectors. By 31 and 32 Vict. chap. 82 rogue-money in the shires was abolished, and in lieu thereof power was conferred on the Commissioners of Supply to levy by rate a 'County General Assessment.' By the Local Government (Scotland) Act, 52 and 53 Vict. chap. 50, sect. 11, this power of the Commissioners of Supply is now vested in the locally elected county councils. It is to be observed, however, that the repealed portions of 31 and 32 Vict. chap. 82 do not include sect. 10, which reserves the existing right of any burgh to levy rogue-money.

Rohan, an ancient Breton family of princely rank, descended in the male line from the dukes of Brittany, the name taken from the village of Rohan in the department of Morbihan. Its motto was characteristic of its pride: 'Roy ne puyt, Duc ne daygne, Rohan suyt.' The family still flourishes in the line of Rohan-Guéméné-Rochefort, naturalised with princely rank in Austria. The line of Rohan-Soubise became extinct in 1787, that of Rohan-Gié in 1638. The founder of the family was Alain I., fourth son of the Vicomte Eudon de Porhoët, who became Vicomte de Rohan in 1128. Under Charles IX. in 1570 the domain of Guéméné was formed into a principality for Louis Rohan VI., whose son Louis de Rohan-Guéméné was made in 1588 by Henry III. Duc de Montbazou. Both the latter and his son Hercule (died 1654) bore arms against the League. The famous beauty, wit, and political intriguer, the Duchesse de Chevreuse (died 1679), was a daughter of Hercule. Louis, Prince de Rohan-Guéméné (born 1635), lost the favour of Louis XIV. by his dissolute life, and died on the scaffold in 1674 for treasonable dealings with the Dutch.

LOUIS RENÉ ÉDOUARD, PRINCE DE ROHAN-GUÉMÉNÉ, born 25th September 1734, embraced the clerical life in spite of dissolute morals and an extravagant love of luxury, and at an early age became coadjutor to his uncle the Bishop of Strasbourg. In 1772 he was sent as a special minister to Vienna. His habits were displeasing to Maria Theresa, and he ruined himself at the French court by slanderous gossip about Marie Antoinette. He was recalled in 1774, and, although with grudging, made grand-almoner in 1777. Next year came a cardinal's hat, through the influence of Stanislaus Poniatowski, king of Poland; and a year later the succession to the bishopric of Strasbourg, held by three members of his family before him. His eagerness to recover his footing at court made him an

easy victim to the schemes of Cagliostro and the adventuress Lamothe, and their clumsy forgeries and personations were enough to make him purchase the famous Diamond Necklace for the queen. As soon as the plot was discovered the cardinal was sent to the Bastille, but was acquitted by the Parlement of Paris, 31st May 1786. He found himself for the moment a hero of the mob, was elected to the States-general in 1789, but refused to take the new oath to the constitution in January 1791, and retired to Ettenheim in the German part of his diocese, where he died, 17th February 1803.

See DIAMOND NECKLACE, and books enumerated thereat; also the far from trustworthy *Mémoires inédits du Comte de Lamotte-Valois* (edited by Louis Lacour, 1858), and G. C. D'est Ange, *Marie Antoinette et le Procès du Collier* (1889); the *Mémoires* of Rohan's secretary, the Abbé Georget, as well as the books by Beugnot and Madame Campan.

With Victor Louis Mériadeuc, Prince de Rohan-Guéméné, Duc de Montbazou and Bouillon, who died in 1846, ended the direct main line. He was succeeded by his two nephews, scions of a younger branch of the line Guéméné, that of Rohan-Rochefort, who had been adopted in 1833 by his brother Jules Armand Louis (died 1836).

The line Rohan-Gié, which sprang from that of Guéméné, was founded by Pierre de Rohan de Gié (1453-1513), marshal and tutor of Francis I. His son fell at Pavia in 1525; his grandson, René I., at Metz in 1552. The latter was married to Isabella d'Albret, great-aunt of King Henri IV., whence the Calvinism of the family. René II. (1550-86) married in 1575 the celebrated poetess, Catherine de Parthenay, heiress of the house of Soubise.—Their son Henri, Duc de Rohan-Gié, Prince of Leon, was born 21st August 1579 at the castle of Blain in Brittany, and at sixteen came to the court of Henry IV., with whom he was ever an especial favourite. He was made in 1603 Duc de Rohan and a peer of France, and in 1605 he married the daughter of Sully. After the king's murder—a fatal blow to his hopes—he became one of the chief leaders of the Huguenot party in France, and, when all endeavours to bring about a peaceable settlement had come to nothing, took up the sword, fortified the places in Guienne, held Montauban against the king, and at last forced him in the peace of 1622 into a confirmation of the Edict of Nantes. Thereafter he took his share in all the tortuous intrigues of the time, fighting now for his king, now against him, ever holding up the religious cause, alike in times of open warfare and hollow peace. After the surrender of La Rochelle (1628) a price was set on his head, and he made his way to Venice, but soon after was called on by Richelieu to serve his king in the Valtelline, out of which he speedily cleared both the Imperialists and the Spaniards. He next carried his sword to Bernhard of Saxe-Weimar, but received a wound at Rheinfelden on the 28th February 1638, of which he died at Königsfeld on the 13th April. But his name survives best in his admirable *Mémoires*, three books of which (1644) embrace the civil wars, the fourth (not published till 1758) the Valtelline campaign. They may be found in Michaud and Poujoulat's collection.

See the works by Fauvelot du Toc (Paris, 1667), Schybergson (ib. 1880), H. De La Garde (ib. 1884); Bühring, *Venedig, Gustav Adolf, und Rohan* (Halle, 1885); Langol, *Henri de Rohan, son rôle politique et militaire sous Louis XIII.* (Paris, 1889); the *Edinburgh Review* for April 1890; Veraguth, *Herzog Rohan* (1894).

His daughter, Marguerite de Rohan, brought the great possessions of the house in 1645 to her husband, Henri de Chabot, Marquis de Saint-Aulaye, who thereupon assumed the name of Rohan.

See SOUBISE; also De la Chenaye-Desbois, *Genealogie des Maisons Rohan* (Prague, 1872).

Rohilkhand, a division of the United Provinces of Agra and Oudh, has an area of 10,800 sq. m. and a pop. of 5,200,000.

Rohillas were Afghan Pathans who rose to power in Rohilkhand, India, about the middle of the 18th century. The Mahrattas on one side and Shuja ud-Daula of Oudh on the other pressed them hard; at last Shuja, with the help of British soldiers lent to him by Warren Hastings, succeeded (1773-74) in subduing them. See Sir John Strachey's *Hastings and the Rohilla War* (Oxford, 1892).

Rohlf's, GERHARD, German traveller in Africa, was born at Vegesack near Bremen on 14th April 1832, studied medicine at Heidelberg, Würzburg, and Göttingen, and joined (1855) the Foreign Legion serving in Algeria. Having learned Arabic and made himself thoroughly familiar with Mohammedan customs, he set off (1861) for Morocco, travelled through that country under the protection of the Grand Sherif, and was exploring the Wady Draa in the Sahara (1862) when he was attacked by his own guides, plundered, and left for dead in the desert. Two marabouts found him and carried him back to Algeria. In 1864 he again visited the Sahara, getting to Tuat and Ghadamès; in 1865 he was in Fezzan and Tibesti; in 1866 in Bornu, whence he made for the Benue, and so reached the Niger. He accompanied the British expedition to Abyssinia in 1868; and was then sent to carry presents from the king of Prussia to the sultan of Bornu. In 1873-74 he was commissioned by the khedive of Egypt to lead an expedition to the oasis of Siwa (Jupiter Ammon) in the Libyan Desert. The German government in 1878 sent him to carry presents from the emperor to the sultan of Wadai; but the expedition was attacked and driven back by Arabs in the oasis of Kufra. The last mission of Rohlf's was from the German emperor to Abyssinia in 1885. He died 2d June 1896. He wrote several books on his journeys.

Rohtak, a town of British India, in the Punjab, 42 miles NW. of Delhi. Turbans are manufactured. Pop. 25,000.

Rokitansky, KARL, BARON VON, founder of the school of pathological anatomy at Vienna, was born at Königgrätz in Bohemia on 19th February 1804, studied medicine at Prague and Vienna, in 1828 was appointed assistant to the professor of Pathological Anatomy in the university of the latter city, and in 1834 succeeded him. He likewise held the offices of prosector at the city infirmary, legal anatomist to the city, and medical adviser to the ministry of education and public worship. In 1869 he was made president of the Austrian Academy of Sciences. He retired from work in 1875, and died on 23d July 1878. Although Rokitansky agreed with the old humoral pathologists in so far that he regarded the changes of the blood as the chief immediate causes of disease, he laid the principal stress of medical study upon morbid anatomy, post-mortem dissection, and observation. He stands pre-eminent amongst German medical teachers as the one who established pathological anatomy as the basis of all original scientific inquiry in the domain of medicine. His teachings were published in the great work *Handbuch der pathologischen Anatomie* (5 vols. 1842-46; 3d ed. 1855-61; Eng. trans. of Sydenham Society, 4 vols. 1849-52), and in *Memorials of the Vienna Academy of Sciences*. See an anonymous Biography (Vienna, 1874).

Roland (Ital. *Orlando*, Span. *Roldán*), the most prominent hero in the Charlemagne legend, is a figure in history as well as in poetry and fable, though all that we know of him is contained in one line of Eginhard's *Vita Karoli*,

chap. ix., and that simply records his name, Hruodlandus, his rank of prefect or warden of the march of Brittany, and his death at the hands of the Gascons in a valley of the Pyrenees. Such is the acorn from which a whole forest of romance has sprung up. According to the *Annals* (commonly attributed to Eginhard, but by some to Angilbert, who died fifteen years before they end), Charlemagne was invited in 777 to take possession of Saragossa and other cities in Spain by Ibn al Arabi, leader of the revolt against the Khalif Abd-er-Rahman, and in 778 crossed the Pyrenees into the territory of the Gascons, attacked and took Pamplona, the stronghold of the Navarrese, and advanced to Saragossa, and having received the submission of Ibn al Arabi and his friends, and taken hostages of them, returned the way he came. According to other accounts the Saracens played him false, and a rising of the Saxons compelled him to hasten home. Al Makkari merely says that after warring for some time with Abd-er-Rahman he sent him an embassy proposing an alliance and friendship, and that peace was concluded between them. At any rate it is certain that Charles made but a short stay in Spain, that on his way back he levelled the walls of Pamplona to the ground, and that about 25 miles north-east of it the rearguard of his army was annihilated by the Gascons at Roncesvalles. The battlefield is a small oval plain, evidently an old lake-bed, shut in all round, except on the south where the waters escaped, by steep mountain-ridges clothed from base to summit with thick beech woods. To the north there is a slight depression where, by the Col of Ibañeta, a path crosses the crest of the Pyrenees and descends the Val Carlos to St Jean-Pied-de-Port. The features of the spot are faithfully given in a few words by Eginhard. As the army, by reason of the narrowness of the place, was marching in extended order, the Gascons, from an ambush on the heights, rushed upon those guarding the rear, hurled them into the valley beneath, and there slew them to a man. Roncesvalles is in fact a natural trap, and it says little for Charles as a general that he should have ventured into it without first securing the heights and scouring the woods; for when Roland, in the *Chanson*, thinks of it, it is too late. He was in a hostile country, made so by his own acts. Eginhard may talk of the perfidy of the Gascons, and poets sentimentalise over the *dolorosa rotta*, but history and justice will call it a merited retribution for overbearing militarism, and the proper punishment of insolent contempt for a weak adversary.

Naturally, the tragic character of the disaster, and the reverse to the mighty king of the Franks at the close of what was looked upon as a holy war, made a deep and wide-spread impression. Upon himself the effect, the *Annals* say, was that it clouded the success of his expedition, and there can be no doubt that already in his lifetime it was a theme with the popular minstrels far and wide. In the middle of the 9th century the biographer of Louis held it needless to mention the names of those who fell, *quia vulgata sunt*. In course of time the story underwent modifications in the hands of the poets. Everything in it was magnified. The expedition became a campaign lasting twice as many years as it had occupied months; the disaster was made a defeat of vast proportions, accounted for by treachery, the traitor Ganelon being invented for that purpose; the Basques were turned into Saracens; and for further dramatic effect Charlemagne, who was but thirty-six, was represented as a venerable old man with a snow-white beard, and Roland as his nephew. M. Bédier regards the *Chanson de Roland* and the other Charlemagne epics as separate literary creations, not products of evolution through oral tradition.

The oldest form in which we have the *Chanson de Roland* is that of the MS. in the Bodleian Library, Oxford, written presumably towards the end of the 12th century; but this is evidently by no means its oldest form as a consecutive poem. It is in the language of northern France, the language of the *trouvères*, but there is no good reason for assigning it to any one province. The best, and most likely the oldest, part of the poem is that which deals with the combat at Roncesvalles, Roland's refusal, until too late, to sound his horn, the deeds and deaths of the peers one by one, and of Roland last of all. The opening portion, the despatch of Ganelon at Roland's suggestion as envoy to the Saracens, his anger and betrayal of Roland in revenge, and the concluding part, the vengeance of Charlemagne, and the trial and death of Ganelon, probably came later. There can be little doubt that the episode of the Emir Baligant was a comparatively late addition.

Besides the Oxford MS. there are half-a-dozen others ranging from the 13th to the 16th century. In the Oxford MS. the assonant rhyme is maintained throughout, the same assonance being kept up to the end of each break or *laisse*. In the later MSS. the assonance is turned into full consonant rhyme, and the poem expanded to twice or thrice its former length. A very close German version, the *Ruolandes Liet*, shows that early in the 12th century the *chanson* had passed out of its native country and language; and it is almost as closely followed in the Icelandic *Karlamagnus Saga* of the 13th. The *Chanson de Roland* is the foundation of the Charlemagne legend. Charles's wars and quarrels with his vassals would no doubt of themselves have furnished themes for the jongleurs, but the legend, culminating in the Morgante of Pulci and the Orlando of Boiardo and Ariosto, is the outcome of the story of Roland and Roncesvalles.

The following are the printed editions of the *Chanson de Roland*. From the Oxford MS., by Françoise Michel (Paris, 1837); text, with translation, by F. Genin (Paris, 1850); the Oxford text, ed. Müller (Gött., 1851; reprinted with additions, 1863, 1878); 2d ed. of F. Michel's, with text of 13th-century MS. in the Bib. Nat. added (Paris, 1867); *Roncesval*, Oxford text. E. Boehmer (Halle, 1872); MS. of Lib. of St Mark, Venice, fac-simile by E. Kolbing (Heilbronn, 1877); Oxford MS., ed. by E. Stengel, with a photograph fac-simile (Leipzig, 1900); Text, with translation in assonant rhyme, Petit de Julleville (Paris, 1878); Text, with translation, commentary, notes, &c., by Léon Gautier (often reprinted). There are other translations by Joinain, Lelugeur, St Albin, Jubert, Baron d'Avril (1865, 1877), and Fabre (1902). The *Ruolandes Liet* was printed in 1727, and again by W. Grimm in 1838, and by Karl Bartsch (1874); and there is a translation by W. Hertz (1861). Mrs Marsh in 1854 translated Vitet's epitome of the poem; O'Hagan produced a scholarly metrical version (2d ed. 1883), as did Rabillon (New York, 1885) and Way (1913); Butler's (1904) is in prose; Scott Moncrieff's (1919) in *laissez*. See two works by G. Paris (1900-5), Bédier, *La Chanson de Roland* (1922).

Roland de la Platière, JEAN MARIE, and his greater wife, MADAME ROLAND (*née* Marie-Jeanne- or Manon-Philippin), are among the most memorable martyrs of the French Revolution. Roland was born of a decayed legal family at Thizy, near Villefranche-sur-Saône, in 1734. He made his way unaided, and had risen to be inspector of manufactures at Amiens, when in January 1776 he made the acquaintance of his gifted wife. She was twenty years his junior, having been born at Paris, 17th March 1754, daughter of an engraver, who ruined himself by unlucky speculations. From the first an eager and imaginative child, she read everything, even heraldry, and Plutarch made the young idealist a republican for life. At eleven she

went for a year into a convent to prepare for her first communion, next passed a year with her grandmother, and then returned to her father's house, where she read Buffon, Bossuet, and Helvétius, and at length found her gospel in the writings of Rousseau. Her mother died in 1775, and the girl, solitary and poor, and soured to her father by his misconduct, at length in February 1780 married the estimable Roland. He was over forty, thin, yellowish, careless in dress, abrupt and austere in manners, solid and well-informed indeed, but dry, unsympathetic, and addicted to talking about himself. They lived at Amiens, where her only child, a daughter, Eudora, was born (Oct. 1781); and next at Lyons, and travelled in England and Switzerland. The Agricultural Society of Lyons charged Roland to draw up its *cahier* for the States-general, and in February 1791 he went to Paris to watch the interests of its municipality, returned to Lyons in September, but came back to Paris before the close of the year. It was now that Madame Roland became queen of a coterie of young and eloquent enthusiasts that included all the famous and ill-fated leaders of the Gironde, Brissot, Buzot, Pétion, and at first even Robespierre and Danton. In March 1792 Roland became minister of the Interior, and his stiff manners, round hat, and unbuckled shoes struck dismay into the court. Three months later he was dismissed for his remonstrance to the king, who had refused to sanction the decree for the banishment of non-juring priests. It was Madame Roland's vigorous pen that wrote this letter, as indeed she wrote most of the papers that her husband signed. He was recalled after the king's removal to the Temple, made himself hateful to the Jacobins by his protests against the September massacres, and took his part in the last ineffectual struggle of the Girondists to form a moderate party. On 22d January 1793, just after the king's execution, he resigned. It was in the last days of the Gironde that the reciprocal affection between Madame Roland and Buzot crossed the indefinite bounds that separate friendship from love. But her Spartan soul sacrificed its passion to duty, and she made a confidant of her husband. On 31st May the tocsin announced the proscription of the Twenty-two. Roland had been arrested, but escaped and fled to Rouen; Buzot and some of the others fled to Caen to organise insurrection, but in vain; next day she herself was seized and carried to the Abbaye. Set at liberty two days later, she was arrested anew and taken to Sainte-Élégie. In her five more months of prison she wrote her unfinished *Mémoires*, furtively, with a swiftly flowing pen, on sheets of coarse gray paper given her by a kindly turnkey. The approach of death unsealed her lips, and (22d June to 7th July) in four letters to Buzot, strangely discovered in 1863, she spoke out a love that could never now come into conflict with duty. On the 8th November 1793 she was carried to the guillotine along with a trembling printer of assignats, whom she asked Sanson to take first to save him the horror of seeing her head fall.—'You cannot,' said she, 'refuse the last request of a woman.' On the scaffold, as she looked up at the statue of Liberty, she exclaimed, 'O Liberté, comme on t'a jouée!' or as it is still more commonly given, 'O Liberté, que de crimes on commet en ton nom!' She had often said her husband would not long survive her; on hearing of her fate he ran himself through with his sword-stick near Rouen.

Madame Roland's *Mémoires*, a serene and delightful revelation of her youth in a series of charming glimpses, were first published in 1820. In 1864 they were printed in their entirety, and edited by Dauban and by Faugère. The best edition is that of Ferroud (1905). But in writing

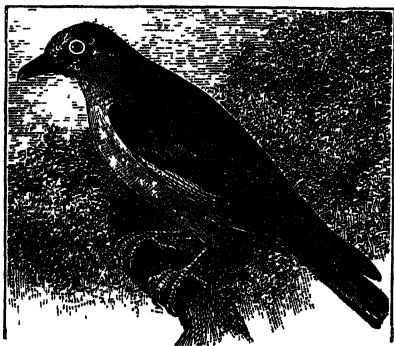
she is best and most natural in her letters, as in those to her future husband, the series to Bosc, those to Bancal des Issarts, the four to Buzot, and the exquisitely simple letters to her two school friends, Henriette and Sophie Cannel. Her *Letters* were collected by Dauban (2 vols. 1867), and by Ferroud (2 vols. 1900-2), who also edited the *Lettres d'Amour* of the Rolands (1909). See the studies by Dauban (1864), Mathilde Blind (1886), J. A. Taylor (1911); Lamy, *Deux Femmes Célèbres* (1884); Austin Dobson, *Four Frenchwomen* (1890); Sainte-Beuve, in *Nouveaux Lundis*, and in *Portraits de Femmes*: Una Birch, *Mme. Roland* (1917).

Rolf. See NORTHMEN, NORMANDY.

Rolland, ROMAIN, was born at Clamecy in central France on 29th January 1866. Educated at Paris and Rome, he devoted himself to the fine arts, taking special interest in the history of music and the theatre, and lecturing as professor of the History of Art at the Sorbonne. His works include historical plays (*St Louis, Le 14 Juillet, Danton*, &c.); monographs on Händel, Beethoven, Hugo Wolf, Millet, Michelangelo, Tolstoy; critical essays on the drama and opera; socialist and pacifist writings; but his most notable production is a novel-cycle, *Jean Christophe*, in three parts and ten volumes (1904 *et seq.*; Eng. trans. 4 vols.), the comprehensive plotless story of the development of a musician of genius, a hero 'with a pure heart and unclouded vision,' revolted by the shams and compromises of conventional morality. This colossal work won immediate recognition by the subtlety and delicacy of its psychological analysis, its fine courage, and its vivid style. See *Rolland, l'Homme et l'Œuvre*, by P. Seippel (1913); and Stefan Zweig's Study (1921).

Rolle, RICHARD. See HAMPOLE.

Roller (*Coraciidae*), a family of Picarian birds characteristic of the Ethiopian and Oriental regions, although the common Roller is extensively distributed in the Palearctic region and a few species enter the Australian region. None are found in the New World. Madagascar possesses three species peculiar to itself, and so different from one another that they are regarded as types of different genera, and so different from other rollers that they are grouped into a separate sub-family, Brachypteraciinae: they are named ground-rollers, and are nocturnal in habit. An Indian species, *Eurystomus orientalis*, is also nocturnal. The Common Roller (*Coracias garrula*) is an autumn or more rarely a spring visitor to the British Isles; and about one hundred have been recorded since the first one was noticed by Sir Thomas Browne in 1644. Some have visited the Orkneys



The Common Roller (*Coracias garrula*).

and Shetlands, one has been found as far west as St Kilda, and about half a dozen have been recorded from Ireland. It is a straggler to northern Europe; in central Europe it is common; in

countries bordering on the Mediterranean it is very abundant. It ranges through Asia to Omsk in Siberia and to North-west India. In winter it extends its migrations to Natal and the Cape. In size it is about a foot long. The general colour is light bluish green; the mantle is chestnut-brown; the wings and rump are adorned with beautiful azure blue. The female resembles the male in plumage. Nesting takes place in the woody haunts in May. The nest, which is made in a hollow tree or wall, is built of a few chips, or of roots, grass, feathers, and hair, according to circumstances. The eggs are five or six in number and are of a glossy white colour. The food consists of beetles and other insects captured on the ground. The name 'Roller' is given to the bird on account of its varied and unsteady flight and the habit the male has, during the breeding season, of indulging in extraordinary tumbling antics, and turning somersaults in the air.

Rolleston, GEORGE, was born at Maltby in Yorkshire, July 30, 1829. He had his schooling at Gainsborough and Sheffield, next entered Pembroke College, Oxford, took a classical first-class in 1850, and was elected Fellow of his college the next year. He studied at St Bartholomew's Hospital, and was appointed in 1855 a physician to the British Civil Hospital at Smyrna. Returning to England in 1857, he was made physician to the Radcliffe Infirmary at Oxford, and somewhat later Lee's reader in Anatomy. In 1860 he was appointed Linacre professor of Anatomy and Physiology, became F.R.S. in 1862, Fellow of Merton College in 1872, and died June 9, 1881. His *Forms of Animal Life* (1870) gave him a high reputation, confirmed by his valuable dissertation on craniology in Greenwell's *British Barrows* (1877). See Life prefixed to his *Scientific Papers and Addresses* (ed. Turner and Tylor, 2 vols. 1884).

Rolliad, the name, derived from Lord Rolle (1750-1842), a staunch supporter of Pitt, for a series of Whig satires by George Ellis and others, directed mainly against Pitt and Dundas.

Rollin, CHARLES, born at Paris, January 30, 1661, studied at the Collège du Plessis, and became professor there, next at Paris, and was chosen rector of the university of Paris in 1694. In 1699 he was appointed coadjutor to the principal of the Collège of Beauvais, but was ejected from this situation twelve years later owing to his Jansenistic sympathies. He was re-elected rector of the university in 1720, and died September 14, 1741. His *Traité des Études* (4 vols. 1726-31) has been pronounced by Villemain 'a monument of good sense and taste'; his *Histoire Ancienne* (13 vols. 1730-38), long popular and much translated, is feeble in its philosophy, jejune in its criticism, and often inaccurate in its facts. Yet it has opened the study of ancient history to many men since the young prince Frederick the Great. His *Histoire Romaine* (16 vols. 1738-48) was a much inferior work, long deservedly forgotten. See a book by Fertet (1902).

Rollin, LEDRU. See LEDRU-ROLLIN.

Rollo. See NORTHMEN, NORMANDY.

Rolls, MASTER OF THE, was formerly the chief of the twelve Masters in Chancery, entrusted with the care of grants passed under the great seal, and of all the records of the Chancery; he also sat on the equity side of the court as an independent though subordinate judge; doubts having been raised as to his jurisdiction, his powers were confirmed by act of parliament in 1730. The official residence of the Master of the Rolls in Chancery Lane, with the chapel, &c. thereto attached, form the Liberty of the Rolls. The Master of the Rolls was formerly permitted to sit in the House of Commons, and this usage was defended in a well-

known speech by Macaulay. By the Judicature Act of 1873 the Masters of the Rolls was excluded from the House of Commons; he has since been transferred, by an act passed in 1881, to the Court of Appeal, but he continues to perform administrative duties as head of the Record Office. For the Rolls Series, see RECORDS.

Romagna, formerly the name of a region of Italy, forming the northern portion of the states of the Church (q.v.), in eastern Emilia. From the middle of the 8th century, when the Frankish king Pepin gave the Exarchate of Ravenna to the Roman Church, the Romagna witnessed struggles innumerable between the papal and the temporal authorities of the region. In 1861 the *legations* of Bologna, Ravenna, Ferrara, and Forlì, of which the Romagna then consisted, became provinces of the kingdom of Italy.

Romaic, a term for the popular Greek dialect developed before the fall of the Byzantine empire, essentially similar to the modern Greek tongue as now spoken. The first who wrote in this popular tongue is believed to have been a monk Prodrômus in the 12th century. Those who clung to the old Attic, which still maintained an artificial existence, called themselves *Hellènes*; the party of the popular speech were called *Rhōmaioi*, from *Nea Rhōmē* ('new Rome'), the new name for the capital of the eastern empire. See GREECE.

Romaine, WILLIAM, evangelical divine, was born at Hartlepool, 25th September 1714, and was educated at Hertford College and Christ Church, Oxford. He held various curacies and lecture-ships in London. In 1764 he was chosen rector of St Andrew Wardrobe and St Ann's, Blackfriars, and though the election was disputed it was confirmed by the Court of Chancery in 1766, and he held the living till his death, 26th July 1795. Romaine was a bulwark of Evangelicalism in his day, though himself infected with the taint of Hutchinsonianism. He assailed, not without credit, Warburton's *Divine Legation of Moses*; published commentaries, many sermons, and three books of edification that enjoyed for three generations a remarkable popularity: *The Life of Faith* (1763), *The Walk of Faith* (1771), and *The Triumph of Faith* (1794). There is a complete edition of his works, with a Life by the Hon. and Rev. W. B. Cadogan (8 vols. 1796).

Roman, a town in Moldavia, Rumania, near the junction of the Moldava and Sereth, 36 miles SW. of Jassy. It is the seat of a Greek bishop, with a cathedral (1541), and has beet-sugar factories. Pop. 18,000 (including many Jews).

Roman Architecture. The foundation of Rome falls in the same century as the earliest Greek settlements of Southern Italy and Sicily; but her art and architecture were influenced not by them, but by the Etruscans, the origins and affinities of whom, as well as the date of their arrival in Italy, are as yet unknown. It was to the Tarquins that the Cloaca Maxima and the temple of Jupiter Capitolinus were due; and while some of the branches of the former are preserved, providing examples of the oldest Roman arches we have¹ (see ROME, p. 762), we can form an idea of the aspect of the latter from discoveries in Etruria, and especially from the discovery at Veii of terra-cotta statues of the same date, and probably by the same school of artists.² This, then, and the other early temples of Rome, were in the Etruscan, or rather Italic, style, raised on a podium, with columns in

front only, and often with three cellæ; the superstructure was partly of stone, partly of wood, and the decoration in painted terra-cotta.³ After this, however, there is a long gap; and the next buildings we get in Rome and its neighbourhood are aqueducts, bridges, and comparatively small temples (though at Tivoli and Palestrina they are associated with huge substruction walls and terraces going up the hillside), not at all influenced by what went before, but derived from Hellenistic models of the beginning of the 2d century B.C., in which examples of the Doric, Ionic, and Corinthian orders are to be found. One of the finest, the so-called temple of Fortuna Virilis (probably Mater Matuta) in the Forum Boarium in Rome, really belongs to the time of Julius Cæsar, and buildings of similar style are to be found in the early Augustan age—some of them, like it, constructed of volcanic tufa (or else peperino) and travertine (a hard limestone), which materials were at that period covered (and this must never be forgotten) with a heavy coating of stucco, in which the finer mouldings were expressed; while others were built in marble (such as the temples of Saturn and Julius Cæsar, and the Regia).

The use of the arcade in elevation (i.e. the engaged column combined with the arch) is first found in the Tabularium (78 B.C.), where there is an arcade, with Doric half-columns attached, carrying an entablature (a characteristic combination in Roman architecture), above which was a Corinthian colonnade. Such a building postulates the knowledge of the potentialities of concrete, and especially of concrete vaulting. A great advance in their use was made when, in the time of Augustus, kiln-baked bricks (fragments of roof-tiles were at first used, bricks coming in only under Claudius) began to be used instead of, or in combination with, small pieces of stone as facing, and this rendered possible the construction of enormous concrete walls. A further advance was the introduction of ribs of tiles under Domitian; they were first used under Hadrian in intersecting vaults, which are the prototype of all later cross-vaulting. (They are not used in the Pantheon, where there is a series of arches in the lower part of the dome, and pumice-stone is largely used in the skin to decrease the weight.) This diminished the amount of scaffolding required, as well as the weight of the vault itself, and the great domed constructions of the 3d and following centuries, one of the most important of which, in the history of construction, is

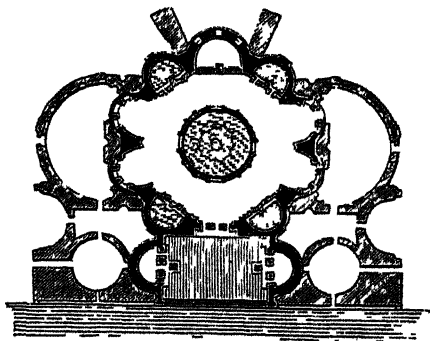


Fig. 1.—Plan of the so-called Temple of Minerva Medica at Rome.

the so-called Temple of Minerva Medica (really a nymphæum—fig. 1), owe their origin to this invention, and from them spring the Christian circular

¹ In Etruria proper we can point to no true arch before the 3d century B.C., nor indeed anywhere else in Italy.

² Pliny tells us that the statue of Jupiter was executed by one Vulca of Veii, and was in painted terra-cotta (*Nat. Hist.* xxxv. 167).

³ A very good idea of such temples can be had from the reconstruction by Bradshaw in *Papers of the British School at Rome*, viii. pl. 1.

and polygonal churches and baptisteries. The planning of such a building as the Baths of Caracalla is not less remarkable than the architecture of the superstructure. But, from the point of view of construction and statics, it is the Baths of Diocletian (with which may be taken the Basilica of Maxentius) which sum up the principles attained by the architects of imperial Rome, and point the way forward to succeeding ages.

When we come to decoration, we find that the Romans had developed the three Greek orders on their own lines. The column of the Doric order, which is Hellenistic in origin, is slenderer than its Greek prototype, and generally has a base, while the capital is more developed in later examples. The Tuscan, a simplified form of the Doric, with unfuted shaft, often rests upon a pedestal, as in the lower arcade of the Colosseum (fig. 2). The Ionic

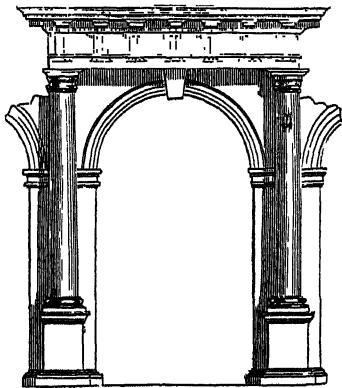


Fig. 2.—Doric Arcade.

and Corinthian were less refined than in Greek architecture, and the former, in some examples, had the volutes turned out angularwise, so as to present a similar face in each direction; while the latter was far more freely used, and was thus more fully developed. In fact, most of the finest buildings in Rome (the temples of Castor and Mars Ultor, and the Pantheon, for example; see *ROME*, p. 764), and many in the provinces (e.g. the *Maison Carrée* at Nîmes), are in this style. The most characteristic type is perhaps the pseudo-peripteral, with half-columns instead of side colonnades; though, where the space was sufficient, peripteral temples occur (the best example is perhaps the temple of Castor). The derivation of the circular temple probably goes back as far as the circular hut of primitive days. The Composite, a combination of these two orders, was invented by the Romans, and largely used on triumphal arches. The mouldings became gradually more elaborate, and we get a kind of imperial baroque architecture, well exemplified at Baalbek. The walls were enriched by facing in slabs of marble or in plaster decorated with painting, while for the vaults stucco, white or coloured, was used—in large buildings often with coffering. The pavements were of marble or of mosaic; the latter came more slowly into use on walls, while in domes it is not found before the 2d century A.D., and even then is rare. The use of the arch springing direct from the column, a feature of such great importance for Christian architecture, is a natural development from the use of the arch springing from a massive stone pillar, and is found on a small scale in houses in Pompeii. One of its best-known exemplifications is in the palace of Diocletian at Spalato (fig. 3), where the architrave is bent round the arch; but the cornice is still continued horizontally above it, and this

remains characteristic of the architecture of the Christian basilicas.

The prototype of these buildings had already been fully evolved in Rome in pagan times, as is

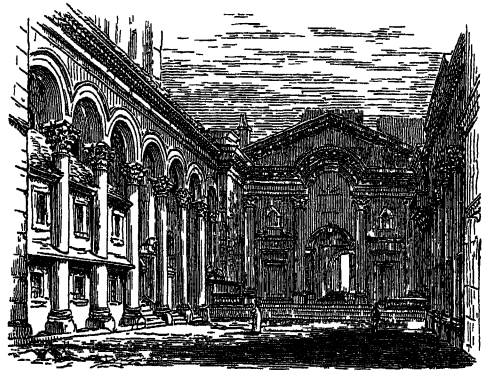


Fig. 3.—Central Courtyard of the Palace of Diocletian, Spalato.

shown by the discovery, close to the Porta Maggiore, of the famous underground basilica of the 1st century A.D.¹ Halls with or without apses, the larger of which were divided by columns into nave and aisles, were in fact common in the Pagan period, and were used for such various purposes that the Christian basilica can hardly be said to be derived from any one type. There are, further, cases in which the nave was certainly raised above the aisles and roofed separately from it (e.g. the Basilica Emilia in the Forum in Rome); and it must be remembered that the apse is so little an essential part of the basilica that many pagan (and a few Christian) basilicas are without it. Nor is either the atrium nor the transept an integral or necessary part of it. What distinguished the Christian basilicas from their predecessors were rather the differences due to their new purpose, which led to their decoration with mosaics and paintings of a new character, though having their roots in classical art. Wilpert's splendidly illustrated work, *Die Römischen Mosaiken und Malereien* (Freiburg im Breisgau, 1917), may be referred to for Rome itself; cf. also the article RAVENNA. Such a characteristic feature as the open wooden roof, so common in mediæval churches, was probably concealed at first by a flat ceiling in painted plaster, as at Aquileia. But it was with the rise of Romanesque Architecture (q.v.) that the transition from the classical to the mediæval period began.

For the various monuments of Roman architecture, see the articles AMPHITHEATRE, AQUEDUCT, BASILICA, BATHS, OSTIA, POMPEII (these last two for domestic architecture), ROME, SPALATO.

See Anderson and Spiers, *Architecture of Greece and Rome* (1907; new edition, by Dinsmoor and Ashby, 1927); Choisy, *Histoire de l'Architecture* (1899); D'Espouy, *Monuments Antiques* (1906-24), and *Fragments* (1896-1905); Durm, *Baukunst der Etrusker und Römer* (1905); Banister Fletcher, *History of Architecture on the Comparative Method* (1925); Stuart Jones, *Companion to Roman History* (1912); Rivoira, *Roman Architecture* (1925); Statham, *Short Critical History of Architecture* (n.d. 1712); Choisy's edition (1909), and Morgan's English translation (1914), of Vitruvius.

Roman Catholic Church, practically the 'church militant' as defined by Cardinal Bellarmine: 'An assembly of men united by the profession of the same Christian faith, and by the

¹ Strong and Jolliffe in *Journal of Hellenic Studies*, xlv. (1924) 65 sqq.

communion of the same sacraments, under the rule of legitimate pastors, and especially of the one vicar of Christ on earth, the Roman pontiff.' It is evident that this is really a definition of the Roman Catholic Church. The truth is that the Roman Catholic Church claims exclusive right to the title of Church of Christ on earth, and declares that 'outside of her fold there is no salvation.' This claim of the Church of Rome to be the exclusive means of salvation has been much misunderstood, and calls for some words of explanation. As we intend to remove a misconception, we explain first what the claim does not mean. It does not mean that none but Roman Catholics are in the way of salvation. This is sufficiently clear from the Encyclical letters ('*Quanto conficiamur*') of Pope Pius IX., dated August 10, 1863. 'It is well known,' writes His Holiness, 'that those who labour under an invincible ignorance concerning our most holy religion, and who at the same time sedulously observing the natural law and the precepts thereof, which are inscribed by God on the hearts of all, are ready to obey God, can, the virtue of divine light and grace working within them, attain to eternal life.' It is not then the teaching of the Roman Church that none but Roman Catholics are saved. The sense of the axiom 'outside the Church of Rome there is no salvation,' as understood by Roman Catholic theologians, is that, whereas Christ came on earth to establish a church which was to be the divinely appointed means for the salvation of all men, the Roman Catholic Church is that church. Further light may be cast on the sense of this axiom by considering the distinction made by Roman Catholic theologians between the body of the church and the soul of the church. By the body of the church they understand the church considered as a visible and external society. By the soul of the church they understand the supernatural life of the members of the church—that is to say, sanctifying grace. Whoever, then, is in the state of grace belongs to the soul of the church. Whoever is not in the state of grace, even though he belong to the visible and external organisation or body of the church, does not belong to the soul of the church. Now the axiom 'outside the church there is no salvation' has reference primarily to the soul of the church. Thus, then, according to Roman Catholic doctrine, the non-Catholic who dies in the state of grace is saved. The Catholic who dies out of the state of grace is lost.

In the symbol commonly known as the Nicene Creed, faith is expressed in 'one, holy, Catholic, and Apostolic Church.' Christian antiquity then regarded unity, sanctity, catholicity, and apostolicity as properties of the true church. The Church of Rome claims to possess these properties, and to possess them manifestly, and in consequence claims to be clearly recognisable as the true church of Christ.—The Church of Rome claims to be *one*, with the completest and most perfect unity, with unity of doctrine, unity of liturgy, and unity of government. (1) With unity of doctrine. Roman Catholics all the world over have precisely the same faith: the learned, indeed, may have a larger acquaintance with the doctrines of faith than the illiterate; but there is nothing believed by the most learned theologian which is not believed, at least implicitly, by the most simple member of the faithful. Every Roman Catholic says, 'I believe whatever the holy Catholic Church proposes for my belief.' (2) With unity of liturgy. In every part of the world the Roman Catholic Church offers the same unbloody sacrifice of the mass, everywhere administers the same sacraments, everywhere observes the same great festival days, &c. (3) With unity of government. Roman

Catholics, whether living under monarchical or republican governments, whether united to each other or divided from each other by their various national interests, are everywhere in subjection to their pastors and bishops, and above all to the Holy See. Indeed, it has perhaps never been denied that with respect to unity the Roman Catholic Church excels all other churches.—The Roman Catholic Church claims to possess visibly the second property of the true church—viz. *sanctity*. She claims to be holy (1) by reason of the holy doctrines which she teaches. Thus, she insists upon the great truth of moral responsibility. She declares that, though man's freedom of will was impaired by the Fall, it was not destroyed; that freedom of will remains, and that no adult can be saved without the due exercise of it. She proclaims that 'faith without works is dead.' She calls upon her children to confront their evil passions with the weapons of fasting and mortification in their hands; holds in high honour the 'life of counsels,' the life of voluntary poverty, chastity, and obedience; and declares that such was the life of the Lord and of the precursor of the Lord. (2) By reason of the means of holiness which she provides. Prominent amongst these a Roman Catholic would place the sacrament of penance. (3) By reason of the fruit of holiness which she produces. Professing that she has existed from the first, the Roman Catholic Church claims as her own all the saints of past times. She declares that her power of producing saints is strong to this day, and points to a St Francis Xavier, a St Charles Borromeo, a St Philip Neri, a St Francis de Sales, a St Vincent de Paul, and many other saints of more recent times. And whoever is acquainted with the rigorous inquiry which precedes the process of canonisation, whatever he may think of the faith of those canonised by Rome, will admit that the saints of the Roman Church were men of even heroic virtue.—The Roman Catholic Church claims to possess visibly the third property of the true church—viz. *catholicity*. She claims to be Catholic *de jure*, inasmuch as she was commissioned to 'teach all nations;' and also *de facto*, and this in three ways. (1) With respect to persons. This means that Roman Catholics constitute by far the most numerous body of Christians. (2) With respect to place. This means that the Roman Catholic religion is more or less diffused wherever Christianity prevails. (3) With respect to time. This means that she has existed visibly since the days of the apostles, and that she will exist visibly till the end. The claim of continued existence from the first really merges into the claim of apostolicity, which we shall next explain. Her belief in her continuance of existence till the end she bases on Christ's promise of constant assistance, which she declares was made to herself.—Finally, the Church of Rome claims to possess visibly the fourth property of the true church—*apostolicity*. She claims to be apostolic (1) as founded by Christ through the apostles, and because her pastors descend from the apostles by a succession which has never been broken. Under this head we may remark that, while many Protestant writers have denied that St Peter the apostle ever resided in Rome, on the other hand many well-known Protestant authorities, such as Barrow, Cave, Chamier, Vossius, Baratier, Bishop Pearson, and Whiston, have freely conceded this to the Catholics. Whiston states that the fact of St Peter's residence at Rome 'is so clear in Christian antiquity that it is a shame for any Protestant to confess that any Protestant ever denied it.' Bishop Pearson declares that 'it is wonderful that those can be found who deny that Peter ever was at

Rome.' Baratier is still more emphatic: 'All the ancients,' he writes, 'and the great majority of the moderns have undertaken to derive the succession of the bishops of Rome from the apostle Peter. So great in this matter has been the agreement of all that in truth it ought to be deemed a miracle that certain persons born in our day have presumed to deny a fact so manifest.' Besides claiming connection with the apostles, by a line of pastors descending from them in uninterrupted succession, the Church of Rome claims to be apostolical (2) by reason of her doctrines. She denies that she has ever surrendered any doctrine taught by the apostles, and she denies that she has ever professed any doctrine which is not contained in divine apostolical tradition. Here it must be remembered that, while the Church of Rome accepts the Word of God alone and exclusively as the Rule of Faith, besides the Sacred Scriptures or written Word of God it admits an unwritten Word of God, which possesses an authority equal to that of the written Word. By the unwritten Word of God Roman Catholics understand a body of truths delivered by Christ to the apostles, and by the apostles to their successors, which were not in the first instance committed to writing. It is certainly worthy of note that Christ did not write, but preach; that he did not command his apostles to write, but to preach; that only five out of the twelve apostles—reckoning St Mathias in the place of Judas—are recorded to have written anything at all; that three out of these five—St Peter, St James, and St Jude—have left us nothing more than brief epistles, written under particular circumstances, and for special reasons; that more than half of the New Testament was written by inspired men who were not among the apostles to whom the commission was addressed by our Saviour. The church is the depositary, guardian, and living and infallible interpreter of both the written and the unwritten Word of God. It may be remarked, in passing, that there would seem to be some analogy between the Roman Catholic rule of faith and the civil constitution of England. According to Judge Blackstone's Commentary, the municipal laws of England are divided into *lex non scripta*, the unwritten or common law, and the *lex scripta*, or statute law; and the common law is the 'first ground and chief corner-stone of the laws of England.' If the question arises as to how these customs or maxims are to be known, and by whom their validity is to be determined, Blackstone decides that the question must be settled by the judges in the several courts of justice, for these judges are 'the depositaries of the law, the living oracles, who must decide in all cases of doubt.'

The Church of Rome teaches that no addition has ever been made to the deposit of faith left by the apostles to the church, and that no objective increase of revelation is to be expected. She does not deny that divine revelations have been made to individuals since the days of the apostles, but she holds that such revelations do not increase the deposit of Christian revelation, and do not constitute an article of Catholic faith to be professed by all the faithful. The faithful are not bound to accept revelations made to private persons, even though the church should express approval of these revelations; for it is understood that the church does not intend by her approval to guarantee their genuineness. The approval of the church amounts to no more than a declaration that there is nothing in the supposed revelations at variance with sound faith and morality. But though the entire deposit of faith was received by the church from the apostles, it does not follow that all the truths contained in this deposit were revealed *explicitly*, and have been at all times

explicitly taught by the church. There has, indeed, never been any difference with respect to the *formal* object, as it is called, or motive of faith. Whatever truth has been believed has always been accepted on the authority of God who revealed it. But with respect to the *material* object of faith—i.e. the truths of revelation—there has been this difference, that, while some have been from the first explicitly believed, others were at one time believed implicitly only. The distinct proposition and promulgation of these latter doctrines belongs to the *magisterium*, or teaching office, which the church exercises under the guidance of the Holy Spirit.

The church fulfils this teaching office in many ways: (1) By indicating in detail the various truths contained in some complex article of explicit faith. Thus, it was always expressly believed by the church that our Saviour was a true and perfect man. But if our Saviour was truly man it follows that He possessed a human body, a rational soul, a human will, and a human energy. And these various consequences the church distinctly proposed for explicit belief, on the emergence of the Gnostic, Apollinarian, Monothelite, and other heresies at variance with these consequences. Or, to take an instance from Roman Catholic theology, the plenitude of the primacy of the Bishop of Rome has always been a principle of faith explicitly believed. But, as occasions and circumstances required, the church has proposed for explicit faith one or other of the prerogatives involved in this primacy. (2) By enunciating in particular truths already comprehended in some universal proposition of explicit faith. Thus, while the church had already taught that grace was necessary for all salutary actions and states, on occasion of the Semipelagian heresy it distinctly decreed that grace was necessary for entrance into the way of salvation and for perseverance in the same. (3) By proposing distinctly and articulately what was already believed, though with less distinctness. Thus, according to Roman Catholics, it has always been the belief of the church that it was due to the honour of the Son of God that His mother should be free from the least stain of sin. The proclamation, then, in recent years of the doctrine of the Immaculate Conception was no more than the distinct and articulate declaration of a truth which had been an object of implicit belief from the first. (4) By expressly declaring some truths which had been already indicated by the practice of the church. Thus, the church, by not rebaptising those converted to her fold from heresy, had practically manifested her belief in the validity of baptism conferred by heretics; but when the validity of heretical baptism was impugned she expressly declared that where the proper matter, form, and intention were employed such baptism was valid. Thus, then, according to the Roman Catholic teaching, there may be truths objectively contained in the deposit of revelation, or the remote rule of faith, which have not been always clearly proposed and promulgated by the proximate rule of faith—i.e. the *magisterium* of the church. Until they are thus proposed and promulgated they may be called in question without loss of faith; for the unity of faith is maintained so long as there is due subjection to the *magisterium* of the church. In the history of many doctrines we may distinguish three distinct phases: (1) In the first instance, they are implicitly contained in revelation indeed, but not yet proposed by the church; and by the faithful they are not explicitly believed, neither are they called in question. (2) Then arises a controversy concerning these doctrines; some are for accepting, others for rejecting them. (3) Finally, the church,

either by solemn judgment or by her common teaching, declares that these doctrines belong to the deposit of revelation; and thenceforward they are an object of explicit faith.

For the teaching of the Roman Catholic Church concerning the Holy See we must refer our readers to the articles POPE, INFALLIBILITY, &c. We may, however, mention here that the very name Roman Catholic is intended as an expression of the belief that there can be no true Catholicity without union with Rome. Roman Catholics assert that there can be no catholicity without unity; and they contend that the See of Rome has always been regarded as the source of unity, and that communion with Rome was regarded by the early church as the ultimate proof of orthodoxy. In support of this contention they quote many striking declarations of the Fathers and of the early councils. The name 'Roman Catholic' is not new. Cardinal Newman, writing of the 5th and 6th centuries, says: 'It is more than remarkable that Catholics of this period were denoted by the additional title of "Romans." Nor was this association of Catholicism with the See of Rome an introduction of that age' (*Essay on Development*, chap. v.).

The hierarchy of the Roman Catholic Church consists of the sovereign pontiff, who is assisted by the Sacred College of Cardinals, and by several sacred congregations, or permanent ecclesiastical committees; of the patriarchs, archbishops, and bishops; of the apostolic delegates, vicars, and prefects; and of certain abbots and prelates. The cardinals, who are the advisers and assistants of the sovereign pontiff, constitute the supreme council or senate of the church; and on the death of the pontiff they elect his successor. The College of Cardinals when complete consists of 70 members: 6 cardinal bishops, whose dioceses are the 6 'Suburban Sees' of Ostia, Velletri, Porto and Santa Rufina, Albano, Frascati, Palestrina, and Sabina, 50 cardinal priests, and 14 cardinal deacons. The sacred congregations carry on the central administration of the Roman Catholic Church.

(1) The Congregation of the Holy Office deals with heresy, indulgences, mixed marriages, and (since the suppression in 1917 of the Congregation of the Index) condemnation of writings prejudicial to faith or morality (see INDEX, INQUISITION); (2) The Consistorial Congregation prepares matter for Consistories, and deals with matters relating to dioceses and bishops, &c.; (3) The Congregation of Sacramental Discipline deals with matrimonial dispensations, and other matters relating to marriage, and the sacraments generally; (4) The Congregation of the Council, originally for the interpretation and execution of the decrees of the Council of Trent, deals with observance of precepts of the Church, with secular clergy, ecclesiastical property, and much else; (5) The Congregation for the Affairs of Religious, with questions between members of religious orders or between them and bishops; (6) The Congregation of Propaganda, for the propagation of the faith and the government of the church in non-Catholic countries; (7) The Congregation for the Eastern Church with jurisdiction over persons and things pertaining to the Oriental Rites; (8) The Congregation of Sacred Rites, for the decision of all questions relative to the liturgy, rites, and ceremonies, and for the conduct of the processes of the beatification and canonisation of saints; (9) The Congregation of the Ceremonial for papal ceremonies, ceremonial of cardinals, &c.; (10) The Congregation of Extraordinary Ecclesiastical Affairs for consideration of matters specially submitted to it by the pope; (11) The Congregation of Seminaries and Universities of Studies, for supervision of courses, con-

ferring of degrees. The jurisdiction of the congregations does not cease on the death of the sovereign pontiff; nevertheless all important business is suspended during the vacancy of the Holy See.

There are 10 patriarchates, with 14 patriarchal sees—8 of the Latin rite, and 6 of Oriental rite. The greater or more ancient patriarchates are those of Alexandria, *Latin* and *Coptic*; Antioch, with 4 patriarchal sees, *Latin*, *Maronite*, *Melchite*, and *Syriac*; Constantinople, *Latin*; and Jerusalem, *Latin*. The less are those of Babylon, *Chaldaic*; Cilicia, *Armenian*; East Indies, *Latin*; Lisbon, *Latin*; Venice, *Latin*; and West Indies, *Latin*. There are in the communion of Rome, besides the 14 patriarchal sees, about 1000 archiepiscopal and episcopal *residential* sees. Besides the archbishops and bishops of these residential sees, there are some 600 archbishops and bishops of *titular* sees. Titular sees, or, as they were styled till 1882, *sees in partibus infidelium*—i.e. sees which in ancient times existed in those eastern regions which have now lost the faith and fallen into barbarism—are, for the most part, assigned to archbishops and bishops who are appointed to apostolic delegations, to vicariates-apostolic, to prefectures-apostolic, or to the office of coadjutor, auxiliary, or administrator of a diocese. Delegates-apostolic and vicars-apostolic enjoy episcopal jurisdiction, and exercise episcopal powers, in countries where a hierarchy proper has never been established, or having once existed has been suppressed. When the ancient hierarchy of England came to an end in 1585 with the death of Thomas Goldwell, Bishop of St Asaph, the English Catholics were at first placed under the jurisdiction of archpriests or prefects-apostolic. But in the year 1623 Pope Gregory XV. appointed a vicar-apostolic with jurisdiction over all the Catholics of England. About sixty years later, in 1688, Pope Innocent XI. created four districts or vicariates, the London, Midland, Northern, and Western, appointing to each district its own vicar-apostolic. In 1840 Pope Gregory XVI. created eight districts or vicariates, the London, Western, Eastern, Central, Welsh, Lancashire, Yorkshire, and Northern, each district having, of course, its own vicar-apostolic. In 1850 Pope Pius IX. re-established the Roman Catholic hierarchy in England. The vicars-apostolic were all bishops of titular sees. Thus, Cardinal Wiseman, who before the restoration of the hierarchy was vicar-apostolic for the London district, was entitled while vicar-apostolic Bishop of Melipotamus. Prefects-apostolic are as a rule not bishops, but simple priests, who receive from the Holy See authority to exercise *quasi*-episcopal jurisdiction in missionary countries.

As is well known, the Latin rite prevails with few exceptions in the West, and also in some regions of the East; nevertheless various other rites are also followed within the communion of Rome. These are (1) the Greek rite, of which there are the following forms. (a) The Greco-Rumanian. There are 3 bishops and 1 archbishop of this rite, whose sees are situated in Rumania. The language of the liturgy is Rumanian, excepting in the parish of Scainsiu, in the diocese of Lugos, where the language employed is ancient Slav. (b) The Greco-Ruthenian. There are 8 bishops and 1 archbishop of this rite, with sees in Galicia and Poland proper and elsewhere. The liturgical language is ancient Slav. (c) The Greco-Bulgarian. Of this rite there are 2 bishops, vicars apostolic, for Macedonia and Thrace. The liturgical language is ancient Slav. (d) The Greco-Melchite. Of this rite is the Melchite patriarch of Antioch, with a number of archbishops and bishops, whose sees are situated in Syria. The liturgical language is Arabic. (e) The pure Greek rite, also in communion with Rome, is under Latin delegates-apostolic at Athens and

Constantinople, with a bishop in Hungary and one in Italy. (2) The Syriac rite, of which there are the following forms. (a) The pure Syriac. Of this rite is the Syriac patriarch of Antioch, with 4 archbishops and 4 bishops, whose sees are situated in Syria, Iraq, and Turkey. The liturgical language is ancient Syriac. (b) The Syro-Chaldaic. Of this rite is the patriarchate of Babylon, with 2 archiepiscopal and 10 episcopal sees situated in Kurdistan, Turkish Armenia, Mesopotamia, and Persia. The liturgical language is ancient Chaldaic. (c) The Syro-Maronite. Of this rite is the Maronite patriarch of Antioch, with 7 archbishops and 2 bishops, whose sees are situated in Syria, Turkey, and Cyprus. The liturgical language is ancient Syriac. (d) The Syro-Malabaric. There is an archbishop at Ernakulam, with 3 bishops in Southern India. The liturgical language is Syro-Malabaric. (3) The Armenian rite. To this rite belong the Armenian patriarchate of Cilicia, the archiepiscopal see of Lemberg, and many other archiepiscopal and episcopal sees situated in Turkey, Syria, Egypt, and Persia. The language of the liturgy is ancient Armenian. (4) The Coptic rite. Of this rite there are two forms: (a) the form followed under the Coptic patriarchate of Alexandria, where Coptic or ancient Egyptian is the language of the liturgy; (b) the form observed in the vicariate-apostolic in Abyssinia, where the liturgical language is ancient Ethiopic or Gêez.

The Catholic population of the world is estimated at 317½ millions of the Latin rite and 7 millions of other rites. Of these 15½ millions are in the British Empire, and nearly 28 millions in the United States and its possessions (including 8 millions in the Philippine Islands).

See Cardinal Manning's *Temporal Mission of the Holy Ghost*; Newman's *Essay on Development of Doctrine*; Wiseman's *Lectures on the Catholic Church*; Ward's *Essays on the Church's Doctrinal Authority*; Murphy's *Chair of Peter* (1888); Leibniz's *System of Theology*, translated by Russell (1850); *Catholic Directory*; *Missiones Catholicae* (Propaganda Press, Rome); Wetzer and Welte, *Kirchenlexikon* (new ed. 13 vols. 1882-1903); Addis and Arnold, *Catholic Dictionary* (new ed. 1905); Herberman and others, *Catholic Encyclopedia* (16 vols. 1907-14; supplement, 1922). The organisation and statistics of the Catholic Church will be found in the relevant paragraphs on the several Catholic countries. The more important Catholic doctrines and institutions are all dealt with in separate articles in this work; as are also the saints and thinkers. See especially the articles:

Absolution.		Douai.		Mary.
Altar.		Excommunication.		Monachism.
Apostolic.	Succession.	Extreme Unction.		Newman.
Aquinas.		Fasting.		Orators.
Archpriest.		Festivals.		Penance.
Atonement.		Franciscans.		Peter.
Baptism.		Gallican Church.		Pope.
Benedictines.		Greek Church.		Prayer.
Bible.		Hell.		Priest.
Bishop.		Hymn.		Purgatory.
Canonisation.		Image Worship.		Relics.
Canon Law.		Inmaculate Conception.		Reservation.
Cardinal.		Indulgence.		Rosary.
Casulistry.		Infallibility.		Sacraments.
Catechism.		Inquisition.		Sacrifice.
Celibacy.		Jansen.		Saints.
Church.		Jesuits.		Supererogation.
Confession.		Liturgy.		Transubstantiation.
Councils.		Lord's Supper.		Trent.
Creeds.		Martyrs.		Vulgate.
Dominicans.				

Roman Catholic Emancipation. See CATHOLIC EMANCIPATION.

Romance Languages, a general name for those modern languages that are the immediate descendants of the language of ancient Rome. In those parts of the empire in which the Roman dominion and civil institutions had been most

completely established the native languages were speedily and completely supplanted by that of the conquerors—Latin. This was the case in Italy itself, in the Spanish peninsula, in Gaul or France, including parts of Switzerland, and in Dacia. When the Roman empire was broken up by the irruptions of the northern nations (in the 5th and 6th centuries) the intruding tribes stood to the Romanised inhabitants in the relation of a ruling caste to a subject population. The dominant Germans continued, where established, for several centuries to use their native tongue among themselves; but from the first they seem to have acknowledged the supremacy of Latin for civil and ecclesiastical purposes, and at last the language of the rulers was merged in that of their subjects; not, however, without leaving decided traces of the struggle—traces chiefly visible in the intrusion of numerous German words, and in the mutilation of the grammatical forms or inflections of ancient Latin, and the substitution therefor of prepositions and auxiliary verbs. It is also to be borne in mind that the language which underwent this change was not the classical Latin of literature, but a popular Roman language (*lingua Romana rustica*) which had been used by the side of the classical, and differed from it—not to the extent of being radically and grammatically another tongue—but chiefly by slovenly pronunciation, the neglect or misuse of grammatical forms, and the use of 'low' and unusual words and idioms. As distinguished from the old *lingua Latina*, the language of the church, the school, and the law, this newly-formed language of ordinary intercourse, in its various dialects, was known from about the 8th century as the *lingua Romana*; and from this name, through the adverb *romance*, came the term Romance, applied both to the language and to the popular poetry written in it, more especially to the dialect and poems of the troubadours. The Romance languages recognised by Diez are six—Italian, Spanish, Portuguese, Provençal, French, and Rumanian. Ascoli and newer investigators treat the Romansch of the Grisons as a seventh sister-tongue; and each of these has more or less numerous dialects.

It is beyond doubt that the several daughters of the mother Latin had their characteristic differences from the very first, as, indeed, was inevitable. The original Latin spoken in the several provinces of the Roman empire must have had very different degrees of purity, and the corruptions in one region must have differed from those in another according to the nature of the superseded tongues. To these differences in the fundamental Latin must be added those of the superadded German element, consisting chiefly in the variety of dialects spoken by the invading nations and the different proportions of the conquering population to the conquered. French, as was to be expected, is richer in German words than any other member of the family. Italian is next to French in this respect, but on the whole is nearest to the mother Latin. Spanish and Portuguese have considerable Arabic elements; and Rumanian was much modified by Slavonic. The Romance tongues further differ from the common parent in simplifying or dropping the inflections of nouns, substituting for these the use of prepositions, and simplifying the verbal forms by a free use of auxiliary verbs. The Romance tongues and their literatures are treated in the articles on Italy, Spain, Portugal, Provençal, France, Rumania, Romansch.

See Cornwell Lewis, *On the Origin and Formation of the Romance Languages* (2d ed. 1862); Diez, *Grammatik der romanischen Sprachen* (1836-44, and later editions), and his dictionary, the great *Wörterbuch* (1853, and later editions; Eng. trans. 1864); Paul Meyer, *Rapport sur*

le Progrès de la Philologie Romane (1874); works on Romance philology by Korting; Grober, *Grundriss der romanischen Philologie* (1888-1902; new ed. 1906); Meyer-Lübke, *Grammatik der romanischen Sprachen* (1890-1902), *Einführung in die rom. Sprachwissenschaft* (1899), and in Hinneberg's *Kultur d. Gegenwart* (vol. i. 1909); and the periodicals *Romanische Studien* (1871 et seq.), *Romania* (1873 et seq.), *Romanische Forschungen* (1883 et seq.).

Romances. Romance has long since lost its original signification in every country except Spain, where it is still occasionally used in speaking of the vernacular, as it was in the middle ages when Latin was the language of the lettered classes and of documents and writings of all kinds. But even there its commoner application is, as elsewhere, not to a language, but to a form of composition. In English it has been almost invariably applied to a certain sort of prose fiction, and, in a secondary sense, to the style and tone prevailing therein. By 'the romances,' using the term specifically, we generally mean the prose fictions which, as reading became a more common accomplishment, took the place of the lays and *Chansons de geste* (q.v.) of the minstrels and trouveres, and were in their turn replaced by the novel. Of these the most important in every way are the so-called romances of chivalry, which may be considered the legitimate descendants of the *chansons de geste*. The chivalry romances divide naturally into three families or groups: the British (which, perhaps, would be more scientifically described as the Armorican or the Anglo-Norman), the French, and the Spanish; the first having for its centre the legend of Arthur and the Round Table; the second formed round the legend of Charlemagne and the Twelve Peers; and the third consisting mainly of Amadis of Gaul followed by a long series of sequels and imitations of one kind or another. In strict chronological order the Charlemagne cycle should stand first, for the Charlemagne legend was apparently of an earlier formation than the Arthurian; but on the other hand the materials out of which the Arthur legend shaped itself must of course have been the older, and the prose romances which either grew out of it or were grafted upon it are for the most part of an earlier date than those belonging to the Charlemagne story.

The first appearance of Arthur is in the history of Nennius, where he is presented in a quasi-historical shape, simply as the chosen leader of the Britons in twelve successful battles fought with the Saxons; but it is in the *Historia Regum Britanniae* of Geoffrey of Monmouth (1140) that he first appears as the hero of a connected story. Geoffrey, in fact, may be fairly claimed as the founder of the Arthurian legend. Whatever his materials may have been or whatever the source from which he obtained them, he contrived to give them 'un caractère chevaleresque et courtois,' to use the words of M. Gaston Paris, which was altogether foreign to them when they came to his hands, and thus succeeded in presenting a picture of Arthur and his court which at once proved acceptable to the age in which he lived. It is this character, impressed upon the Arthur legend by Geoffrey, that led Cervantes to regard it as the fountain-head of chivalry and chivalry romance, as he does in *Don Quixote* (part i. chap. xiii.). The story, however, as Geoffrey left it, is little more than the foundation of the structure raised by his successors a century later. Whether we accept in its entirety or in part only his account of the 'very ancient book' from Brittany which he professed to have translated, or hold that his authorities were simply Nennius, Welsh traditions, and Breton lays and tales, it is clear that his sources of information conveyed no hint of the Round Table or of the

Grail, to say nothing of Lancelot and other personages who have come down to us as part and parcel of the Arthurian story. The first reference to the Round Table is in the *Brut* of Wace (1155), which is in fact an amplified metrical version of Geoffrey's history, and from the words used—'Fist Artus la roonde table, dont Breton dient mainte fable'—we are left to suppose that it was through Breton tradition that it found its way into the story. By some it has been conjectured that in the Round Table we have only an imitation of the Peers of the Charlemagne legend, but in truth the two institutions represented two totally distinct ideas. The peers were simply a fraternity, 'xii. cumpanions,' as the *Chanson de Roland* calls them, bound together by mutual affection alone, with no ulterior aim or object, and entirely uninfluenced by the sovereign. The Round Table, on the other hand, was a knightly fellowship in which the bond of union was the pursuit of chivalrous adventures and 'deeds of worship,' of which the king was the head, and by which he was 'upborne' and the quiet and rest of his realm insured. The distinction deserves notice, for it is characteristic of the difference between the two legends and the romances that represent them. The Arthurian stories were knightly and courtly, their authors were courtiers, sometimes knights—if we may trust the statements of early editors, they were written to order at the instance of magnates, among whom Henry II. and Henry III. of England are named, and at any rate were obviously addressed to what would now be called the aristocratic section of society. With the Carlovigian it was very different; the *chansons de geste* from which they were derived were made for and sung to no one class in particular, and it is manifest that the selection for translation into prose was always governed by considerations of popular interest. Hence the phenomenon noticed by more than one observer, that the Arthurian stories have never become in the strict sense of the word popular in any age or country, while the Carlovigian have enjoyed a wide-spread popularity, and in some instances continued to hold their own as popular stories down to the present day. Mr J. A. Symonds observes that in Italy the Arthurian stories, though relished by the cultured classes, never took the fancy of the people at large in the same way as the Carlovigian; and in Spain the romances and ballads that treat of Arthur are few and meagre, while the Charlemagne literature is extensive and rich, and the *History of Charlemagne and the Twelve Peers* is still a current chap-book in high request. A more obscure question is how the Holy Grail came to be linked to the Arthurian story. There can be no doubt that Celtic tradition and mythology present sufficient analogies to justify a theory that the idea of the Grail is a purely Celtic one which may be traced back to pagan times. But none of these analogues, not Fionn's healing cup or the mystic basin which figures in *Peregrin*, can be in any true sense called a Grail. The essence of the Arthurian Grail lies in its character of a Christian relic, and the very name suggests that the conception as it is there presented to us was an Anglo-Norman one. It is very possible, no doubt, that Celtic tradition may have had a share in shaping the conception, but that is all that can be safely said. Some little light, perhaps, is thrown on the question by the curious coincidence between the book presented in a vision in the year 717, which Robert de Borron (*circa* 1190) sets up as the prime authority for his *Saint Greal*, and the vision in the same year in which the Grail itself was seen by a British hermit, as recorded by Helinand in 1204. The return of the first Crusaders stimulated that enthusiasm for

relics of the Passion of which we have a proof in the *Sacro Catino* at Genoa and its rivals. A very natural consequence would be an eagerness to discover the hiding-place of the true catino, and this, when the Round Table idea had been once imported into the Arthurian story, would furnish the 'deed of worship' *par excellence* necessary to its constitution, while an equally natural consequence would be that the poets in working out the idea would avail themselves of any floating traditions of mystic vessels endowed with miraculous properties which could be pressed into their service. Arthur himself has, no doubt, been treated in the same fashion. Hero-worship is almost always accompanied by annexation. The Charlemagne legend is largely made up of fragments that properly belong to Charles Martel, Pepin, and Charles the Bald. Even in the comparatively modern case of the Cid, one of the most famous exploits, the unseating of the French ambassador, is in reality the property of the 15th-century Conde de Cifuentes. It would be strange if so remote a figure as Arthur's did not show signs of some such process; but even if we find there, as Professor Rhys holds, traces of the culture hero, or of the solar myth, the question of his personality cannot be said to be thereby affected. It would be almost as unreasonable to treat him as a purely mythical being on such grounds, as to deny Sheridan's existence because jokes attributed to him are to be found in early editions of Joe Miller. There is very little certainty connected with the construction of the Arthurian story. It seems plain that the History of the Grail, which properly should precede the Quest, was in reality a later composition; and the respective shares of Chretien de Troyes and Robert de Borron in the Grail, Perceval, and Lancelot are pretty clearly defined. But in most other respects the Arthurian cycle deserves the title M. Gaston Paris applies to it of 'dédale inextricable.' In no case, as Mr Alfred Nutt says, do we possess a primary form; all the versions that have come down to us presuppose something earlier; all is uncertainty, the order in which the component parts were produced, the sources from which they were derived, the authors to whom they are attributable, the relationships of the various versions and forms one to another; and research seems ever to reveal new nebulae and discover fresh clusters of difficulties. Even on the question as to whether the primary form was in verse, as analogy would lead us to expect, we are for the most part left to conjecture. That Breton popular poetry may have contained the germs of Tristram, Perceval, and Lancelot is no doubt a probability; but of one thing at least we may be certain, that veritable creations like the Lancelot of the Arthur story could have had no place in the simple naïve *lais* of which we have examples in the translated specimens of Marie de France. The stones may have come from a Celtic quarry, but the building was Anglo-Norman.

It was inevitable that the Arthur stories proper should be followed by romances claiming a supplementary or an introductory character, such as *Meliadus*, *Guiron le Courtois*, *Artus de Bretagne*, and *Perceforest*, but it would be an injustice to treat these, as Dunlop has done, as though they were legitimate members of the Arthurian cycle, nor have they been admitted into it by the compilers or arrangers who have now and then attempted to present it in a consecutive shape. *Facile princeps* of these is our own Sir Thomas Malory, whose work is, as Dr Sommer says in his masterly edition, 'by far the best guide to the Arthur romances in their entirety.' Malory's judgment may not be, perhaps, invariably impeccable. He has not always chosen the best or most poetical form, and he has

left uncultured many beauties of the old MSS. But this may not have been so much his fault as that of the materials with which he had to content himself. Of his general good taste and literary skill there can be as little question as of his English which has made his book one of the classics of his language. Malory, furthermore, as the exhaustive researches of Dr Sommer show, is the sole authority for portions of the series, in particular the story of Gareth in the seventh book. See ARTHUR, GRAIL.

In the romances of the Charlemagne cycle we stand on much firmer ground. It is true that we know even less of the authors than in the case of the Arthur stories, but on the other hand the whole process of production lies plain to view. The starting-point of the legend is undoubtedly the disaster of Roncesvalles, and the *Song of Roland*—not, of course, the *Chanson de Roland* that has come down to us, but some older form, the existence and nature of which are matters of inference—may be taken as the foundation of the whole Charlemagne cycle of romance (see ROLAND). Of this, apparently, we have a prose version at the end of the Latin history of Charlemagne, which pretends to be the work of his contemporary the Archbishop Turpin. Nothing was further from the intention of the writers than to produce a romance; but among the romances, or at the head of them, their work must be placed. About its intention there can be no mistake. By Charlemagne's example it points out the advantages here and hereafter of serving the church liberally and zealously, endowing holy shrines, encouraging pilgrimages, converting the heathen or exterminating them when unconvertible. It records a military pilgrimage to Compostela made by Charles at the call of St James, and is plainly the work of different hands. M. Gaston Paris believed the five first chapters to have been written by a monk of Compostela about 1050; but it is not very obvious why a Spaniard who had his own national legend of Compostela should have gone out of his way to make a patron of a foreigner and an invader. The remainder, he thinks, was written by a monk of Vienne between 1109 and 1119. The book was soon translated into French, and became the chief source of the story of Roland and Roncesvalles, for which it was believed to be the prime authority until the discovery of the *chanson* proved the existence of a common ancestor. The influence of the latter was mainly through the *chansons de geste* of which it was in most cases the model. Of these the number is large. M. Léon Gautier's list enumerates above a hundred belonging to the Charlemagne cycle, and this of course only represents survivors. Only a few, however, gave birth to prose romances. The Roland had been forestalled by the Turpin history, and of the others the majority were in interest too local, not sufficiently popular, or for other reasons unsuitable for prose. The story of Ogier le Danois (who possibly had nothing to do with Denmark, but was merely warden of the Ardenne-mark) was too famous to be left in the verse of Adenes le Roy; the traditions of the struggles between the sovereign and his vassals in Aquitaine, not so much in Charlemagne's time as in Pepin's, lent an interest to Renaud de Montauban, the Rinaldo of Italian poetry, but best known as the hero of the *Four Sons of Aymon* (q.v.), a romance that has probably never been out of print since the introduction of printing; and similar reasons, more or less strong, influenced the selection of *Doon de Mayence*, *Maugist d'Aggremont*, *Guerin de Montglave*, *Mille et Amys*, *Jourdan de Blaves*, *Galien Rhetoré*, and divers others. One of the most notable, independently of its connection with Don Quixote, is *Fierabras*. In the 15th century it was translated into prose by one Jean Baignon of Lausanne, who

prefixed to it the early account of Charlemagne by Vincent de Beauvais, and added the concluding chapters of Turpin with the Roncesvalles story, the whole forming a kind of consecutive Charlemagne romance resembling the Arthur compilations. In this shape, and under the title of *La Conquête du grant roy Charlemaigne des Espaignes*, it achieved extraordinary popularity, became a regular chap-book, was translated into Spanish by Nicolas de Piamonte, whose version supplied the balsam of which Don Quixote made trial, and from Spanish into Portuguese about the middle of the 18th century; when it was supplemented by an entirely new Charlemagne romance by the translator, a curious proof of the vitality of the legend.

From the lays of the minstrels of the same period there came also many independent prose romances not necessarily connected with any particular cycle: *Valentine and Orson*, which, however, is sometimes linked with the Charlemagne cycle; *Cleomades*, or *Clamades*, where Cervantes found the magic wooden horse, which by a lapse of memory he assigns to *Pierre of Provence and Magalona*, another romance of the same kind; *Partenopeus of Blois*; *Melusina*; *The Knight of the Swan*, in some respects the most interesting of all, and curious as an illustration of the growth of a romance. Originally a folklore legend of Brabant, the source of *Lohengrin*, the story was turned into a poem and incorporated in the series on Godfrey de Bouillon, who was made a descendant of the Knight of the Swan; then it was annexed by Vincent de Beauvais for his *Speculum Historiale*, from which it passed into the shape of a romance, and was translated into English at the instigation of Edward, Duke of Buckingham, who claimed to be one of the knight's descendants.

Cervantes correctly claims *Amadis de Gaula* as the founder of Spanish chivalry romance, though he may have been in error as to its being the first work of the kind printed in Spain; the Valencian *Tirant lo Blanch* must have preceded it. It was long held to be of Portuguese origin on the bare statement of Gomez de Azurara that it was entirely the work of Vasco de Lobeira; but there is ample proof that an *Amadis* was extant in Spain at least as early as the middle of the 14th century, very probably as early as 1300, but at any rate before Lobeira was born. Southey, in whose time the evidence was not forthcoming, may be excused for asserting the Portuguese origin of the romance; but it is strange to find M. Gaston Paris describing it as 'portugais puis espagnol aux XV^e et XVI^e siècles.' Whether this *Amadis* was in verse or in prose is uncertain; we only know from one witness that it was in three books, and Garci de Montalvo, who is responsible for the existing *Amadis*, merely claims to have corrected three books, which previous editors and scribes had left in a corrupt state, and to have added a fourth. Nor is it a certainty that it was of purely Spanish origin. The influence of the Arthurian romances is manifest, but what is far more suspicious is the absence of Spanish colour and indications of Spanish parentage; the names are almost all akin to those of the Arthur stories, the fay Urganda is a distinctly Celtic creation, and the scene throughout is laid on Arthurian ground, Wales, England, Brittany, or Normandy, a choice not easily explained in a romancer whose business was to interest Spanish hearers or readers. But whether or not the original may have been some northern French story, it certainly was not, as has been sometimes suggested, *Amadas et Ydoine* in which there is no more resemblance to *Amadis* than there is in *Acassin and Nicolette*.

The earliest known edition of the *Amadis* (q.v.) is of 1508, but this cannot be the first; it is too near the date of other romances obviously inspired

by it and born of its success, and it is evident that it was finished shortly after the fall of Granada in 1492. The date is significant in its bearing on the curious phenomenon of the sudden outburst of a chivalry romance literature in Spain, just as the middle ages were drawing to an end and other nations were beginning to put away chivalry among the *bric-à-brac* of bygone days. But in Spain it marked the close of a campaign of seven centuries and the end of a national life of sustained excitement. Under the new order of things, the triple despotism of crown, church, and Inquisition, the nobles and minor nobility were left with a superabundance of leisure on their hands, a condition, as every seaside librarian knows, always favourable to the circulation of fiction, so that Montalvo could not have chosen a better time for his venture. But it would be unjust in the extreme to deny to the merits of the *Amadis* their share in the creation of Spanish chivalry romance. In almost every respect, story, incidents, characters, and human interest, it will bear comparison with the best of its predecessors, and as a romance of chivalry, pure and simple, it has no equal. In this lay the secret of its success. For Spain chivalry romance had a reality unknown elsewhere. *Amadis* came to a generation which had seen round Ferdinand and Isabella knights who could match any of Arthur's or Charlemagne's in exploits. Coming at such a time it is no wonder that *Amadis* was followed by a cry for more, and that more was promptly supplied. But *Esplandian*, *Florisando*, *Lisuarte*, *Amadis of Greece* were of a very different vintage. It was by Feliciano de Silva, the object of Cervantes' special detestation, that the work of continuation was chiefly carried on. He was a clever man, with a facile pen, and if not imagination, at least invention in abundance, but his greatest gift was his intuitive perception of the tastes of his readers. He perceived that it was not so much recreation as excitement they wanted, and that so far from objecting to rant, bombast, and extravagance, the more they got the better they were pleased. He seems to have been the first author who reduced writing nonsense to a system, and also the first who made a handsome fortune by his writings. The professed continuations formed, however, only a small portion of the romances, more or less in imitation of the *Amadis*, and infected by the style of Feliciano de Silva, the *Feliarmantes*, *Belianises*, *Olivarises*, which continued to flow from the press until the long line ended with *Policisne de Boecia*, two years before *Don Quixote* was sent to the press.

With *Don Quixote*, fittingly, the history of romances as a branch of fiction comes to a close. There are, indeed, two other groups that claim the title, the Pastorals, and those sometimes called the Heroic, an epithet better deserved by the readers who were bold enough to face entertainment in such a formidable shape. But to these quite as much space as their merits entitle them to has been already given (see NOVELS).

See Paulin Paris, *Les Romans de la Table Ronde* (1868-77); Gaston Paris, *La Littérature Française au Moyen âge* (2d ed. 1890), *Histoire poétique de Charlemagne* (1865), *De Pseudo-Turpino: Hist. Caroli Magni* (1865), &c.; Sommer, *Morte d'Arthur* (1889), and *The Vulgate Version of the Arthurian Romances* (1909-12); A. Nutt, *Studies on the Legend of the Holy Grail* (1888); Rhys, *The Arthurian Legend* (1891); G. Paris and J. Ulrich, *Merlin, Roman en Prose d'après le M.S. appt. à M. Huith* (Soc. Anc. T. Fr. 1886); W. F. Skene, *The Four Ancient Books of Wales* (1868); J. S. Stuart Glennie, *Arthurian Localities* (1888); Birch-Hirschfeld, *Die Sage vom Gral* (1877); Herz, *Sage vom Parzival und dem Gral* (1882); E. Martin, *Zur Gral Sage* (1880); H. Zimmer (on the Breton sources of the Arthur Legend—*Göttingische Gelehrte Anzeigen*, Oct. 1890); L. Gautier, *Les Epopees*

Françaises (1878-92); Melzi, *Bibliografia dei Romanzi Italiani* (1865); Gayangos, *Libros de Caballerías* (Bib. de Autores Españoles, vol. xi.); Mily a Fontanals, *Poesía heroico-popular Castellana* (1874); *Turpini Historia Caroli Magni, Teate Revue par F. Castets* (1890); Ward, Catal. of Romances in the Dept. of MSS., British Museum (1883-93); Quaritch, Catal. of Romances of Chivalry (1882); Early English Text Society's publications; *Romania*; the section on literature in the article SPAIN; Saintsbury, *The Flourishing of Romance* (1897); W. P. Ker, *Epic and Romance* (1897); works by Miss Weston and others in 'The Grimm Library'; works by Joseph Bédier, &c. For verse romances, see separate articles, as ARTHUR, GUY OF WARWICK, THOMAS THE RYMER, WACE.

Roman de la Rose. See MEUNG, CHAUCER.

Roman Empire. See ROME.

Roman Empire, HOLY (more fully in German, *Heiliges Römisches Reich Deutscher Nation*), the official denomination of the German empire from 962 down to 1806, when Francis II. of Hapsburg resigned the imperial title. The Western Roman empire came to an end in 476 A.D.; Charlemagne sought to reconstitute it when he was crowned emperor at Rome by Pope Leo III. in 800. But the reconstituted empire fell again into fragments and chaos, till Otto the Great succeeded in making a great monarchy again, and was crowned emperor by Pope John XII. at Rome in 962. Thenceforward for more than eight centuries there was an unbroken succession of German princes claiming and in a measure exercising the powers and privileges of Roman emperors. The name of 'Roman emperor' was carefully retained; 'Holy' was added to signify that the empire was now Christian; and 'of the German nation' was sometimes appended to indicate the new nationality that dominated over the old imperial realms. The emperor was the official head of the Christian world, the temporal colleague and rival of the pope. The new German empire of 1871 called itself simply German, and dropped all claim to be either 'Roman' or 'Holy.' See GERMANY; CHURCH HISTORY; Herbert Fisher, *The Mediæval Empire* (1899); Bryce's great monograph, *The Holy Roman Empire*.

Romanes, GEORGE JOHN, naturalist, was born at Kingston, Canada, on 20th May 1848, and after a private education in London and on the Continent entered Caius College, Cambridge, and graduated in 1870 with natural science honours. While still at the university he formed a friendship with Darwin, and he has powerfully reinforced his master's arguments in his Croonian, Fullerian, and other lectures, and in his various works—*Animal Intelligence* (1881); *Scientific Evidences of Organic Evolution* (1881); *Mental Evolution in Animals* (1883); *Jelly-fish, Star-fish, and Sea-urchins* (1885); *Mental Evolution in Man* (1888); *Darwin and after Darwin* (1892); *Examination of Weismannism* (1893; see WEISMANN). This most fertile English writer on the theories and philosophy of modern biology died 23d May 1894. His posthumous *Thoughts on Religion*, edited by Canon Gore, showed that, once a defiant agnostic, he had become almost, if not altogether, a Christian; and in this spirit he had before his death revised his *Candid Examination of Theism* (1878). He was F.R.S. and LL.D. See his *Life and Letters* by his wife (1896), and his *Poems* (1896).

Romanesque Architecture, a term invented by Narcisse de Caumont a century ago to describe the architecture of the period between the death of Charlemagne (814 A.D.) and the rise of Gothic Architecture (q.v.). It has sometimes (e.g. by D. MacGibbon in previous editions of this work) been extended to cover the whole period from the time of Constantine to the 11th (or

better the 12th) century. But Rivoira places the dividing line between Christian architecture, which is the continuation of Roman imperial architecture, and what follows, at the Italian churches of the 8th and 9th century (e.g. S. Pietro at Toscanella), which he attributes to the pre-Lombardic style. Here, while the main lines are retained, the classical feeling and proportions are gone, and the decoration is rough. This being so, we can hardly agree with C. Ricci, who, writing on the subject of Romanesque architecture in Italy (*Romanesque Architecture*, London, 1925), does not consider it the rise of a new style, but rather attributes to it

a number of individual features of church architecture—detached campaniles (which even in Ravenna do not appear earlier), large crypts raised on pillars, with stairs leading to the choir above, the introduction of tombs into the interior, porches and small arcades springing from columns (as seen both in cloisters and as decoration to the exterior), the use of heavy bronze doors, &c. &c. There was, undoubtedly, a persistence of architectural vigour in Lombardy (see LOMBARD ARCHITECTURE) which led to an improvement in construction (coupled with a tendency to extend vaulting over the whole church) and in decoration generally; and this revival influenced not only the rest of Italy but the whole of north-western Europe, including England; while the rise of the Italian communes in the 11th century led to the construction of very fine buildings all over the country, not only churches but municipal palaces and private dwellings. Different varieties developed in various places, but they were only rarely (especially in Venice and in Sicily) influenced by Byzantine art. The great monastic establishments of the various orders are also important both in Italy and elsewhere.

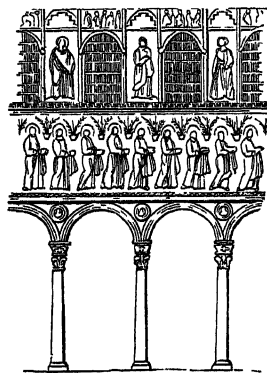
In the 12th and 13th centuries the decoration with *opus sectile* (mosaic of coloured marbles) of floors, pulpits, altars, and even cloisters and façades, was carried out with great success by the masters known as the Cosmati in Rome and Southern Italy.

In Rome itself there is no definite solution of continuity—the classical tradition was too strong, and the influence of Byzantine art slight; while even in Ravenna, where the latter was more strongly felt, a great deal more can be traced back to Roman classical models than has been till recently allowed: and this is especially the case with such features as intersecting vaults, domical construction, the use of arches springing directly from columns, &c. &c. S. Miniato a Monte at Florence shows a similar persistence of the classical style, but with a marked Lombard influence.

See Kingsley Porter, *Mediæval Architecture* (1909); Rivoira, *Lombard Architecture* (1910); Bannister Fletcher, *History of Architecture* (1924).

Romania, (1) the name given by the Venetians to the eastern part of the Morea, whence the capital was called Napoli di Romania (see NAUPLIA).—(2) Roumelia (q.v.) was sometimes called Romania.—(3) Rumania (q.v.) or Roumania.

Roman Law. See LAW, CODE, JUSTINIAN.



Romanesque Interior.

Romano, GIULIO. See GIULIO.

Romanov, HOUSE OF. See RUSSIA.

Romans, a town of France (dept. Drôme), stands on the right bank of the Isère, 12 miles by rail N.E. of Valence. A bridge of the 9th century connects it with Péage on the left bank. Romans owes its origin to an abbey, founded in 837 by St Bernard, Bishop of Vienne. Silk fabrics, shoes, and hats are manufactured. Pop. 17,000.

Romans, EPISTLE TO THE. This epistle, according to the common theory, was written by St Paul to Rome, during his stay at Corinth about the year 58. It belongs to the second group of epistles, and is mainly concerned with the Judaistic controversy. The epistle with which it is most closely related is Galatians—but there is a difference in tone between the two. Galatians is polemical; in it Paul is fighting the battle of his life, and he is merciless in his criticism of the arguments of his opponents. Romans, on the other hand, is more constructive than polemical; there is less passion in its arguments; Paul is in a calmer mood and contents himself with the positive exposition of his fundamental theological principles. The relation between the two epistles is very similar to that which exists between Ephesians and Colossians. Lightfoot compares Galatians to the 'rough model' and Romans to the 'finished statue.' Romans has often been regarded as a compendium of the Pauline theology. Luther, for instance, described it as an *absolutissima epitome evangelii*. This description, however, is difficult to justify, because Romans contains no doctrine of the Church or the eucharist, and there is very little reference in it to eschatology. Probably Moffatt's statement of the object of the epistle is the correct one. 'The purpose of the apostle is to restate, in the light of his experience during the long mission now closing, and in view of the fresh propaganda which he contemplated in the West, the principles of his Gospel for the Gentiles in its relation to Judaism.' (*Introduction to the Literature of the New Testament*, p. 147.)

The common view as to the original destination of the epistle has been challenged in some forms of modern criticism on the evidence of the internal textual data of the epistle. (a) There is good evidence to show that Marcion used a text of the epistle which did not contain the two final chapters. (b) There is considerable diversity of opinion in the Greek MSS. and versions as to the position at which the doxology (xvi. 25-27) ought to be placed. While the most important Greek uncials place it at the end of ch. xvi., other MSS. put it at the end of ch. xiv., a few place it in both positions, and a few omit it altogether. (c) There is a similar discrepancy with regard to the position of the benediction. While the most ancient MSS. place it at xvi. 20, some important authorities insert it after verse 24, and others again after verse 27. (d) Some authorities omit the phrase 'in Rome' in i. 7-15. (e) The long list of salutations in chap. xvi. has always been a difficulty. Is it likely that Paul would have had so many personal friends in a church which he had never visited?

These facts need explanation. Sanday and Headlam think that they can be accounted for by supposing that Marcion omitted the last two chapters because he objected to some of Paul's teaching in them. Hort thinks that the explanation is to be found in the theory that the last two chapters were omitted in the lectionaries as unsuitable for public worship. There is a growing belief, however, among scholars that the textual phenomena can only be explained on the hypothesis that the epistle was issued in several recensions, and was intended to be a 'circular-letter' addressed

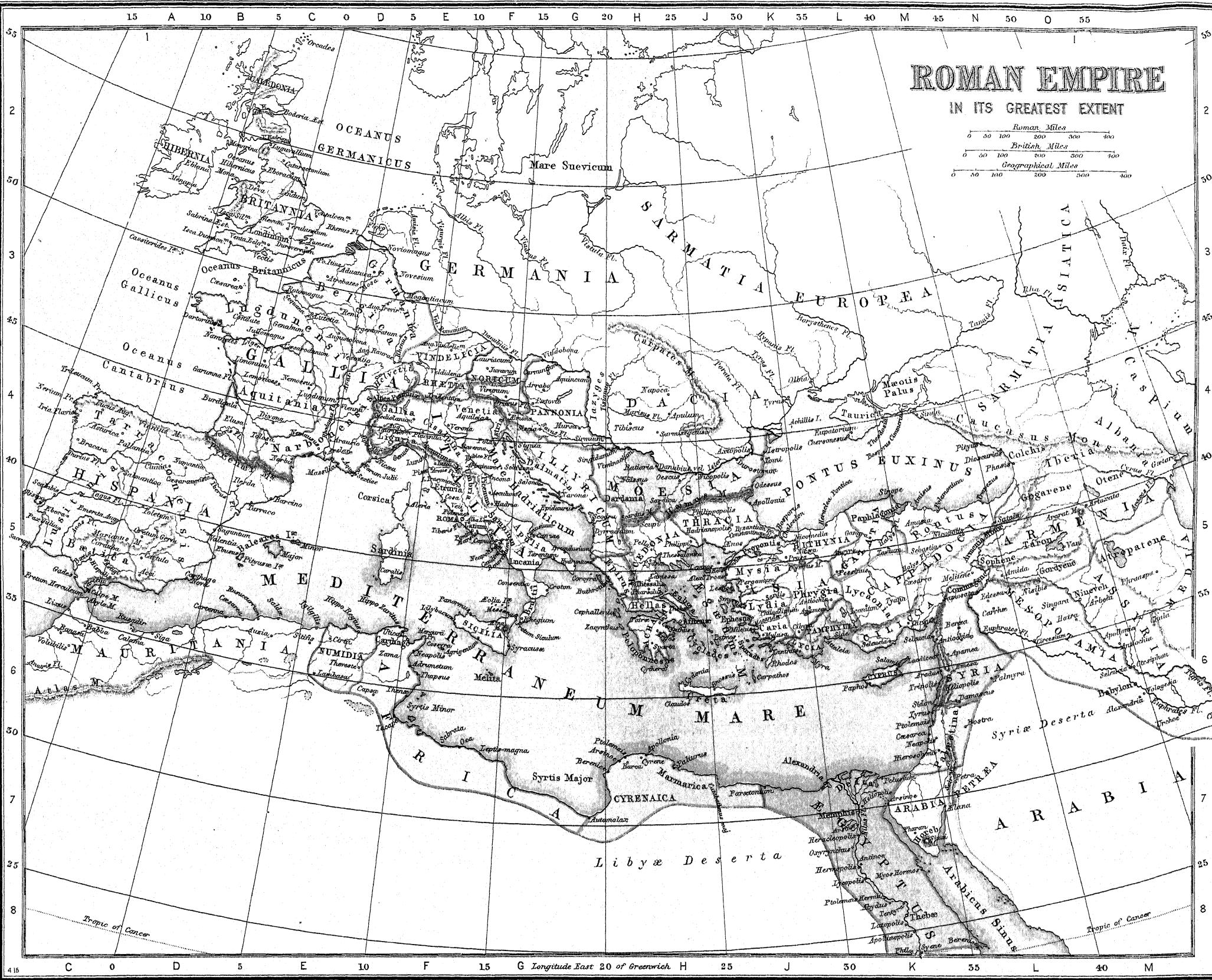
to a number of churches. There is no general agreement, however, as to the relations of the different recensions. Kirsopp Lake holds that the epistle was originally a circular-letter written by St Paul at the same time as Galatians, and primarily intended for the mixed churches which had sprung up in the provinces of Syria and Asia, and that its concluding paragraphs were varied to suit the needs of the different communities to which it was addressed. Lightfoot's theory is that the epistle was originally written for the Roman church, and contained even the salutations in chap. xvi.; but it was subsequently transformed into a circular-letter by the omission of the last two chapters, and the placing of the doxology at the end of chap. xiv. Renan's theory is more elaborate. He thinks that our present epistle contains four different recensions of what was originally a circular-letter—(1) a letter to the Romans, chap. i.-xi. and xv.; (2) a letter to the Ephesians, chap. i.-xiv. and xvi. 20; (3) a letter to the Thessalonians, chap. i.-xiv. and xvi. 21-23; (4) a letter to an unknown church, chap. i.-xiv. and xvi. 25-27.

The 'circular-letter' theory adds to rather than diminishes the importance of the epistle. It accounts for the catholic and comprehensive exposition of the gospel which it contains. The apostle is never—at any rate in the general outline of his argument—diverted from his main purpose by local considerations and controversies. He is able to state his position not in the terms of some local community but for the church as a whole. And consequently there is broader sweep in his argument and a more massive movement in his exposition of his theology than in any other of his epistles, except perhaps Ephesians, which is also a circular epistle and written under similar conditions.

The best modern commentaries are those of Sanday and Headlam (1895), Gifford ('Speaker's Commentary'), Jowett, Beet, Deane ('Expositors' Greek Testament'), Garvie ('Westminster New Testament'), Lipsius (1892), Lietzmann (1906). The best discussion of the critical question will be found in K. Lake, *The Earlier Epistles of St Paul* (1911); Hort, *Prolegomena to Romans and Ephesians* (1895); Lightfoot, *Biblical Essays*; Moffatt, *Introduction to the Literature of the New Testament*. See also, New Testament Introductions of Jülicher, B. Weiss, Reuss and Peake; Shaw, *The Epistles of St Paul*.

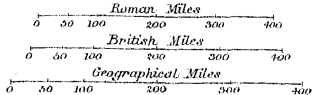
Romansch (Ger. *Churwälsch*, from the town of Chur), a name applied to the Romance dialect, or rather agglomeration of cognate dialects, spoken from the Grisons to Friuli on the Adriatic. Ascoli includes all varieties under the common name of Ladin, although strictly that term applies to the dialect of the Engadine, as Rumonsch does to that of the upper Rhine valley. There are dictionaries by Conradi (Zur. 1820) and Carisch (Chur, 1821). See also Ulrich's *Chrestomathies* (1880-90), and the books named at ROMANCE LANGUAGES.

Romanticism (through the adjective *romantic*, from *romant* or *romant*, 'romance'; see ROMANCES), a movement in feeling and thought that has transformed the literature and art of most nations, was defined by Theodore Watts-Dunton as 'the renaissance of the spirit of wonder in poetry and art.' It was a revolt against pseudo-classicism; a return from the monotonous commonplace of everyday life to the quaint and unfamiliar world of old romance; a craving for the novel, original, and adventurous; an emphasising of the interesting, the picturesque, the 'romantic,' at the expense, if need be, of correctness and elegance, and the current canons of 'good taste.' Deep humour, strong pathos, profound pity are amongst its notes. Romanticism is not necessarily limited to any one period; there are romantic elements in Homer,



ROMAN EMPIRE

IN ITS GREATEST EXTENT



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Æschylus, Sophocles; the poetry of Dante is eminently romantic when contrasted with ancient classical poetry as a whole; but though what is romantic for one generation tends to become classic—and so tame, though not really insipid—for a later one, and though the romantic is almost inevitably one side of a truly artistic temperament, there are certain epochs that are specially romantic, and certain writers in those epochs more romantic than their fellows. The 18th century was notoriously classic in ideal, or pseudo-classic—conventional, pedantic, academic; and the revolt against spiritual ennui which followed is the romantic movement *par excellence*. The movement arose under various conditions in the several countries, had a somewhat varying character and course, and sometimes tended towards the merely crude and grotesque. In England, the fountainhead of the movement which culminated in the beginning of the 19th century, it may be traced from the Percy Ballads and Chatterton, from Cowper and Blake and Burns, to Scott and Byron, Wordsworth and Coleridge, Keats and Rossetti. In Germany there were tendencies in that direction in Lessing, in Schiller, in Goethe, as well as in the philosophy of Schelling, and the 'Sturm und Drang' period was largely romantic in its temper; but it was Novalis who was the prophet of 'romanticism,' and among the other representatives of the school were the Schlegels, Tieck, Kleist, Fouqué, and Hoffmann. In France beginnings are found in Rousseau, in Chateaubriand, and others; but the great chief of French romanticism is Victor Hugo. Other French romantics are Lamartine, Dumas, Gautier, George Sand, Flaubert, Müllner. The romantic movement in the three countries is discussed in the articles on the literature of each. The other countries were more or less moved by the same spirit. The influence of Percy's *Reliques* is traced in the article BALLADS. In Germany romanticism included with the love of the mediæval an affection for the oriental; in religion it led some of its notable representatives to Catholic ideals and into the Catholic Church; and in politics it was associated with reactionary conservatism. The aims of the romantics in painting are defined at PAINTING; see also PRE-RAPHAELITISM. In music Weber has been called the 'creator of romantic opera;' but see OPERA. Berlioz is regarded as the type of French romanticism in music.

Romany. See GYPSIES.

Rome, the capital of the modern kingdom of Italy, stands on the Tiber, about 15 miles from its mouth. Roman legend ascribes the foundation of the original settlement on the Palatine to Romulus, at a date corresponding to 753 B.C. The city occupied seven hills, whose summits rise from 80 to 120 feet above the river and the intervening valleys. These hills are believed to have been formed by submeral erosion of beds of soft tufa previously erupted by submarine volcanoes. Of these seven hills, five—the Palatine, the Capitoline, the Aventine, the Cælian, and the Esquiline,—being more or less isolated, were termed *Montes*; and two, the Quirinal and Viminal, being mere spurs jutting out from the tableland to the east, were called *Colles*. The Esquiline is, however, more properly a *Collis* than a *Mons*, being connected by a narrow neck to the tableland, and its two spurs, the Cispius and the Oppius, were both called *Montes*. The Palatine and the Capitoline, being the most defensible sites, were doubtless the first to be occupied, and this accords with the Roman legend which makes the Palatine the site of the primitive city founded by Romulus, the Capitoline being occupied by a rival Sabine settlement, which, under Tatius the Sabine king, soon

extended to the Quirinal, a contiguous spur of the tableland, separated only by a narrow valley from the Capitoline. We are also told that the Aventine, which after the Palatine and the Capitoline was plainly the most desirable site, was occupied by a colony of Latins in the time of Ancus Marcius, the fourth king. Under Servius Tullius, the sixth king, the Esquiline, together with the Viminal, which is a mere spur of the Esquiline, is said to have been added to the city. These legends conform to the probabilities of the case; and the tombs mentioned below furnish evidence of human habitation at least as early as the 8th century B.C.

The Palatine had considerable natural advantages, being almost completely isolated by two marshy valleys, and only connected by the narrow ridge of the Velia with the Mons Oppius, the south-western extremity of the Esquiline; while the cliffs which surrounded it were a formidable obstacle. It was probably, therefore, not fortified with a wall—the remains which have been found belong to the wall of Servius, which surrounded the whole city. Its neighbourhood to the Tiber enabled it to command the crossing, which must have existed in some form long before the foundation of Rome. The Via Salaria—the salt way—which led from the Sabine mountains to Rome and so to the salt marshes at the river-mouth, is obviously of very early origin; and until the construction of the Via Flaminia in 220 B.C. the Pons Sublicius was the only bridge over the Tiber.

Tradition ascribes the building of the Cloaca Maxima, which drained the valley of the Forum and the Velabrum, to the fifth king, Tarquinius Priscus, the first of a powerful race of foreign kings, the Tarquins, from the city of Tarquinii in Southern Etruria.¹ The Tarquins are said to have ruled over Rome in the 6th century B.C., and this chronological statement is supported in a remarkable way by the discovery of tombs, the latest of which are dated down into the 6th century B.C., proving that the valley of the Forum was used as a burial-place until that time. It is not certain whether this cemetery belonged to the Palatine or the Septimontium;² but, in any case, burials must have ceased to take place here after the valley of the Forum was drained and had become the common market-place of the Latin-Sabine settlements on the Palatine and the Quirinal.³

The valley of the Circus Maximus must have been drained at the same time, for tradition ascribes the beginnings of the circus and the assignment of definite places to the Senate and the Knights (where they could erect wooden platforms twelve feet high from which to view the games) to the Tarquins. It is indeed only reasonable to suppose that, after the separate communities had been knit into one, the two valleys no longer served as the defences of one hill only, but became sites of supreme importance for the development of the life of the whole; and the first wall which enclosed the enlarged city, Rome of the Seven Hills, is ascribed by tradition to Servius Tullius, the immediate successor of Tarquinius Priscus, and predecessor of the seventh and last king, Tarquinius Superbus, and may, from its remains, be assigned with fair certainty to the 6th century B.C. We may suppose, if we will, that the Aventine was at first left out of the enceinte, and the wall carried along the south side of the

¹ A noticeable feature in Etruscan cities was the attention paid to drainage. Not only are rock-cut sewers a feature of Etruscan sites, but the system of tunnels for draining the territory to the north of Veii is one of the most remarkable in existence.

² This was a development towards the east of the original settlement on the Palatine, including two spurs of the Esquiline (the Cispius and Oppius) and the Cælian.

³ The earliest burials are by some assigned to the 11th, by some to the 8th, century B.C.

Palatine. This gives a far better defensive line, avoids the inclusion (which does not seem reasonable) of the place reserved for games and festivals within the area which had to be protected by a wall, and explains the non-inclusion of the Aventine within the pomerium until the time of Claudius.

Of the Cloaca Maxima, little or nothing remains that belongs to the earlier structure; and indeed in the time of Plautus it was called *canalis*, and may still have been open at any rate for part of its course. Some branch-drains, however, on the slope of the Capitol, may still belong to the regal period, and provide examples of the oldest Roman arches in existence.

The remains of the 'Servian' wall that have come down to us belong in the main, however, to its reconstruction after the capture of Rome by the Gauls. Their line can be traced along the entire circuit, and the best preserved portion, with the Porta Viminalis close by, may still be seen in the railway station. Here the wall served as revetment to the *Agger*, a huge mound of earth, and outside it was a ditch, in some places 30 feet deep and 100 feet wide. This method of defence was adopted where the line of the wall had to cross the tableland of the Esquiline, and at other points of weakness; but where possible the wall was carried along the slopes of a hill as a retaining or escarpment wall; and this is most clearly seen on the Palatine, which must have continued to be separately fortified. For 800 years, until the reign of the Emperor Aurelian, the Servian wall formed the only defence of the city. The wall which bears the name of Aurelian followed the octroi boundary of imperial times. On the left bank of the river its line still remains unchanged, though it underwent considerable repairs, both in Roman and in Papal days; but on the right bank it has, in the main, disappeared. It enclosed the suburbs which had grown up beyond the Caelian, the Esquiline, and the Quirinal, and included two additional hills, the Pincian and part of the Janiculum, as well as the low-lying ground near the Tiber called the Campus Martius, which now forms the busiest and most densely populated part of the modern city. The Aurelian Wall, as it is called, was begun by Aurelian in 271 A.D., and completed by the Emperor Probus in 280. It was constructed in such haste that existing buildings were made use of as far as possible—it has been calculated for as much as one-sixth of its total length—including three sides of the wall of the Prætorian Camp constructed under Tiberius as barracks for his guards. It was restored and partly rebuilt by Honorius, and repaired by Belisarius. It is 12 miles in circuit. The Leonine Wall enclosing the Vatican Hill was built by Leo IV. in 848.

Paul III. began to defend the city by a series of bastions, planned by Antonio da Sangallo the younger; but only a few of them were completed. Pius IV. extended the fortifications of Leo IV., enclosing a larger area between the Vatican and the Tiber; while Urban VIII. fortified the whole of the Janiculum, thus superseding the Aurelian Wall on the right bank. Populous suburbs have arisen to the east, west, and north beyond the walls, while to the south, extensive spaces within the walls are uninhabited. In 1888 no less than 1465 acres, chiefly on the Caelian and the Aventine, were occupied by vineyards, fields, and gardens; but this figure is now much lower; while public gardens and squares occupied 106 acres.

Of the monuments of the primitive Forum, one is certainly preserved—the cippus, with its archaic Latin inscription, which still stands near the traditional tomb of Romulus. The whole text is easily read, but one of Mommsen's last pronouncements was that only one word could be interpreted with

certainty—but that was 'recei,' the archaic form of 'regi,' the dative of 'rex': and the inscription itself dates in all probability from the time of the kings.

The tomb of Romulus was closely connected with the Rostra, the raised platform from which the orators spoke, decorated with beaks (rostra) of the ships captured from the Volscian city of Antium. It was situated in front of the Senate House, the Curia Hostilia, which took its name from Tullus Hostilius, the third of the kings of Rome; on the boundary between the Comitium (a rectangular space, constructed according to the rules of augury, with its sides facing the four cardinal points), where the people assembled, and the Forum outside. And it was regarded as making considerable progress in the direction of democratic government when, for the first time, in 145 B.C., the tribune Gaius Licinius Crassus turned his back on the Comitium and began to address the people in the Forum.

On the west side of the Comitium lay the Carcer, the lower chamber of which, the *Tullianum*, a subterranean dungeon, belongs also to a very early period. It has been recently discussed whether it was originally a well-house or a bee-hive tomb. It was the scene of the executions of Jugurtha, Vercingetorix, and other enemies of Rome, including the associates of Catiline, executed here in 63 B.C. at Cicero's orders, on a charge of high treason. It was used as a place of execution down to the 4th century A.D., and has become famous in Christian legend as the prison of Saint Peter. The small size of the prison—though it had annexes and an overflow known as the 'stone quarries' (*lucumia*)—is explained by the fact that it was a place of detention before trial or execution, imprisonment as a punishment being entirely unknown to Roman law. The name 'Mamertine' prison is of mediæval origin.

Not far south of the Carcer lay the Volcanal, a very ancient altar of Vulcan, ascribed even to the time of Romulus. It was originally hewn out of the solid rock of the lower slopes of the Capitol, and part of it may still be seen, showing traces of damage (perhaps caused by the Gauls when they captured Rome) and of subsequent repair with blocks of stone coated with cement painted red.

We can also trace, in some of the earliest of the temples of the Forum, scanty remains of the original structure: and we may be fairly certain that they were preserved in the later reconstructions by reason of the sanctity which attached to them. This is an interesting anticipation of the Christian practice which is so familiar to us. Thus, both in the temple of Castor and Pollux, founded close to Juturna's well, where the Great Twin Brethren watered their horses, after bringing to Rome the news of the victory at Lake Regillus in 496 B.C., and in the temple of Saturn dedicated two years earlier, we may see embedded in the massive concrete bases of the stately edifices of the early Empire the blocks of stone which belonged to the far humbler buildings of the infant Republic.

The Temple of Vesta was of even earlier origin, and its neighbourhood to the well of Juturna presents an interesting juxtaposition of the two main elements of primitive life—fire and water. The form of the temple imitated the primitive round hut, and the virgin priestesses represented the unmarried girls, who, while their men-folk were away hunting or fighting, and the elder women tilled the fields, remained at home to guard the sacred fire on which the life of the tribe depended.

Close by was the Regia, originally the house of Numa Pompilius, according to tradition, and by

him given to the Pontifex Maximus, the chief priest, as his residence.

Besides these primitive sanctuaries, the early forum was enclosed by two rows of shops or booths, the *tabernae veteres* and *tabernae novae*, the former on the south, the latter on the north side. Through this open space ran the *Sacra Via*, along which triumphant generals marched with their armies, ascending finally to the temple of Jupiter on the Capitol, considerable remains of the platform of which still exist, belonging to the original temple which was erected by Tarquinius Priscus, according to tradition.

After the end of the 2d Punic War in 201 B.C., a new kind of building, the *Basilica*, found its way into Rome from Greece. The name means Royal Hall. These were large covered halls which provided shelter from sun and rain, in which courts of law sat, and business was transacted. The first of these halls was built by the famous M. Porcius Cato Censorius in 185 B.C.; in 179 the censors built a second basilica behind the *Tabernae Novae*, which took its name, *Æmilia*, from one of them; while nine years later, T. Sempronius Gracchus, the father of the well-known popular leaders, conqueror of Sardinia, who brought back so many slaves that the market was glutted with them, built a third behind the *Tabernae Veteres*. The erection of these buildings must have considerably modified the aspect of the Forum; but the greatest change of all was made when Julius Cæsar transplanted the Rostra from their position between Comitium and Forum to the upper end of the open area of the latter, in front of the Vulcanal. On the left the Basilica Æmilia was restored at his expense; on the right the Basilica Julia was begun on the site of the older Basilica Sempronia. The Curia was rebuilt, and the size of the Comitium decreased; the older Rostra, with the traditional tomb of Romulus, were buried under a pavement of black marble, still preserved. 'The black stone in the Comitium,' as the antiquarian Pomponius Festus (one of the few archaeologists of antiquity) tells us, 'marks a spot connected with death. According to some, it was intended to serve as the grave of Romulus, but this intention was not carried out, and in the place of Romulus his foster-father Faustulus was buried. According to others it was the grave of Hostus Hostilius, the father of the third king Tullus Hostilius.'

The assembly of the tribes was, at the same time, transferred to the Campus Martius, where, on the west of the *Via Lata* (the first part of the great highway to the north, the *Via Flaminia*, the modern Corso, the most famous street in Rome, and perhaps in the world), a huge covered voting-hall, the *Septia*, was constructed. Further, in order to facilitate communication between the Forum and the Campus Martius, a new Forum was erected to the north-east of the Curia, the Forum Julium, an open space surrounded by colonnades, with the temple of Venus Genetrix in the centre.

Such were the splendid projects of Cæsar, who dedicated the Forum Julium and the Basilica Julia in 46 B.C., and fell less than eighteen months after in the Curia of Pompey under the daggers of his assassins. But in this, as in other respects, his successor Augustus faithfully carried out his trust, and brought his predecessor's schemes to completion; and the Forum proper, as we see it at present, is essentially the work of these two rulers. Almost the only later additions are the Arch of Septimius Severus, with its reliefs commemorating his victories in Mesopotamia, and the group of columns standing on brick bases, which once supported statues, of which the Column of Phocas is one.

The Curia, as it stands, is a reconstruction of the time of Diocletian, but it occupies the site of that of Cæsar.

The Rostra, from which Cicero delivered most of his orations, must have been the older platform on the boundary between Comitium and Forum; but we can recognise traces (behind the large platform of the Rostra of Augustus) of the structure erected by Cæsar, from which his own funeral oration was delivered by Mark Antony, and to which were nailed the head and hands of Cicero.

Indeed, the very spot on which the body of the great dictator was burnt, at the opposite end of the Forum proper, was hallowed by the inclusion in the façade of the temple raised to his memory by Augustus, of a semicircular niche enclosing the actual slabs on which the impromptu pyre was raised.

In the time of Augustus the two basilicas were both restored, the *Miliarium Aureum* or Golden Milestone set up, with the names and distances of the chief towns of the empire upon it (its pendant, the *Umbilicus Romæ*, the central point of the city, is probably of later date), the temples of Concord, of Saturn, and of Castor and Pollux rebuilt, and the open area of the Forum repaved. Augustus also constructed a splendid Forum adjacent to that of Julius Cæsar; the massive and lofty enclosing walls, the three columns and the podium of the temple of Mars Ultor, are among the most imposing remains in Rome.

The *Sacra Via* proper, from the Regia to the Arch of Titus, owes its present line to the construction by Nero of huge porticoes leading up to the vestibule of his Golden House on the Velia: to this line the House of the Vestals was made to conform, and later buildings in this quarter, such as the temple of Antoninus and Faustina and the huge Basilica Nova, built by Maxentius, but altered by Constantine, whose name it bears, followed the same orientation.

The Golden House, erected by Nero after the fire of 64 A.D., occupied an enormous area, with its buildings disposed in a great park, of which an ornamental lake formed the centre; but the appropriation of so much of the centre of Rome was an extremely unpopular act, and Vespasian began the erection of the Colosseum on the site of the lake in the very year of his accession. He also built another Forum, the Forum of Peace, of which little remains; while his son Domitian built the Forum Transitorium (often called the Forum of Nerva), enclosing the Argiletum, one of the most crowded streets of Rome, to connect the Forum of Peace with the other two. Finally, Trajan solved the problem of the connection between the Forum Romanum and the Campus Martius by placing his Forum in the centre of the space between the Capitol and the Quirinal. It was the largest of all, and was reckoned one of the wonders of the world. Within the walls stood the Basilica Ulpia, which has been partly excavated so as to expose the bases of many of the columns.

Beyond it stands the great column of Trajan, 124 feet in height, with spiral bas-reliefs representing scenes from Trajan's campaigns against the Dacians, forming the most instructive historical monument in Rome. We are shown the march of a Roman army, the construction of bridges, assaults on forts, and all the varied incidents of a campaign, constituting a pictorial record containing some 2500 figures of men and horses. In the same style, but of inferior art, is the Column of Marcus Aurelius in the Piazza Colonna, on the Corso, usually called the Antonine Column. It bears reliefs representing scenes in the Germanic and Sarmatic wars, both waged on the Danube.

The Palatine Hill, which rises to the south-west

of the Forum Romanum, became, as early as the 3d century B.C., a favourite residence; and in the last century of the Republic many of the great men of Rome had houses there—among them Milo, Cicero and his brother, and his opponent Hortensius. And it is the house of the last-named, which Augustus bought and enlarged for his own dwelling, which is generally known as the House of Livia, and is still in part preserved.

His successor, Tiberius, erected the first of the great imperial palaces on the south-west summit of the hill, that known as the Cermalus. Caligula extended it towards the Forum, and we are told that he considered the Temple of Castor as the vestibule of the palace. (That this is no mere rhetorical exaggeration is shown by the discovery, under the floor of S. Maria Antiqua, of an open water-tank, once lined with marble, which must have once stood in the middle of a great peristyle or courtyard, and is orientated with the palace of Tiberius.) Of his bridge between the Palatine and the Capitol, which was destroyed by his successor, no remains, naturally, exist.

Nero had already planned, and in part built, a huge palace which should join the Palatine with the Esquiline (*domus transitoria*), when the fire of 64 A.D., which destroyed it, enabled him to realise his projects in still larger measure. The palace of Tiberius seems to have survived this fire, but to have been seriously damaged in another conflagration in 80 A.D.

It was thus to Domitian, after the imperial residences on the Palatine had been entirely laid waste, that the task of reconstruction fell. It seems likely that he first devoted his attention to the palace of Caligula and Tiberius on the Cermalus; and what is known as the 'Bridge of Caligula,' above the Clivus Victoriae, is simply a balcony in two stories, which served to finish off, so to speak, the huge arched substructures of this palace—a balcony which may also be traced at the east angle of this vast pile. He also constructed, or at any rate began, a new approach to the Palatine from the Forum on the same site as the vestibule of Caligula; and the great hall known as the Temple of Augustus, and the two halls behind it, which, in the 6th century after Christ, became the church of S. Maria Antiqua, are ante-chambers to a series of inclined planes which lead up from the Forum to the Clivus Victoriae. But the huge arches which span the road, and which extended the area of the palace considerably towards the Forum, are due to Hadrian. On the remainder of the hill Domitian erected a far larger palace, which was added to, and partly rebuilt, by Septimius Severus, who built the Septizonium to mask its huge substructions, but has otherwise in the main remained unaltered. While this palace was being erected, the main building of the Golden House was, no doubt, still in use; but a fire in 104 A.D. destroyed it, and Trajan erected his huge baths over its ruins (which have recently been excavated), making use of the large reservoir known as the Sette Sale, which had belonged to Nero's palace. Hadrian constructed the temple of Venus and Rome, with its two apses back to back, on the site of the vestibule, and removed the colossal statue of Nero (changed by Vespasian into an Apollo) to the lower ground in front of the Colosseum.

Other temples, besides those already mentioned, include the circular temple by the Tiber, formerly thought to be that of Vesta, now attributed rather to the harbour god Portunus; while the neighbouring Ionic temple, generally known as that of Fortuna Virilis, is probably that of Mater Matuta. Both these are in the Forum Boarium, or cattle-market; and in the adjacent Forum Holitorium, or vegetable market, a group of three more temples

lies beneath the church of S. Nicola in Carcere. Beyond the line of the Servian wall we reach the Campus Martius, a flat plain between the Tiber and the Pincian, Quirinal, and Capitol, originally, as its name implies, used for military exercises, which towards the close of the Republican period began to be utilised for the erection of public buildings. Here is the theatre of Marcellus, begun by Julius Caesar, and finished by Augustus in 11 B.C. in honour of his nephew, who was to have been his heir. In the 12th century it was held as a fortress by the Faffi or Fabii, and later by the Orsini. Two of the three external tiers of arches still stand. Close by is the portico of Octavia, the mother of Marcellus, enclosing the temples of Jupiter and Juno, of which some remains exist; and the theatre of Balbus was not far off. Further to the north lay an earlier group—the theatre of Pompey, with the senate-house in which Cæsar was murdered, and the huge portico attached to it—of which nothing remains above ground; and much the same may be said of the Circus Flaminius, one of the earliest monuments in the Campus Martius, which gave its name to the 9th region of Augustus. It was erected in 221 B.C. by C. Flaminius, the conqueror of Cisalpine Gaul, the constructor of the great north road which bears his name, while within the city it was known as the Via Lata, and formed the eastern boundary of the region. To the north we find a group of buildings which in their present form (as far as they are preserved) belong to the Imperial period. To the west of the Sæpta lay the Iseum and Serapeum of Domitian, then the Thermæ or Baths of Agrippa (in their present form a work of the time of Alexander Severus, to whom was also due the restoration of the Baths of Nero, not far away), who was also the original builder of the Pantheon—though this was apparently a rectangular building facing southward. Certainly the splendid rotunda, the best preserved of ancient Roman interiors, lighted only by a hole in the roof, is entirely the work of Hadrian, together with the Corinthian portico of granite columns in front of it, facing north, and the halls immediately behind. It was consecrated by Pope Boniface in 609 as the church of S. Maria ad Martyres, and in the Middle Ages acquired the name of S. Maria Rotonda. To the west is the Stadium of Domitian (the modern Piazza Navona preserves its form), and to the north the temple of Hadrian (often called that of Neptune), erected by Antoninus Pius, in which the Bourse is now situated. To the north of this an important cross-street ran east and west, and we find beyond it nothing but sepulchral monuments. Near and under the Chamber of Deputies was a group associated with Antoninus Pius and his successor Marcus Aurelius—the columns erected in their honour (only the latter now stands), and the areas in which their remains were cremated; while some way further north again is the huge circular Mausoleum of Augustus, in the Middle Ages the castle of the Colonna family, and recently converted into a concert-hall. On the east side of the Via Lata we find few public buildings, and the remainder of the more important of them are scattered about in different quarters of the city. Even in the Campus Martius the absence of any scheme of town-planning is very noticeable—the monuments fall into comparatively small groups—while in the rest of the city it is still more marked. This is due to the fact that its topography was from the first dictated by the seven hills and the valleys between them, and by the position of the gates in the Servian wall and the roads that led to and issued from them, the lines of which seem to have remained stereotyped.

The importance of the aqueducts in rendering

possible residence in the hilly parts of the city can hardly be overestimated; and it was their cutting by the barbarian invaders of Rome which caused the hills to be almost entirely deserted in the Middle Ages, and indeed until Sixtus V. constructed the *Acqua Felice* in 1585-7. The first, the *Acqua Appia*, was brought to Rome by Appius Claudius Cæcus, the constructor of the Appian Way, in 312 B.C.; but the second, the *Anio Vetus* (272 B.C.), which took its water from the river Anio, above Tivoli, was far more important. The *Acqua Marcia* (144 B.C.) tapped a series of very fine springs in the floor of the Anio valley, which (though the water is calcareous) still form the main supply of the city of Rome; and after a minor aqueduct, the *Tepula*, (125 B.C.) had been added to the supply, and Agrippa had constructed the *Acqua Iulia* (33 B.C.), and the *Acqua Virgo* (19 B.C.), which is still in use, and provides the best drinking water in Rome, Caligula and Claudius returned to the Anio valley, and by the construction of the *Acqua Claudia* (which made use of the same group of springs as the *Marcia*) and the *Anio Novus*, which drew its water from the river once more, enormously increased the supply (38-52 A.D.). Succeeding emperors either repaired or added to the existing aqueducts, and much was done by *Frontinus*, *cursator aquarum* under Trajan, who nearly doubled the amount of water available by removing the abuses which had crept in. Trajan also added a new aqueduct, which bore his name, from springs on the right bank of the Tiber; and so did Alexander Severus, having recourse to the springs below the Alban Hills, of which Pope Sixtus V. was later to make use for the *Acqua Felice*, while Septimius Severus, his son Caracalla, and Diocletian added to the volume of those already in existence. The work of all the last four emperors mentioned was directly in connection with the large baths which they erected.

The huge Baths of Trajan (until lately wrongly known as the Baths of Titus, which are in reality a much smaller building) covered the main palace of the Golden House, and set the model for the two great establishments of the kind, those of Caracalla (*Thermæ Antoninæ*) and Diocletian.

On the low ground, south of the Caelian, are the ruins of the former: they were begun in 212 A.D., and were completed by Alexander Severus. They were built to accommodate 1600 bathers, and, after serving for centuries as a quarry, are still the vastest, and in their desolation perhaps the most impressive, of all the ruins in Rome. The lofty walls are still standing, and, as all the halls have been cleared of rubbish, the arrangements of Roman *thermæ* can here best be studied. We see the *Calidarium*, the *Tepidarium* (a comparatively small room—the so-called *Tepidarium* is really a great central hall), and a *Frigidarium*, with an *Exedra* and a *Stadium* or racecourse. The outer wall encloses a space of nearly 27 acres, of which the baths themselves occupy more than 6 acres. Even more magnificent were the *Thermæ* of Diocletian on the summit of the Quirinal, destined to accommodate 3600 bathers. The semicircular curve which forms such a conspicuous feature in the *Piazza delle Terme*, was the *exedra* of these baths. One of the smaller circular halls forms the church of S. Bernardo, while the great vaulted central hall, with its columns of Egyptian granite, was converted by Michelangelo into the magnificent church of S. Maria degli Angeli, while the cloisters of a Carthusian convent built out of the ruins are now converted into a museum, which has been extended into the greater part of the central building of the *Thermæ*.

Alexander Severus was responsible for the reconstruction of the Baths of Nero near the Pantheon.

The only other large baths that we have not mentioned, the *Thermæ* of Constantine on the Quirinal, have been entirely destroyed since the 16th century.

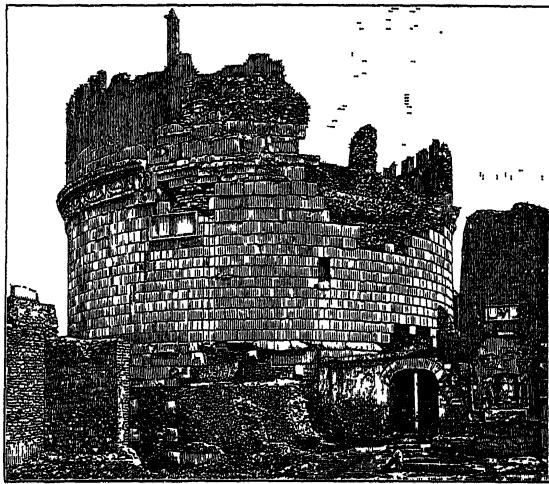
We may now turn to the 'spectacular' buildings, in which shows and games were held for the delectation of the public. In the same characteristic Roman style as the theatre of Marcellus is the great Flavian Amphitheatre, which goes by the name of the Colosseum, built for gladiatorial exhibitions, and for the combats of wild beasts. Commenced by Vespasian, it was dedicated by Titus in 80 A.D., and finished by Domitian. It is built in the form of an ellipse, the longer diameter measuring 617 feet, and the shorter 512 feet. It rises to a height of 160 feet, covering five acres of ground. The Venerable Bede saw it still intact, and its ruin probably began with the earthquake in the time of Leo IV. In the Middle Ages it was used as a quarry, but, though so large a portion has been demolished, it constitutes perhaps the most imposing monument of Roman magnificence which is left. The earlier amphitheatres were mostly of wood, and have mostly perished. The site of the Amphitheatre of Statilius Taurus, erected in 31 B.C., is unknown. At the side of the church of S. Croce in Gerusalemme are considerable remains of the *Amphitheatrum Castrense* (or Court Theatre), which was utilised in the construction of the Aurelian Wall, from which it projects, forming a sort of semicircular bastion.

The oldest circus was the *Circus Maximus*, in the valley between the Palatine and the Aventine. It dated from the regal period, but was enlarged by Julius Caesar, and more than once restored subsequently. It was about three furlongs in length and one in breadth, and is thought on a conservative estimate to have been capable of seating 140,000 spectators. The arrangements of a Roman circus can best be studied in the well-preserved circus on the Appian Way, near the tomb of *Cæcilia Metella*, and built in 311 A.D. by the Emperor Maxentius in memory of his son Romulus. It is 350 yards long and 86 broad. The *metæ*, the *spina*, the carceres, and the seats for the emperor and spectators can still be traced. An Egyptian obelisk of the time of Domitian, removed from this circus in 1641, now adorns the *Piazza Navona*.

Of the *Circus Flaminius*, built in 220 B.C. on the *Campus Martius* immediately below the northern slope of the Capitoline Hill, few vestiges remain; while nothing is now to be seen of the *Circus* of Nero on the Vatican, the centre of which occupied the hollow between St Peter's and the Sacristy, through which the visitor now drives to the Vatican Museum. While the circus was designed for chariot races, the stadium was used for foot races, but the plan of both was identical with that of the modern stadium. The *Stadium* of Domitian on the *Campus Martius* is represented by the present *Piazza Navona*, recently renamed the *Piazza Agonale*; while the *Stadium* or *Hippodrome* in the Palatine was so named from its shape, and was in reality simply a walled garden.

The roads leading out of Rome beyond the Servian Walls were bordered by tombs, many of which, on the erection of the Aurelian Wall, were included within the city. On the Appian Way are the tombs of the Scipios, the inscriptions on which, forming some of the earliest contemporary records of Roman history, are among the treasures of the Vatican. Close by four ancient *columbaria* (amongst many others which have been excavated) are to be seen. Outside the Aurelian Wall is the tomb of *Cæcilia Metella*, wife not of the triumvir Crassus but of his son or grandson (the tomb is certainly a monument of the early Augustan period), which in the 13th century was converted into a

fortress by the Caetani family. It is a cylindrical drum of masonry 90 feet in external diameter, with a circular chamber in the centre. Another remarkable tomb is the Pyramid of Caius Cestius on the Via Ostiensis, close to the Porta Ostiensis (Porta S. Paolo) and the Protestant Cemetery. The most magnificent of Roman tombs was the Mausoleum of Hadrian, now the Castle of S. Angelo. It was a cylindrical mass of masonry, 210 feet in diameter and 70 high, standing within a base 275 feet square. The height of the whole tomb is uncertain; it was surmounted by a colossal statue of the emperor. When the Goths besieged Rome, the tomb was converted into a fortress by Belisarius. It afterwards became the castle of the popes and citadel of Rome, and in 1527 was defended against the French by Benvenuto Cellini. Hardly inferior in magnitude was the Mausoleum of Augustus. Two obelisks of Egyptian granite faced the entrance,



Tomb of Caecilia Metella.

one of which now stands in the piazza of S. Maria Maggiore, and the other fronts the Palace of the Quirinal. In all there are thirteen Egyptian or pseudo-Egyptian obelisks which ornament the piazzas or gardens of Rome. Two stand near the Pantheon, close to the sites of the Temples of Isis and Serapis, before which they were originally erected, while two others from these temples stand, one near the railway station, the other in the Villa Mattei. Another, now in the Piazza del Popolo, was brought from Heliopolis (where it had been erected by Rameses II.) by Augustus, and placed in the Circus Maximus. That in the Piazza di Monte Citorio was also brought to Rome by Augustus. That in the Piazza of St John Lateran, 106 feet in height, is the largest in existence. It was erected at Thebes by Thotmes III., and removed by Constantine to the Circus Maximus. The obelisk in the Piazza di S. Pietro was brought from Heliopolis by Caligula, and placed in the Circus of Nero, near its present site. On the Pincian is an obelisk of Hadrian; and there is another in front of the Trinità di Monti, which is also of Roman date—as is that in the Piazza Navona, which has already been mentioned.

Of the many triumphal arches erected by various emperors in the Forum and elsewhere, the arch of Septimius Severus remains in a fair state of preservation in the Forum, just below the Capitol. At the further end of the Sacred Way is the Arch of Titus, with the well-known reliefs representing the spoils from the Temple at Jerusalem. A little

further south, where the Sacred Way joins the Via Appia, stands the Arch of Constantine, mainly decorated with reliefs from earlier buildings. The so-called Arch of Drusus carried a branch aqueduct to the Baths of Caracalla over the Appian Way, just before the latter passed through the Aurelian Wall. The Arch of Dolabella, built in 10 A.D., is almost hidden in the brickwork of the Aqueduct of Nero, called the Aqua Claudia; and the Arch of Gallienus on the Esquiline, erected in 262 A.D., originally had two side arches as well.

Of the fourteen bridges over the Tiber, three are survivals of the eight or nine ancient bridges. The oldest is the Pons Fabricius, built in 62 B.C. by L. Fabricius, leading from the city to the island in the Tiber. The Pons Cestius, rebuilt by the Emperor Gratian, leads from the island to the right bank of the river. The Pons Ælius, now called the Ponte S. Angelo, was built by Hadrian in 135 A.D. in front of his mausoleum, and now serves as an approach to St Peter's and the Vatican. The Ponte Rotto, or 'broken bridge,' was part of the Pons Æmilius, built in 179 B.C. The Ponte Sisto was built by Pope Sixtus IV. to replace the Pons Aurelius.

Modern Rome.—It is impossible within moderate limits to give an adequate account of Rome, which contains more objects of interest than any other city in the world. A bare enumeration of facts must therefore suffice. The observatory in the Collegio Romano is situated in $41^{\circ} 53' 52''$ N. lat. and $12^{\circ} 28' 40''$ E. long. The population was 226,022 in 1870, 300,467 in 1881, 462,783 in 1901, 688,561 in 1921, and 709,657 in 1923, and it is still increasing fast. The walls, which enclose over 3800 acres, are 14 miles in circuit, and have fifteen gates. In the last thirty years of the 19th century many thousands of houses were built, miles of streets constructed, and millions of money laid out; and since the war the growth of the city has been even more rapid. Under the strict building regulations adopted in 1887, the streets are much more spacious, and even the tenement houses of a better character; meanwhile the government has carefully guarded against the destruction of buildings of historic or antiquarian interest. During recent improvements and excavations many interesting sites have been laid bare (especially near the Forum), and numbers of statues, busts, inscriptions, and smaller objects recovered. Old Rome stands on the left bank of the Tiber; on the right bank, occupying the Vatican and Janiculum Hills and the low ground between these hills and the river, are St Peter's, the Vatican Palace, the Borgo, and Trastevere. The business part of the city occupies the plain on the left bank between the hills and the river, traversed by the Corso (officially Corso Umberto I.), the principal thoroughfare of Rome, about a mile in length, leading from the Porta del Popolo to the foot of the Capitoline Hill. From the Piazza del Popolo two streets diverge on either side of the Corso, the Via di Ripetta to the right, skirting the Tiber, and the Via del Babuino to the left, leading to the Piazza di Spagna, whence the Spanish Steps, once the resort of artists' models, ascend to the Pincian Gardens, on the site of the gardens of Lucullus, which command a splendid view of the city, and formed, till the advent of motor-cars, the fashionable drive and promenade of the Romans. The Villa Borghese (officially Villa Umberto I.), has now been united with these gardens by a viaduct.

Before Rome became the capital of Italy in 1870, the greater part of the Pincian, Quirinal, and

Esquiline Hills was occupied by villas of the Roman nobles, with extensive gardens planted with ilex and other trees. With two exceptions these have been destroyed, and their sites have been covered with modern houses, and too often by blocks of ugly barrack-like buildings, many stories in height, let out in flats. The once dirty but picturesque mediæval and Renaissance city is assuming the aspect of a modern capital, broad straight thoroughfares having been driven through quarters formerly occupied by narrow streets and mean crowded houses. Of the new streets, the most important are the Via Venti Settembre, from the Porta Pia to the Quirinal, and the Via Cavour and the Via Nazionale, which lead from the railway-station—the first to the Forum, and the second to the lower end of the Corso. This is continued to the west by the Corso Vittorio Emanuele as far as the Borgo, crossing the Tiber by a new bridge. The older foreign quarter lay at the foot of the Pincian, around the Piazza di Spagna, but the higher ground towards the railway-station and the so-called Ludovisi quarter are now quite as much frequented.

Of the palaces, the largest are the Vatican, the residence of the pope, and the Quirinal, now the residence of the king, but formerly a papal palace, in which the conclaves were held for the election of the popes. Many of the palaces of the Roman nobles contain collections of pictures and statuary. Chief among them are the Palazzi Borghese (though the greater part of the collections have now been transferred to the Villa, now government property, as are the Palazzi Chigi, Corsini, and di Venezia), Colonna, Doria, Barberini, Rospigliosi, Farnese. Among the notable villas are the Villa Borghese, standing in a great park below the Pincian; the Villa Ludovisi on the Pincian (now a mere fragment of its former self); the Villa Albani, outside the Porta Salaria; and the Villa Medici on the Pincian, now the Académie Française. The gardens of the Villa Mattei, on the Colian, command one of the best views in Rome. The picturesque arches of the Neronian branch of the Aqua Claudia traverse the gardens of the Villa Wolkonsky, now much reduced in size.

Besides the private collections, Rome abounds in libraries and museums. The Collegio Romano, formerly a great Jesuit college, is now occupied by a public library, the Biblioteca Vittorio Emanuele, and by a well-arranged prehistoric and ethnological museum. Etruscan and other pre-classical antiquities from the district round Rome are housed in the Villa Giulia, built by Pope Julius III., outside the Porta del Popolo; while those of the classical period are placed in the Museo Nazionale Romano in the Baths of Diocletian, to which the Ludovisi collection of sculpture has been added. Rome as yet lacks a mediæval museum, though some works of art of this period and of the Renaissance are collected in the Palazzo di Venezia, while the pictures belonging to the government are to be found in the Galleria Nazionale di Arte Antica in the Palazzo Corsini (fine collection of drawings and engravings also). The municipal collections of classical sculpture and antiquities are to be found in the Museo Capitolino and the Museo dei Conservatori (to which an important addition has recently been made) on the Capitol; the two palaces, with the Palazzo del Senatore (built upon the ancient Tabularium) between them, form a fine and dignified group round the Piazza del Campidoglio, in the centre of which is the famous bronze equestrian statue of Marcus Aurelius.

The chief papal collections are contained in the galleries attached to the Vatican, the largest palace in the world. In addition to the private gardens and apartments of the pope, the Vatican palace

comprises immense reception-halls and collections of the highest importance, which can only be mentioned briefly. The walls of the Sistine Chapel, built in 1473 by Sixtus IV., are covered with magnificent frescoes by the great Florentine masters, while Michelangelo painted the ceiling and the 'Last Judgment' on the end wall. The Capella Nicolina, built by Nicholas V., and the Pauline Chapel, built by Paul III. in 1540, are also painted in fresco; the first by Fra Angelico, and the second by Michelangelo. Raphael's stanze are halls covered with celebrated frescoes executed by Perugino, Raphael, Giulio Romano, &c., while the decoration of the loggie, largely designed by Raphael, was entirely carried out by his pupils. The world-famous Vatican Library, with its priceless MSS., its collections of early-printed books, of Christian antiquities, and jewellery, is contained in several large halls. The vast sculpture galleries, with their extensive collections, comprise the Museo Chiaramonti, the Braccio Nuovo, and the Museo Pio-Clementino, which includes the Cortile di Belvedere, containing the Laocoon, the Apollo Belvedere, and the so-called Antinous. The inscriptions are contained in the Galleria Lapidaria, the Etruscan antiquities in the Museo Gregoriano, below which is the Egyptian Museum. The new picture-gallery is on the ground floor opposite to the Vatican Gardens. The Lateran Palace, which is also papal, contains important collections of Pagan and Christian sculpture and inscriptions.

The churches, upwards of 300 in number, are among the most conspicuous features of modern Rome. Many of them are opened only once a year, on the festival of the saint to whom they are dedicated. There are also the churches of the great religious orders, twenty-eight parish churches, and the titular churches of the cardinals. The most noteworthy are the five patriarchal churches, the seven pilgrimage churches, and the eight basilican churches. Others are interesting, either from their early date, their historical associations, from the archaeological or artistic treasures they contain, or from the fragments of earlier structures which they enclose. First in rank are the five patriarchal churches. S. Giovanni, in Laterano, between the Colian and the Esquiline hills, ranks as the first church in Christendom. It dates from the time of Constantine. It was, till the rebuilding of St Peter's, the metropolitan cathedral of Rome and of the western patriarchate. It retains its 5th-century baptistery and the 13th-century cloisters, the most beautiful in Rome. The Santa Scala, brought by the Empress Helena to Rome from Jerusalem, has for centuries been the chief object of veneration for pilgrims. The church itself was burned down and rebuilt in the 14th century, and has been repeatedly altered and modernised. The Basilica of St Peter (S. Pietro in Vaticano), the largest church in the world, was rebuilt in the 16th century from the designs of Bramante and Michelangelo, while Bernini added the colonnade in the 17th century. It was begun in 1506 and consecrated in 1626. It is in the form of a cross, with a vast central dome. The interior length is 611 feet, the height of the nave 145 feet, and the height from the floor to the cross which surmounts the dome 435 feet. S. Paolo fuori le Mura, a vast 4th-century church, was before the fire of 1823 the most interesting church in Rome. It has been rebuilt in a style of great magnificence; it still retains its mediæval cloisters, very similar to those of the Lateran. S. Lorenzo fuori le Mura, occupying the site of a church founded by Constantine, was rebuilt in 578, and enlarged in the 18th century, but still retains the ancient marble and granite columns. The Basilica Liberiana, on the Esquiline, is commonly called S. Maria Maggiore,

being the largest of the eighty churches in Rome dedicated to the Virgin Mary. It is one of the oldest churches in Rome, the nave dating from the 4th or 5th century.

These five patriarchal churches, together with S. Croce and S. Sebastiano, constitute the seven ancient pilgrimage churches. The five patriarchal churches, together with S. Agnese, S. Croce, and S. Clemente, are the eight basilican churches. S. Agnese fuori le Mura was founded by Constantine, and restored in the 6th and 7th centuries. It contains many early Christian inscriptions. S. Croce is a 5th-century basilica, and is said to have been erected by the Empress Helena. S. Clemente is among the most interesting churches in Rome. The upper church dates from the 12th century; the lower, which was discovered in 1857, from the 4th; and below it there are far older buildings dating from the imperial and republican periods, the former including the remains of the house of the saint, and a very well-preserved mithraeum. In addition to the eight basilican churches, others already mentioned conserve the remains of earlier buildings. S. Maria in Cosmedin, one of the most interesting churches in Rome, preserves ten columns of the Statio Annonæ, out of which it was constructed, and twenty ancient columns taken from other buildings. It has also a beautiful pavement of the 13th century, of ancient marbles, like many other churches. S. Maria degli Angeli and S. Bernardo are ensconced in buildings belonging to the Thermæ of Diocletian, and S. Pietro in Carcere over the 'Mamertine' prison. S. Giorgio in Velabro, a 7th-century church, was restored in the 13th century, but preserves sixteen of the ancient columns. S. Costanza, outside the Porta Pia, was erected by Constantine, and contains interesting 4th-century mosaics. The granite columns in S. Maria in Araceli, on the Capitol, have been taken from earlier buildings. On the Celian we have SS. Giovanni e Paolo, founded in the 4th century in the house of the saints to whom it is dedicated, and rebuilt in the 12th; S. Stefano Rotondo, a 5th-century church containing the episcopal throne of Gregory the Great; and the interesting church of S. Gregorio, built in 575 on the site of his father's house. On the Aventine are S. Balbina, and S. Sabina, both of the 5th century. On the Esquiline are S. Pudenziana, a very ancient church with 4th-century mosaics, constructed above a Roman private house; S. Prassede, a 9th-century church with ancient granite columns and 9th-century mosaics; and S. Pietro in Vincoli, a basilica which existed before the beginning of the 5th century and was then restored, with twenty ancient Doric columns; it contains Michelangelo's statue of Moses and the supposed chains of St Peter, which were undoubtedly presented to Pope Leo I. by the Empress Eudoxia in 442. On the right bank of the Tiber are S. Crisogono, a 12th-century church with ancient porphyry columns and a fine mosaic pavement, and (as so often) remains of the Roman house in which the original church was founded lying below; S. Maria in Trastevere, a 5th-century church rebuilt in the 12th century with twenty-two ancient columns, some fine mosaics, a splendid marble pavement, with numerous interesting early inscriptions in the portico; S. Cecilia has 9th-century mosaics; while the Piazza of S. Pietro in Montorio commands the finest view of Rome. S. Maria sopra Minerva, near the Pantheon, the chief Dominican church, is the only Gothic church in Rome. Among the largest of the 16th- and 17th-century churches are the Gesù, the gorgeous church of the Jesuits, containing the tomb of S. Ignatius Loyola; S. Carlo al Corso; S. Andrea della Valle; S. Maria della Vallicella, commonly called the Chiesa Nuova; and the

Cappuccini, with its ossuary and Guido's picture of St Michael.

One of the greatest improvements which have been effected in modern Rome is the embankment of the Tiber, and the straightening and deepening of its channel. This has put a stop to the disastrous floods by which the lower parts of the city were formerly inundated. The opening of new streets and the widening of old ones have also had a favourable result on the public health: and we should remember that the Renaissance popes dealt just as ruthlessly with mediæval Rome. An extensive system of electric trams is in operation, and both these and the electric light and power are worked from high-pressure cables connected with hydraulic power stations in the upper Anio valley and at Terni.

In addition to the objects of interest which have been briefly enumerated are the vast Catacombs extending underground for many miles, which are situated on all the ancient roads radiating from Rome, and the Protestant Cemetery with the tombs of Keats and Shelley. The best panoramic views of Rome are from the Pincio, the Villa Mattei, S. Pietro in Montorio, the Janiculum, the garden of the Priorata di Malta, and from the huge monument to Victor Emmanuel II. on the Capitol. The new *Passeggiata Archeologica*, or Archaeological Park, which includes the Baths of Caracalla and their surroundings, will preserve from modern constructions an interesting part of ancient Rome.

For the clearness of the atmosphere, it is fortunate that there are practically no manufactures in Rome. Hats, gloves, neckties, false pearls and trinkets are made, and there are cabinetmaking and foundries on a small scale, but, compared with other great cities, the absence of factory chimneys is very notable. There are printing-offices, but the Italian book trade is centred at Milan. The chief industry is the manufacture of small mosaics, of small bronzes, of statuary, casts, and pictures, either originals or copies of the works of the great masters. The prosperity of the city depends on the courts of the Quirinal and the Vatican, on the army of functionaries in the public offices, on the numerous banks and businesses which have either main or branch offices in the capital, on the garrison, and on the foreign visitors who crowd the hotels during the winter months. The railways from all parts of Italy converge outside the city, which they enter near the Porta Maggiore on the Esquiline, and have a common terminus on the summit of the Quirinal.

See R. Lanciani, *Ruins and Excavations of Ancient Rome* (London, 1897); S. B. Platner, *Ancient Rome* (Boston, U.S.A., 1918); a topographical dictionary of Ancient Rome by Platner and Ashby is in preparation. Cf. also Lugli, *Zona Archeologica di Roma* (Rome, 1924); Hülsen, *Topographie der Stadt Rom* (Berlin, 1907); *Chiese di Roma* (Rome, 1926); *Guida d'Italia del Touring Club Italiano*, Roma (Milan, 1925).

ROMAN HISTORY.—Rome, the 'Mistress of the World,' the 'Eternal City,' gives name to a political empire which lasted eleven centuries, till its transfer to Byzantium, where it lasted eleven centuries more; also to a religious empire which since 42 A.D. has acquired spiritual sway over a yet larger dominion than its pagan predecessor, and which, in accord with Imperial Germany, formed the twin-factor of the Holy Roman Empire, dissolved in 1806.

Colonised in the Iron Age by Alban shepherds who migrated from their hills in fear of volcanic disturbance, Rome, according to her officially adopted legend, dates from 21st April 753 B.C., when Romulus, first of her seven kings, settled on the Palatine mount. From his quadrilateral stronghold—*Roma quadrata*—he made conquest of the Capitoline and Quirinal. After his successor

Numa, the Caelian was annexed by Tullus Hostilius and the Aventine by Ancus Marcius. To the hills, now five under Tarquinius Priscus the fifth king, were added the Esquiline and Viminal by Servius Tullius, who walled in the seven with a stone fortification. So that under her seventh and last king, Tarquinius Superbus, the City of the Seven Hills was already 'built for empire,' on marshy soil made habitable by drainage, and connecting with the sea-board by the Tiber. The derivation of 'Rome' and 'Romulus' from the *Rumon* or 'river' has recently been disputed, and that from *Ruma*, 'breast,' has been proposed.

Latin in population, with a Sabine infusion, Rome was divided into three tribes—the Ramnes, the Tities, and the Luceres, and again into thirty *curiae*. The tribal division disappeared early; that into *curiae* lasted well into republican times. Out of the *curiae*, originating in common religious observances, grew the *populus Romanus*, including all freeborn Romans. Its king (*rex*) was not always hereditary either in his regal or his religious capacity, nor merely elective. When a king died, his successor was chosen by the heads (*patres*) of families (*gentes*). These *patres*—the guardians of religious observance, of popular right, of state interests—had power to choose a provisional king (*inter-rex*), who, with the *patres* for assessors, decided on the new king, who was then proposed to the *curiae* in assembly (*comitia curiata*) and, if approved, confirmed by the *patres*. The king had now absolute authority, civil, religious, and military. The *patres* were his councillors—the senate—having the above indicated powers, always subject to the king, who consulted them at pleasure, and filled up vacancies. In solemn assembly the Romans met in the Forum under the king or *inter-rex*, who put questions to the vote, when each *curia* voted in turn, its vote being determined by the majority within itself, and the preponderance of these votes deciding the result.¹

Romulus, Numa Pompilius, Tullus Hostilius, and Ancus Marcius—the first and third Latin, the second and fourth Sabine—are little more than legendary names; the warrior chief Romulus typified by his *Roma quadrata* and *Comitium* or place of assembly in the Forum; the priestly Numa by his Temple of Vesta and his Regia close to it; the statesman Tullus Hostilius by his Senate House (*Curia Hostilia*); and the administrator Ancus Marcius by his state-prison, his bridge across the Tiber, his fortification of the Janiculum, and his founding of the seaport Ostia (where no traces of habitation at such an early date have been found). The last three kings, probably powerful Etruscan rulers who extended their sway over Latium, are of a very different character, and far more wealthy and powerful than the simpler native rulers. In Tarquinius Priscus (616–578 B.C.) we have an Etruscan and less shadowy Romulus, admitting into the senate a hundred new *patres* from conquered Latin states, and laying out the Circus Maximus for the entertainment of the people. Servius Tullius, on Tarquin's initiative, distributed all freeholders (for military purposes primarily) into tribes, classes, and centuries. Drawn up in order of battle, the centuries (bodies of one

hundred) in front were composed of the wealthier citizens as better able to equip themselves for attack; behind them came the centuries of the second and third classes, poorer and less fully appointed—the three forming the heavy-armed infantry; while centuries of the fourth and fifth classes, poorer still and correspondingly equipped, held the rear. The full strength of the freeholders was divided into two equal parts—the *seniores* and the *juniores*, the latter engaged in active duty, the former as reserves. Each corps consisted of 85 centuries or 8500 men—i.e. of two legions, each about 4200 strong, auxiliary to which were the sappers and trumpeters. Finally, the six centuries of cavalry were supplemented, from the wealthiest citizens, by twelve more. For the army thus organised Servius drew levies from his four regions, corresponding to his four tribes, the Suburan, the Palatine, the Esquiline, and the Colline. These tribes included freeholders outside the gates, also entitled to meet and vote with the centuries at their *comitia* (*comitia centuriata*). Under her seventh and last king Rome became formidable throughout Central Italy, and owed to him the Temple of Jupiter Capitolinus, and the *Cloaca Maxima*—the drainage system tapping the hills around the Forum and carrying the waste into the Tiber. But Tarquin's rule was so masterful as to drive the people to revolt, the last provocation being his son's outrage on the noble Lucretia. When engaged at a siege near the coast he was dethroned; he and his race were exiled in perpetuity, and regal government replaced by the Republic. Three great efforts to reinstate him were defeated, and he died at Cumæ.

The Republic.—After their successful revolution, the patricians made their power so felt by the plebeians as to start a conflict between them lasting two hundred years. The king was now represented by two consuls, elected annually, and from the patrician order. The plebeians, freeborn citizens as they were, retained their votes by classes at the *comitia curiata* and by centuries at the *centuriata*, but many of them were attached as clients to patricians who commanded their votes, and all of them were excluded from the higher offices of state. Unable to elect one of themselves consul, the plebeians had not even the power to carry the patrician candidate they favoured, being in a minority in the *comitia centuriata*, and, again, in a greater minority in the ultimate and decisive assembly, the *comitia curiata*. The absolute authority wielded by the consuls they felt to be still more oppressive when, in state crises, it was merged in a dictator; so their first attempt to safeguard their liberties and lives was directed at the consular power. The first advantage they gained was the 'right of appeal,' by which no magistrate (the dictator excepted) could subject a Roman citizen to capital punishment unless with approval of the *comitia centuriata*. Power to extort such rights the plebeians possessed in their military capacity, refusing, as soldiers, to serve unless their demands were conceded. The secession of their legionaries to the Mons Sacer, on the Anio three miles off, secured them annually elected magistrates of their own, *tribuni plebis*, with power to protect them against the consuls. From two the tribunes were increased to five, and by 449 B.C. to ten. In no sense a magistrate, the tribune was a check on authority, and his power developed gradually till the tribunate, formidable at the close of the Republic, became still more so under the empire. By the Publilian law (471 B.C.) the assemblies convened by the tribune (*concilia plebis*) were made legal; not yet their decisions (*plebiscita*). At these the voting was by tribes, not by *curiae* or centuries, whence the object of

¹ Such was the tradition, but it is of patrician origin. Hülsen has recently pointed out that, of the names of the seven *mones* of the Septimontium—three (the Caelius, Cispius, and Oppius) are identical with those of plebeian *gentes*; and that the names of the kings, with the exception of Romulus and the Etruscan Tarquins, are also plebeian. On the other hand, the first sixteen tribes *rusticæ*, founded, according to tradition, in 495 B.C., fifteen years after the expulsion of the kings, are all patrician; and the conclusion is obvious—that the patricians were those who had effected the revolution, while the plebeians were the partisans of the old order, and the real founders of Rome.

the tribunes was to add as many to the tribes as possible. To become member of a tribe it was necessary to be a freeholder, and so the tribunes, to multiply freeholders, agitated to secure for the plebeians their share of the *agri publici* or state-lands. Having partially succeeded in this, they won another advantage from the ever-resisting patricians—the appointment for one year of a commission of ten patricians (*decemviri*) to make public a code of law binding on patrician equally with plebeian. This code—the famous Twelve Tables—substituted written and published law for that unwritten code which, confined to the patrician few, was always interpreted in their interests. An attempt to reappoint, possibly to perpetuate, the decemvirate caused another secession; the consuls were again created; and from the growing vantage-ground of their *concilia*, increased by accessions to the plebeian order from without, the tribunes extorted the recognition of the *plebiscita* as legally binding on patricians. The *concilia*, now become *comitia tributa*, could henceforth carry reforms which, if sanctioned by the patres, had the validity of state-law. Another concession gained was intermarriage between plebeian and patrician, and thereafter the consulate—still the patrician stronghold—was attacked. The two consuls were replaced by six military tribunes drawn from either order. Of these consular tribunes the plebeians generally had the majority until, obstacles and delays notwithstanding, the Licinian and Sextian laws were passed (367) replacing the consular tribunes by consuls, two in number, of whom one at least should be a plebeian; enlarging the priestly college from two to ten functionaries, of whom plebeians were to constitute half; relieving the poorer plebeians from debt; and promoting their interests by advantageous reforms in the ownership and cultivation of land. Patrician monopolies shrunk rapidly. In 356 the dictatorship, in 350 the censorship, in 337 the praetorship, and in 300 the colleges of pontiffs and augurs were thrown open to plebeians. The *patrum auctoritas*, or control by patricians of the decrees (*plebiscita*) of the people in assembly, became a dead letter; and the two hundred years' conflict issued in the recognised validity of all measures carried in the *comitia tributa*—a conflict memorable not only for the ability displayed by either order, but for the respect for law observed equally by both.

For her first fifty years of republican life Rome expanded little; in fact, the fall of the Etruscan dynasty probably led to a diminution in the extent of her sway. Nearest her were the Latins, the Volscians to the south-east, the Æquians to the east, and the Hernicans between the two last. Allying herself with the Latins and Hernicans, she kept the Volscians and Æqui in check till her policy became triumphantly aggressive in the sixty years between 449 and 390. Having razed the south Etruscan stronghold, Veii, she pushed northward to the Ciminian forest, whence she drew down on her the Celtic conquerors of north Etruria, who, defeating her on the Allia, took and sacked the city, all but the Capitol. Recovering rapidly from this disaster, she riveted her hold on south Etruria, gradually subjugated her old enemies and allies, the Volscians, Æquians, Latins, and Hernicans, and dominated Central Italy from the Ciminian forest to the Latin shore. The Sabellian tribes of the Apennines now gave her trouble. The most powerful of these, the Samnites, had overrun Campania; but from this she dislodged them, and, in spite of a formidable revolt extending from the Sabine Hills to the Latin shore and Campania itself, she made good her command of plain and seaboard, lying compact and firm between north Etruria with its detached cities,

the Apennines with their miscellaneous tribes, and Southern Italy with its enervated Greek population. The Samnites, in a second war lasting twenty-two years, failed to get the better of her; in a third, with the northern Etruscans and the Celts as allies, they made a last attempt to crush the growing giantess. This too she defeated after desperate conflicts in which she purchased victory dearly: the Celts were shattered; the Etruscans bought peace by heavy indemnities; and the Samnites on honourable terms became her allies. In characteristic fashion she proceeded to consolidate what she had won, planting 'colonies'—i.e. agricultural garrisons—of Roman citizens wherever their presence was required at strategic points, connected by military highways with the capital, and in this way controlling Central Italy from Adriatic to Mediterranean. The network of roads, which from small beginnings (which can be traced in her earliest days) thus gradually sprang up, spread Roman influence and civilisation all over Italy, and eventually over the whole known world. At the invitation of Greek Tarentum, beset with marauding hordes, she successfully intervened in the south, till in turn Tarentum, incurring her hostility (281–280), brought King Pyrrhus of Epirus to repel her. At first the Epirotes prevailed, but their two victories were as costly as defeats, and in a third great battle at Beneventum (275) they were so punished that Pyrrhus returned to Greece. The fall of Tarentum shortly after left Rome dominant in the peninsula from the extreme south to the Ligurian and Celtic frontier. *Divide et impera* was her policy—detaching the subject states or tribes from each other to draw them more closely to herself, leaving them 'home rule,' but reserving the safeguard of coast and frontier and power to make peace or war with the outside world. Among her outlying communities the colonies of *cives Romani* above mentioned ranked first; next came those Latin towns which enjoyed the full franchise, this being sparingly conceded to other communities, of which the lowest received civil but not political rights, their members excluded from the tribes, and, as soldiers, serving not in Roman legions, but in contingents apart. To the urban communities within her pale Rome gave self-government liberally, with assemblies, senates, and magistrates, always, however, subject to the central authorities—the Roman consuls, praetors, and censors. For the administration of justice these colonies and enfranchised towns were annually visited by the praetor's representatives, called *prefects*, who also assumed control of such communities as were without local government. The military system was modified till the old citizen army, with its order in battle determined by civic rank, became the professional institution in which superior fighting power and experience were primary considerations to be paid for accordingly. On distant campaigns the consul in command received extension of his *imperium*, out of which grew the 'proconsul,' empowered to hold the field till the war was at an end.

Eleven years after her victory over Pyrrhus Rome engaged with Carthage in her mighty struggle for the empire of the Mediterranean. To secure her expansion westwards she had first to expel the Carthaginians from Sicily. Having gained to her side the Syracusan king Hiero, she took Agrigentum, and in 260, with her first naval armament under the consul Duilius, she signally defeated Carthage on Carthage's own element. Following up this advantage, she transferred the war to Africa, and was at first so successful as to recall a considerable part of her forces. But her consul Regulus, whom she left behind, was worsted and made prisoner, a series of naval disasters en-

sued, and Carthage seemed about to regain more than she had lost of Sicily, when the consul Catulus (241), in command of a splendid fleet, gained a decisive victory over the Carthaginians, who thereupon undertook to evacuate Sicily and the adjacent Lipari Islands. This ended the first Punic war, twenty-two years in duration, the result to Rome being her acquisition, not only of Sicily, which she henceforth governed as a 'province,' but (a few years later) of Sardinia and Corsica, also governed like Sicily by magistrates sent every year from the capital. Finding Rome her match at sea, Carthage resumed hostilities by acquiring a foothold in Spain, which was to become her military basis for further operations against her rival. Under Hamilcar, the great general who conceived this plan, she occupied the peninsula as far as the Tagus; Hasdrubal continued the work of subjugation till his death (221); and finally Hamilcar's son Hannibal, who, with more than his father's genius, shared all his father's antipathy to Rome, pushed the conquests of Carthage up to the Ebro.

Meanwhile Rome herself was engaged in subduing the Celts in the valley of the Po, and having planted three colonies—Placentia, Cremona, and Mutina—to safeguard her new possessions, and completed the great road to the north—the Via Flaminia—as far as Ariminum, she turned her attention on Spain, and got Carthage to make the Ebro her northern boundary in the peninsula. But such engagements could not long be respected. Saguntum, a Greek colony in alliance with Rome, on the east coast of Spain, was besieged and taken by Hannibal, though a Roman embassy to Carthage had protested against the operation. The second Punic war was declared in 218, and Rome sent one army under P. Cornelius Scipio to Spain, and another under T. Sempronius Gracchus through Sicily to Africa. But Hannibal's plans, long matured in secret, were carried out with unexampled celerity. Scipio had got no farther than Massilia, when Hannibal, having crossed the Pyrenees, was already at the Rhone; and after fighting his way over the Alps against every obstacle—the hostility of the tribes included—descended on Cisalpine Gaul with but 26,000 surviving of his army of 69,000 men. Defeating the Romans on the Ticino and the Trebia, he realised his expectation of getting the Celts to join him, and in the spring of 217 he pushed on to the city through east Etruria. He annihilated the consul Flaminius at Lake Trasimene; and from Spolegium within a few days of Rome he turned eastward, plundering as he went, and paused for supplies in north Apulia. The Romans, now gravely alarmed, elected a dictator, Quintus Fabius Maximus; but his masterly inactivity did not satisfy them, and they sent two consuls with a numerous army to hurl back the invader. In the great battle of Cannæ Hannibal's victory was complete—the Romans losing 70,000 men to Hannibal's 6000, and Southern Italy—all but the Latin colonies and the Greek coast-towns—came to his side. Macedonia and part of Sicily declared for the conqueror, and the Greek communities one by one were surrendering to him. The Romans tried to recover Campania and laid siege to Capua, and this brought Hannibal up from Tarentum. He even marched directly on Rome herself and rode up to the Colline gate; but he retired unable to make any impression on the city and its defenders; he conciliated no allies; and fell back on South Italy, leaving Capua an easy prey to its besiegers. Five years had done little to encourage the Romans, till Hasdrubal, defeated in Spain, crossed the Alps and skirted the east coast of Italy, to reinforce Hannibal in the south. But he was beaten and killed on the Metaurus by Nero, who, turning southwards, marched up to Hannibal's

camp and threw Hasdrubal's head into it. The war in Italy was virtually at an end. Hannibal's attempt on Rome had failed. Meanwhile young Publius Scipio, having driven the Carthaginians from Spain, returned to the city with the proposal to descend on Carthage herself. The senate, not without misgiving, consented. Scipio's successes in Africa compelled Hannibal to leave his vantage ground in Southern Italy and come to the aid of his hard-pressed compatriots. The great battle at Zama left Scipio the victor, Hannibal a fugitive, and Carthage suing for peace. Her request was granted, and she retained her territory, but bound herself to undertake no wars outside Africa and (without the consent of Rome) no wars inside. She surrendered nearly all her navy and had to pay an indemnity of 10,000 talents in fifty years. Rome was now (202) mistress of the Mediterranean, but she had to consolidate her acquisitions. Sicily, easily ruled under a prætor, became her granary and the provision store for her legions. Spain, however, required prætors invested with consular power and a permanent garrison of four legions to keep her in order. The insurrection of Viriathus lasted till the fall of Numantia after a memorable resistance; and not before Scipio Africanus the younger took it in hand could the country really be called pacified and its rich resources made available. Meanwhile Rome had a secret dread of the resuscitation of Carthage, and she courted every pretext for renewing war with her and razing her to the ground. That came in 151 when Carthage, goaded by Masinissa's forays, broke her treaty obligations to punish him. In 149 Rome laid siege to her, and by 146 she was stamped out from the roll of great cities. Her territory was now the Roman province of Africa, protected by Masinissa's three sons, who ruled Numidia. In Italy herself the cities that had declared for Hannibal were severely punished. In the north the Celts forfeited their separate political existence. In the south Roman settlers occupied confiscated lands—nearly everywhere but in Apulia and Lucania; and even the Latins soon felt the preponderance of the Roman element, which tended more and more to assert itself.

Fifty years after she became mistress of the west, Rome had also become the mightiest state in the east, first by conquering Philip of Macedon, who had been the ally of Hannibal, and whose ambition to dominate the Ægean drew Rome into the second Macedonian war (200), which ended in Philip's defeat at Cynoscephalæ and the reduction of Macedon to a minor power. Next came the 'liberation of Greece,' which, with the alliance that followed, enabled Rome to proceed against Antiochus, king of Syria, who in 197–196 had overrun Asia Minor and penetrated into Thrace. Beaten by land and sea, Antiochus sustained a decisive defeat at Magnesia in Asia Minor, and fell back behind the Halys and Taurus range, to the west of which all the kingdoms and communities were now under Rome's protection. Western Greece, however, began to give trouble, and Philip of Macedon's successor, Perseus, incurred a final encounter with the Romans in a third Macedonic war, terminating in his utter rout and capture at Pydna (168). So that, twenty-two years thereafter, Macedonia had sunk into a Roman province, whose governor came gradually to control the Greek states till the whole peninsula was subservient to Rome. Steadily strengthening her hold on Asia Minor, Rome further assumed the guardianship of the king of Syria; while in Egypt, which in 168 had acknowledged her suzerainty, she restored a *protégé* of hers to the throne, at the same time, true to her policy, dividing and weakening his power. From Syria to Spain the Mediterranean was now a Roman lake, but her authority

was better established in the west than in the east. In the former her provincial government was fairly established; not so in the latter, which, besides its more elastic frontier, possessed a civilisation in some respects superior to her own.

With the establishment of her supremacy without began Rome's troubles within. The ennobled plebeians (*nobiles*) combined with the old patrician families (*optimates*) to exclude all but themselves from high office or the senate. The constitution had become an oligarchy in which the comitia, nominally supreme in electing magistrates and passing laws, were practically superseded. The prestige of having saved Rome from Hannibal and raised her to undisputed empire belonged to the aristocratic senate, while the graver disasters (at Trasimene and Cannæ) were due to the people's favourites. But that prestige was getting gradually impaired by economic failure at home and confusion abroad, and the people were awaking to a sense of the power the senate had taken from them. The small holders, particularly in Etruria and South Italy, burdened with military service and competing vainly with foreign importations of corn and labour, deserted the farms on which they could neither thrive nor live, and the multiplication of colonies throughout the peninsula gave but temporary relief. To arrest the imminent annihilation of these freeholders—Rome's main-stay—Tiberius Gracchus, the tribune (133), proposed his reform, which was practically the first of a series of attacks on senate-rule. Occupiers not recognised by the Licinian law were to be evicted; occupation was not to extend beyond 1000 acres; public grazing-lands were to be reclaimed for tillage. The senate opposed him strenuously, and he was killed in an incidental collision; but his struggle was renewed on a larger scale by his brother Gaius, who curtailed the senatorial power by getting the comitia to deprive it of privilege after privilege. He, too, fell in a brawl, and by 111 his reforms had already been frustrated and a quite new aspect given to the agrarian question. But the popular party had been taught its lesson by means of the tribunate to reassert its power in the comitia to work out its salvation. Gaius Gracchus had been dead ten years when the client-state Numidia was seized by Jugurtha, who had supplanted its legitimate governors and insulted the Roman name. The popular leaders insisted on his chastisement; but the war, mismanaged under patrician officers, was carried to a triumphant close by the people's favourite, the low-born, illiterate, but efficient Marius, who in January 104 brought Jugurtha in chains to Rome. Still greater successes awaited their hero. Having annihilated the Cimbri and Teutones, who had inflicted four defeats on the patrician generals, and been made consul for the sixth time, he aided the popular vindicators, Saturninus and Glaucia, to harness the senate. But the advantages they secured were small, their violence had to be curbed by Marius himself, and at last the populace turned upon and killed them. The rise of Marius, however, was fraught with far-reaching results. His six consulships, his intervention as a soldier in politics, his military reforms, by which all classes, irrespective of rank or means, were admitted to the legion, and the compulsory levy replaced by volunteer service under a popular leader were epoch-making in the revolution.

The commercial class—soon to develop into the equestrian order—had by their power in the courts and their increasing exactions as farmers-general (*publicani*) been at feud with their controllers, the magisterial class in the provinces, and fiscal reform became urgent. The Italian communities—the allies of Rome—had long felt their burdens increase as their privileges waned, and they demanded their

share of the conquests they had helped to achieve. Promises of relief and expectation of securing the Roman citizenship had brought them in crowds to the capital, to be driven back again by an exclusive senate and people. The tribune Drusus strove to bring about fiscal reform and the redress of the Italians, but though he carried his laws he could not make them valid, and finally he was assassinated. The equestrians remained supreme in the courts, while the murder of Drusus roused the irritated Italians to rebellion (90–89) in the central highlands and the south especially. The Social War began, the insurgents aiming at the erection of a new Italian state governed on the lines of the Roman constitution. To suppress them the two consuls of the year, each with five legates, including Marius and his future rival Sulla, headed the legions, but were disastrously beaten. In the north, however, Marius and Sulla, and in Campania the consul Cæsar, were partially victorious, but so partially that reform after reform had to be conceded, till the Italians could obtain the franchise merely for the asking. The war at length died out by the absorption of the insurgents into the Roman citizenship; but the internal troubles continued. The new citizens enlarged their political claims, the senate was distracted by personal feuds, economic distress prevailed among all, and a war with Mithridates threw Marius and Sulla into rivalry as to which should command the expeditionary force. The action of the tribune Sulpicius in dealing with this complicated crisis intensified it the more. He introduced laws to entrust Marius with the Mithridatic campaign, to allow the new citizens to vote in all, not in a restricted, number of tribes, to confine the freedmen to the four urban tribes no longer, to unseat any senator more than 2000 denari in debt, to recall from exile those suspected of complicity with the Italian insurgents. Every one of these proposals, bitterly contested, would yet have become law but for the consul Sulla, who, heading in Campania the legions assigned him in the Social War, marched on Rome—the first consul who ever invaded her with her own troops. The flight of Marius and Sulpicius left him free to impose arbitrary measures, among them that by which the sanction of the senate was required before any bill could be entertained by the comitia; and, having seen the consular elections safely through, he set out against Mithridates (87).

In his absence Cinna attempted as consul to carry the reforms of Sulpicius, but was driven from Rome amid the massacre of the new citizens in voting assembly. He in turn rallied round him the legions in Campania, and joined by the veteran Marius, who reappeared from Africa, he entered Rome and was recognised as consul, as was Marius himself (for the seventh time). After a brutally vindictive massacre Marius died (86), and Cinna remained supreme, securing the consulship to himself and a confederate, and getting the newly-enfranchised Italians enrolled in all the tribes. In 84 he died, and next year Sulla, having concluded a peace with Mithridates and left Asia tranquil, landed at Brundisium with a powerful army, including many of the *nobiles* who had fled from Cinna. Resistance, nowhere formidable, he quickly overcame and (82) entered Rome, to find his lieutenants triumphant in North Italy and to annihilate the remnants of the Marian party just outside the city. But he failed to use his power, absolute as it was, for the abatement of long-standing evils and the prevention of coming disasters. Triumphant everywhere, he instituted a reign of terror—slaying, proscribing, and confiscating through revenge or suspicion. For nine years his rule as dictator, in spite of much salutary administration, was marred by a remorseless partisanship which left the future

to take care of itself—creating in the sons and heirs of the proscribed and dispossessed the handy tools of agitation, justified as this increasingly became by ruined agriculture, by the multiplying of *latifundia* with their necessary evictions, and by the rapid disappearance from nearly all Italy of her substantial freeholders. Life and property, already widely forfeited at his bidding, were still further endangered by brigandage, which culminated in the formidable rising of Spartacus, who held out for two years (73–71). Still fortifying the senate, Sulla left the tribunes with no power of interdict save in protecting individual plebeians, and he excluded them from ever holding high office; he took from the equestrians the control of the courts, giving it back to the senate, to which he also restored its exclusive rights in the colleges of pontiffs and augurs. He extended the application of the criminal law—a wise measure; but he did more than any Roman before him to facilitate the rise to supreme power of any ambitious governor of a province or leader of a provincial army. He forged in fact the weapon by which his system fell (70).

In Spain Cneius Pompey, one of Sulla's favourites, held a commission from the senate to crush the Marian governor Sertorius, who had defeated successive proconsuls sent to humble him. With the submission of the natives following the murder of Sertorius he returned to Rome, and found the opposition to Sulla looking out for a leader to effect a change of government. His ambition to have a triumph, to be made consul for next year (70), and by consequence to receive command in the east, was gratified for the sake of his name and influence. He was elected consul with Crassus, the victor over Spartacus, their troops being just outside the gates, and on the triumph and ovation granted to the two generals ensued Pompey's fulfilment of the bargain—the reinstatement of the tribunes in their authority and of the equestrians in the courts, and the weeding out from the senate of Sulla's notorious tools. The example set by Sulla was improved upon, and henceforth the republican constitution was at the mercy of the strongest leader supported by the strongest battalions. Pompey's next move was to obtain command abroad, and after some delay this was found in a mission to clear the Mediterranean of pirates. For this formidable undertaking the tribune Gabinius secured him large powers, tenable for three years, including authority over all Roman magistrates in the Mediterranean provinces for fifty miles inland. These, backed by a splendid fleet and army, were yet further enhanced by the tribune Manilius, who got Pompey entrusted with the campaign against Mithridates and with the charge of Roman interests in the east. The wiser senators gave ominous warning against these measures, but were powerless against tribunes and people, seconded by equestrians, who as the commercial class drew much of their wealth from Asia. So Pompey set out in 67. Meanwhile Caesar had come to the front—a patrician, who was also the nephew of Marius and son-in-law of Cinna, and whose consummate ability, shown in the revindication of the tribunate and the carrying of the measures in support of Pompey, had full scope now that Pompey's back was turned. He deepened his hold on the people by avenging the injured names of Marius, Cinna, and Saturninus, pleading for the children of the proscribed, and bringing Sulla's headsmen to justice.

Rising in popular favour by his efforts to enfranchise the Transpadane Latins and his magnificent promotion of public works and entertainments, he spared no means, constitutional or the reverse, to put himself on even terms with Pompey before that magnate's return. Crassus, the millionaire, he found a tractable auxiliary, in

concert with whom he was rapidly gaining powers hardly inferior to Pompey's, when the Catilinarian conspiracy (63), exposed and defeated by Cicero as consul, involved Caesar in the ill-will in which the middle classes held popular adventurers. Pompey had now returned to importune the senate for the ratification of his measures in Asia and the bestowal of land on his legionaries. His demands met with determined opposition, till Caesar, posing as his friend, formed with him and Crassus the coalition—the first, if irregular, triumvirate—of which Pompey was the head, Caesar engaging to see Pompey satisfied, and Pompey in return promoting Caesar's candidature for the consulship. Cicero strove to undo a coalition he knew to be fatal to his ideal of a conservative republic, but in vain; he saw the senate weakened by a quarrel with the equestrians and its authority impugned by the friends of Catiline, who arraigned him for having, with the senate's approval, violated the law in putting to death the conspirator's lieutenants. The triumvirate in 59 fulfilled its compact. Caesar obtained the consulship and the satisfaction of Pompey's demands, conciliated the equestrians at the expense of the senate, and carried an agrarian law enabling him one day to reward his faithful troops. But his crowning success was his obtaining for five years the military command of Cisalpine Gaul, Illyricum, and later of Transalpine Gaul, from which he could scan every political move in Italy. Next year (58) Clodius, the tribune, proceeded against Cicero, who, thrown over by Pompey and with Caesar out of reach, fled from Rome and was outlawed—to be recalled (57), and his outlawry annulled by senate and people, in the reaction induced by Clodius's misdeeds. Cicero renewed his efforts to fortify the constitution, only to fail and retire from public life. The triumvirs tightened their alliance. Caesar secured his command for five years more; Pompey and Crassus were elected consuls, and Pompey received as province the two Spains, with Africa, and Crassus, Syria—the Roman empire being at the mercy of all three, not, however, for long. Crassus was defeated and killed by the Parthians (53), and Pompey was slowly but surely drawn into antagonism with Caesar. Rome, in the absence of efficient government, was in ceaseless turmoil, till the senate in despair induced Pompey to remain in Italy, electing him sole consul (52), giving him, with fresh legions, five years' more command, and, in fact, pitting him as its champion against Caesar. It tried to reduce Caesar to impotence, either by keeping him at his post, and so hauling his candidature for the consulship, which required his presence in the capital, or, by terminating his command at its legal expiry, to detach him from his troops and make him pursue his candidature in Rome as a private individual. Negotiations between him and the senate only left the latter more uncompromising; and with well-inspired audacity he crossed the Rubicon (49) and advanced on the city. Unprepared for such a move, Pompey and most of the senatorial party, including the consuls and many nobles, withdrew to Greece, leaving Caesar to enter Rome in triumph. The mighty duel between the two chiefs had begun. After a brief pause Caesar hurried to Spain, and, victorious over the powerful armies of Pompey's legates, returned to Rome, where, appointed dictator in his absence, he almost immediately renounced the post, and as consul for 48 crossed over into Greece and dealt Pompey a crushing blow at Pharsalia. The Pompeian cause struggled on till 45, when it collapsed at Munda, and Caesar was made by the senate dictator for life. Unlike Sulla, he used his power with a clemency, a statesman-like wisdom, and a patriot-

ism that made men almost forgive, if not forget, how he came by it. The roll of his salutary reforms and innovations is indicated elsewhere (see CÆSAR); but here our interest centres in the significance of the empire he initiated. That meant the merely nominal retention of the old constitution with its senate, its comitia, its consuls, and its tribunes, under the fiction that the supreme power was held at the people's will. Really it meant an autocracy reaching to the remotest province, resting in the last resort on the military arm—an autocracy whose founder took the title 'imperator,' as expressing his arbitrary and uncontrolled *imperium*, in token of which he appeared with the laurel wreath and the triumphal garb and sceptre. From the senate which he summoned and presided at to the assembly where he carried laws, and the court where he dispensed justice, he was everywhere the chief magistrate. The empire he designed to bequeath was to be bounded by the ocean on the west, by the Rhine and Danube on the north, by the Caucasus and the Euphrates on the east, and by the African desert on the south, and within these limits he wanted to extend the Roman citizenship, and admit their communities to share the government. This scheme of consolidation he did not live to carry out; but he reduced fiscal burdens in the provinces and curbed the authority of their governors.

His assassination, March 15, 44, was followed by an attempt, powerfully aided by Cicero, to win back the old republican constitution; but Cæsar's representative, Antony, at the head of seventeen legions, combined with Lepidus and Octavian, just made consul, in spite of his youth, to form the second triumvirate, which began operations by proscribing and assassinating its opponents—Cicero among the number. A stand made at Philippi by Brutus and Cassius was crushed by Octavian and Antony, and the last hope of the Republican party was gone. The triumvirs divided the empire between them—Octavian taking Italy and the west, Antony the east, and Lepidus Africa. Antony contemplated with Cleopatra an eastern empire, while Lepidus, having lost Africa, was exiled, and the death of Sextus Pompeius, after the destruction of his fleet in the Mediterranean, left Octavian, who had been sagaciously strengthening his position in the west, with only Antony for rival. The inevitable collision took place off Actium (31), and the victorious Octavian, after the suicide of Cleopatra and her paramour, remained master of the east (29). Two years more saw him in Rome, the grand-nephew and heir of Cæsar, armed with authority to mould a government out of republican and imperial institutions. For this he had every qualification.

The Empire.—Augustus began (28–27 B.C.) by a restoration of the republic, with himself as *princeps*, the republican constitution being retained, while the *princeps* held the real power. By decrees of the senate he assumed, in token of supreme dignity, the cognomen 'Augustus,' and also the *proconsulare imperium*, which far exceeded the old proconsular command in width of area and length of tenure, the greater part of the provinces being governed by legates appointed and controlled by him alone. Of army and navy he was commander-in-chief, raising or dissolving both, and declaring or concluding war at pleasure. His *imperium*, contrary to precedent, he was allowed to retain within the *pomerium*, the city's consecrated boundary, giving him there the power wielded by a proconsul in his province. Augustus refrained from exercising this in Rome, but as tribune of the people he controlled the entire administrative machine, so that, what with proconsular command and the *tribunicia potestas*, he possessed powers which made all others of

minor importance. Head of the state, he was also head of religion as *pontifex maximus*, and from time to time he had privileges and exemptions decreed him by the senate. Anxious as he was to retain the outward show of republican institutions, they declined under the weight of his personal influence. The comitia were 'transferred from the Campus to the senate,' which in the succeeding reign nominated and voted for candidates to all magistracies except the consulship, these magistracies being in request for the social distinction they carried, not for any power they conferred. The emperor as *princeps* virtually appointed them, and his subordinates transacted their work. The consulship itself, the highest ambition of the private citizen, and a prerequisite for provincial command, was shorn of its duties, excepting those of presiding in the senate and regulating its proceedings. Prætor, ædile, tribune ceased to be what they were under the republic—the last named swallowed up in the *tribunicia potestas*. Only the quaestor retained something of the old significance. But the senate, in theory at least, continued to represent the republican system. To it, in the absence of a princeps, the real power reverted, and from it the new princeps received the authority and the privileges still derived by a fiction only from the people. But the princeps was really nominated by the army, and though the senate was formally deferred to as beyond his jurisdiction, he could in his capacity as censor man it as he chose, till it survived but in name, like the comitia and the magistracies. These innovations had their compensating side. The provinces, previously at the mercy of nominees of the Roman people, now under the control of the princeps or emperor, gradually gained equality with the Italians as Roman citizens, and made corresponding advances in civilisation and prosperity, though reform was naturally slower in those which still remained under the control of the consuls and the senate.

With the establishment of the imperial system the fortunes of Rome are reflected in those of her emperors, to narrate which would be to repeat the biographies given elsewhere. Henceforth we have but to deal with epoch-making events. Tiberius (14–37 A.D.), a capable ruler, more popular in the empire at large than among the aristocracy of the capital, had little of his predecessor's esteem, genuine or assumed, for republican institutions. The senate became more of an imperial tool, all power more and more embodied in the princeps. The simple mode of life affected by Augustus was replaced by a splendour conspicuous in multiplying palatial residences, in the bodyguards, the courtiers, the aulic etiquette subsequently carried to unheard-of lengths. The population of Rome, from the highest to the humblest, deteriorated—a wealthy, indolent, luxurious upper class maintaining mobs of dependents, below whom was the proletariat, which the emperor from time to time provisioned and amused. Secure against public opinion, Tiberius relied on the military arm, and in Rome herself had his prætorian guard, some 6000 strong, within ready call. These troops acquired a power which overshadowed all others as the emperors became more and more dependent on them. Caligula (37–41), after posing as a liberal ruler, behaved like a madman. After his assassination the prætorians placed his uncle Claudius on the throne (41–54). He was not unstatesman-like, but was ungainly and pedantic, much under the influence of his wives Messalina and Agrippina, and of his Greek freedmen, who wielded a power which soon developed into a central imperial administration. He was succeeded by Agrippina's son Nero (54–68), who was only sixteen, and for the first five years of his reign ruled well under the guidance of Seneca.

But after this things went from bad to worse, and by his suicide he only forestalled his executioners. His vices, however, like those of Caligula, had surprisingly little effect on the empire at large. Like his two predecessors he had first been hailed by the soldiers as imperator, and thereafter invested with power by the senate; but with him the succession from Augustus expired; and whom to replace him by was the question. Galba (68), the nominee of senate and soldiers alike, incurred the enmity of the praetorians, who killed him in the interests of Otho (69), now proclaimed emperor. But the legions on the German frontier preferred their own general, Vitellius (69). Otho, defeated at the head of his praetorians, committed suicide, and Vitellius succeeded him, in turn to be murdered after being disavowed by the army in Syria, who proclaimed their commander, Vespasian. With him began the Flavians (69-96), strong and beneficent emperors, save one. Vespasian (69-79) disclaimed the divine attributes associated with the Caesar-worship of his Julian predecessors, restored a great part of the site of the Golden House to the public by erecting the Colosseum (p. 765), and not only returned to the simpler life and more modest court of early imperial days, but tried to resuscitate the authority of the senate, and even ostentatiously to keep himself within the law and to promote the welfare of the people. His elder son Titus (79-81) improved on this sound policy, but his brother Domitian (81-96) though his reign was a time of great and not unsuccessful military activity (he was responsible for the famous *limes* in Germany), became infamous for autocracy and cruelty. It is, however, difficult to judge him fairly between the flatteries of the court poets and the bitter invectives of the senatorial party, written at a safe distance of time after his death. Nerva (96-98) was mild, and even weak. His reign soon ended—not, however, before he had adopted as son and successor Trajan (98-117), commanding on the Rhine. From this time on, as far as Caracalla, the emperors employed the fiction of hereditary descent. The assumption of empire by a born provincial illustrates the gradual weakening of Rome's connection with her rulers, whose seat of government became really the military headquarters for the time being. He and the following three emperors gave Rome a century of beneficent rule—the happiest hundred years yet known to her. Living like a plain soldier, he conciliated the senate by the deference he paid it, and the people, whose good he consulted, while keeping the Roman name respected abroad. He adopted a forward policy in the east, which was not followed by his adopted successor, Hadrian (117-138), who gave up to travel the time spent by Trajan in war, visiting the provinces from the east to Britain, providing them with public buildings, improving the discipline of the army and indeed the whole administrative organisation. A provincial himself, he adopted a provincial to succeed him—Aurelius Antoninus, a native of Gaul (138-161). He too earned the love of the Roman world, and on his death an adopted son of his, Marcus Aurelius, became emperor (161-180). He was a thinker and moralist, whom necessity made also a man of action, called away to defend the Danube and Upper Rhine. Unhappy in his wife, he was still more so in his son Commodus, and died at headquarters, closing the line of the good emperors. The profligate reign of Commodus (182-192) accentuated still more the ascendancy of the soldiers, who killed his upright and austere successor, Pertinax (193), and became for nearly a century the makers and unmakers of emperors. The Augustan system was gone; except on a few insignificant occasions, the senate did not assert its

right to nominate; the soldiers, often serving on the frontiers, were the arbiters of empire. The praetorians next sold it to the highest bidder, the rich senator Didius Julianus; but this was resented by the provincial armies, who started their own nominees.

The ensuing conflicts between these 'pretenders' resulted in the triumph of Septimius Severus (193-211), an able, unscrupulous African soldier, who, ignoring the senate, till then the formal ratifiers of imperial authority, set the further precedent of posing as proconsul in the city itself, made the palace, not the forum, the justice-seat, and raised the prefect of the praetorians to power only inferior to his own. Caracalla (211-217), that he might impose on the provinces the taxes paid by Rome, gave the rights of citizenship to the former, thus equalising all and unifying the empire. His brutal personality has no further interest for us any more than that of his fifteen successors, nearly all of whom came by a violent death, generally at the hands of the soldiers who had set them up. See the articles on Heliogabalus, Alexander Severus, the three Gordians, Decius, Gallus, and Gallienus. They left the Roman empire weak at every frontier, exposed to the Franks on the Rhine and the Goths on the Danube. The former ravaged Gaul and Spain, the latter Asia Minor and Greece, while the Persians, relieved of the Parthian yoke, had again become a formidable power in the east. In Rome and throughout Italy anarchy and distress prevailed till a temporary revival was brought about by the *Illyrian emperors*—Claudius (268-270) driving back the Goths, and the yet abler Aurelian (270-275), by his victories over Goths and Germans and his successes in the east and west, restoring the lustre of the Roman arms, and, for a brief space, the unity of the empire.

Diocletian (284-305), also an Illyrian, the next great name on the imperial roll, introduced a system of safeguards against dissolution within and aggression from without. He assumed the most capable colleague he could find to share with him the government of the empire. This was Maximian, who, like himself, took the title of Augustus. He further reinforced this dual control by associating with him Galerius and Constantius, able generals, like Maximian, whom he proclaimed as *Cæsares*, below the two *Augusti* in rank, but with the right of succession to these. He himself had Thrace, Egypt, and Asia under him; to Maximian he gave Italy and Africa, to Constantius Gaul, Spain, and Britain, to Galerius the Danubian provinces. Thus internal sedition was suppressed within the empire, and, this distraction removed, the frontier fortifications could be perfected. The Rhine, the Danube, and the Persian boundary were garrisoned at frequent intervals and the barbarians kept in check, while all temptation of the soldiers to sedition was overawed by the repressive measures at the command of the four rulers acting in concert. Rome now ceased to be the one capital. If she remained a capital, it was as the seat of a nominal senate. The *Augusti* and *Cæsares* lived at their headquarters, Diocletian at Nicomedia, Maximian at Milan, Constantius at Treves, Galerius at Sirmium. This was a momentous departure from the tradition by which the emperors had claimed to be but the supreme magistrates of the city and the chiefs of her armies. Rome indeed was less imperial than any town in which the emperor chose to live. The policy of keeping the soldiery estranged from the emperor's presence took the form of increased dignity in his demeanour and mode of life, the oriental magnificence introduced by Aurelian reaching extravagant lengths in Diocletian. He reorganised the services, civil and military, under new titles, which came to be more

valued than the republican consul or senator, and typified the completely autocratic power he assumed. So long as he lived his system worked effectively; but after twenty-one years, and in breaking health, he abdicated publicly the power he felt incapable of wielding. His masterful personality no longer felt, rupture between *Cæsares* and *Augusti* ended in civil wars, till the son of the Cæsar Constantius, Constantine, who had himself become Cæsar of the army in Britain, overcame all rivalry, and in 323 ruled the empire single-handed. Christianity, since its rise under Augustus and its spread under Tiberius and the later emperors, had triumphed over the last attempt under Diocletian to crush it by persecution, and the politic Constantine, adopting it as his own religion, made it also the state's. To the tottering imperial fabric it brought new strength, armed with which he proceeded to develop Diocletian's policy of rehabilitation. From Rome he transferred the seat of government to Byzantium, henceforth called Constantinople, commanding by its position the Greek and Asiatic worlds. Remodelling Rome's traditional institutions, he made a new senate, with a large infusion of Greeks, all of his own choosing; he instituted a new *præfectus urbi*, and founded in the 'Rome on the Bosphorus' an absolute monarchy. Reducing the number of soldiers under each general, he weakened the army's power to revolt by dividing it into two classes, one for the towns, the other for the frontiers. The same subdividing process he carried into the provinces, splitting them up into districts, which again he rearranged into thirteen larger ones, subject to four prefects, responsible in their turn to the emperor. Multiplying officials who owed everything to him, he made them the nucleus of a new nobility, to supersede the old, and to find their interest in perpetuating his power. These sagacious measures, coupled with the prestige of the new religion, reinforced the empire greatly; but the taxation required to keep it up proved an element of weakness. The costly court and the highly paid officials drained the treasury, which had to be replenished by exactions from the people, who met them from the proceeds of the land they tilled. The forays of barbarians, increasing in number and range, steadily reduced the means of these small holders, who thus, except in profound peace, could not satisfy the tax-gatherers. Farms disappeared, not to be replaced, and unproductive waste-lands encroached more and more within the frontier. The death of Constantine was the signal for civil war among the rival Cæsars, till Constantine's only surviving son, Constantius II. (351-363), succeeded in reunifying the empire under the same house. Not without misgiving he made a 'Cæsar' of his cousin Julian and entrusted him with Gaul, where Julian's success was such as to rouse his jealousy. Constantius accordingly commanded his cousin's legions to start for Persia; but instead of complying they proclaimed Julian emperor and Augustus. Constantius died soon after, and an inevitable collision was averted. Julian (361-363) interests us more by his defence of the Rhine frontier and his Persian campaign than by his 'apostasy' from Christianity. He succeeded in staving off the barbarian inroads on the western provinces; but his diversion in favour of the 'creed outworn' did not survive his last encounter on the Tigris, where he was killed. Jovian, who succeeded him on the battlefield, outlived him a few months, and Valentinian I. (364-375), the next emperor, at the instance of the army which proclaimed him, took as colleague his brother Valens, whom he made emperor of the east. For ten years the dual government prevailed, and the barbarians were kept in check at the Rhine and

Danube, but his death found Valens unequal to his post. The Goths, goaded by the Huns in their rear, had thrown themselves on the hospitality of their imperial neighbours, but were so harshly treated that they turned on them and killed Valens in battle (378). They threatened Constantinople, but the next emperor, Theodosius (379-395), made them his allies and even auxiliaries, so that he was able to keep on the throne his colleague of the west, the feeble Gratian. That emperor was murdered (383) by Maximus, whom Theodosius recognised as Cæsar and left in command of Gaul, Spain, and Britain, till he attempted to oust Valentinian II. from Italy and Africa, when he was crushed by Theodosius (386-391). A few months afterwards Valentinian was murdered by Arbogast the Frank, who nominated in his place a creature of his own, Eugenius. Again Theodosius triumphed over the usurper; but after his great victory at Aquileia he died (395), leaving as emperors his two sons—Arcadius in the east and Honorius in the west.

The next eighty years are amongst the most dismal in the world's history. The provinces, drained to inanition by taxation levied for army and court, were further visited by intestine war and barbarian inroads. At first the policy of conciliating the invader, and giving him military command and administrative office, succeeded. But gradually the barbarians established in the east began to aim at conquest in the west, and Alaric the Goth first occupied Illyricum, whence he ravaged Greece, to be driven out by the Vandal Stilicho, the able general of Honorius. Retaining Illyricum, he led his people *en masse* into Italy; but after his crushing defeat at Pollentia he again retreated before Stilicho. On the murder of that officer he returned and besieged and took Rome, which bought him out at a heavy price. Honorius, from his seat at Ravenna, could not be made to concede him the lands he wanted for his people and the post in the imperial army he claimed for himself, so Alaric again appeared before Rome, to accept the office of commander-in-chief under her improvised 'Augustus,' the prefect Attalus. This incapable ruler was displaced by Alaric, who resumed his negotiations with Honorius. These being again fruitless, he took and sacked the city, but died shortly after. His successor Ataulf drew off his people to Gaul, and (419) a succeeding king, Wallia, received formal permission from Honorius to settle in the south-west, where at Toulouse he founded the Visigothic dynasty. Spain, already divided between Vandals, Sueves, and Alans, was in like manner formally made over to those invaders by Honorius, whose authority at his death (423) was on the western continent merely nominal.¹ His successor, Valentinian III. (423-455), witnessed the conquest of Africa by the Vandals and of Gaul and Italy by the Huns. The former, under Genseric, having taken Carthage, were recognised by Valentinian in their new African kingdom in 440; and the latter, the rulers, under Attila, of central and northern Europe, confronted the emperors of east and west alike as an independent power. Attila marched first on Gaul, but the Visigoths, since their conciliation by Honorius, were loyal enough to oppose him, and, commanded by Aetius, signally defeated the Huns at Châlons (451). Next year Attila invaded Lombardy, but got no further, and died (453). In that year Valentinian, the last representative of the house of Theodosius in the west, was murdered; but

¹ There has recently been some discussion as to whether Britain ceased to be Roman in 407 or 442 A.D. In either case the step was not a formal nor deliberate abandonment, but was due to the need of troops elsewhere.

his nine successors have no claim on our attention here. The outstanding events in the history of Rome are now her siege and sack by Genseric (455), and the quarrel between the Emperor Orestes (a Pannonian) and the barbarian soldiery in Italy—the latter requesting and the former refusing a grant of a third of the lands. The soldiery defeated and killed Orestes, whose son Romulus Augustulus resigned the 'useless purple' in favour of their leader Odoacer (476). The empire of the west was gone, Italy was under a barbarian king, and Rome ceased to be the capital. Thenceforth the history of Rome is merged in that of Italy (q.v.), where will be found such outstanding events as the restoration to the city, or to the pope, of the lands rescued by Pepin (q.v.) from the Lombards, the taking of Rome in 1084 by the Emperor Henry IV., the short rule of Rienzi (q.v.), the sack in 1547 by the Constable de Bourbon (q.v.), the Napoleonic invasion of 1796, the republic of 1849, and the re-establishment in 1870 of Rome as capital of Italy. The history of the Eastern Empire is given in BYZANTINE EMPIRE.

See Mommsen, *History of Rome* (Eng. trans. 1894) and *Provinces of the Roman Empire* (1886; fourth German edition, 1894); Pais, *Storia Critica di Roma* (1913-21), *Ricerche Storiche* (1915-21), *Storia dell'Italia Antica* (1925 et seq.); De Sanctis, *Storia di Roma* (1907 et seq.); Heitland, *Roman Republic* (1900); Pelham, *Outlines of Roman History* (1893); Stuart Jones, *Roman Empire* (1908), and the article by Pelham (revised by Stuart Jones) in the *Encyclopædia Britannica*. A history of the Roman Empire (a great desideratum) has been begun by Dossau, *Geschichte der römischen Kaiserzeit* (vol. i., 1924, deals with Augustus). For the later Empire, see Gibbon's *Decline and Fall of the Roman Empire*, ed. Bury (1892-1900); Bury, *The Later Roman Empire* (1923); Hodgkin, *Italy and her Invaders* (1889-85).

RELIGION.—The development of a small city-state into a great empire comprising many different races, languages, and civilisations makes the problem of the Roman religion a complicated one. Among Latins, Sabines, Etruscans religion took an Italian development, redolent of their racial and local characteristics, of which, as compared with the Greeks, lack of creative power was one; hence we miss in the Roman divine world that wealth of legend which makes the Greek so picturesque, while from the same cause the Roman divinities betray fewer of the failings by which those of Greece often sink to the human level. The Roman genius, with its practical and objective turn, determined the more observant spirit of its religious worship, which in its minute attention to detail, both in word and act, implied a graver, more reverential notion of deity. Sprung from shepherds and husbandmen of the simplest patriarchal type, the early Romans strike a rural and domestic note in their religion, worshipping especially the gods of nature, of field and forest, the bounteous protectors of flocks, or donors of harvests, like Faunus, Vertumnus, Saturn, Ops, and the gods who shielded the house and its inmates, gods of the family (Lares and Penates). This worship long retained in Rome the rural and household traits of its original inspiration, and far down in the history of the empire we find numerous festivities antique as to observance and yearly as to recurrence, in the Saturnalia, Lupercalia, and such like. These agricultural, pastoral, and household divinities, however, were only 'numina,' spirits with specialised functions but without human attributes; it was only with Rome's political growth as an Italian power that a mythology began to be created, and state-deities like Jupiter came to the front. After Jupiter, the head of the divine world, came Mars, the defender of the city, father of Romulus and of the Roman people, and Quirinus, the deified Romulus. A second Rome-defending

trinity was composed of Jupiter, with his sister and consort Juno and his daughter Minerva. Beside them in reverential honour were worshipped Vesta, goddess of the sacred fire and of the household hearth, and Diana, goddess of the moon. The deities just enumerated, especially the protective or tutelary deities, formed the main body of the state-religion of the Romans—a state-religion of which their second king, the Sabine Numa, was the revered founder and organiser. Of subordinate importance, but closely intertwined with public life and its concerns, came the worship of abstract, chiefly moral entities, embodied in the religious conception as Virtus, Fides, Pietas. Such deities gradually multiplied according to the appreciation or whim of individuals, till nearly every possible condition or influence, including the commonest occurrences and agencies, even accidental phenomena, were endowed with divine being, and worshipped accordingly. So we find Orbona, the averter of bereavement and bringer of comfort to its victims; Fessonia, the preserver from weariness; Quies, Febris, Abeona and Adeona (the goddesses invoked on departure and arrival). The natural world, the civic, the moral—the three elements above indicated—were the chief components of Rome's religion, and during her supremacy constituted a triune whole jealously guarded by the state from every foreign contamination. But with the spread of her dominion, particularly on her coming into closer contact with the Greeks in lower Italy, she imported into her religion extraneous, mostly Greek, objects and modes of worship. She came early to revere the oracular Apollo of Delphi, and (432) erected in Rome a temple in his honour as the plague-averting deity. Castor and Pollux were another acclimatisation, and her temple to them dates from 304. Venus was introduced, while the worship of Asclepius was taken from Epidaurus (291). So long as her civilisation continued national Rome kept this foreign cult, though introduced and sanctioned by the state, as something separate from her old constitutional religion, which was thus maintained free from all corrupting or disintegrating infusion. Subsequently to the second Punic war, however—that turning-point in her civilisation—in an incredibly short time she became penetrated by Greek and oriental influences, and opened the door to the mythological traditions of Greece. She did indeed retain, for the most part, the names she had given her gods and the rites by which she worshipped them; but these were gradually undermined and overspread by Greek notions, until her literature, in so far as it dealt with religion, became impregnated with Greek legend and spirit. Nor was it Greece at her best that Rome followed in this subjection to her influence. Greece had long parted with her better traditions, and could convey little but what was sceptical and frivolous of her own or what was superstitious and fleshly of her eastern neighbours. Asia and Egypt, through the intermediation of Greece, and latterly at first hand, became the source of a sombre, sensual, degrading cult, which Rome, professedly at least attached to her healthier, more masculine worship, strove fruitlessly to counter-vail. Augustus did his best to prop up the declining religion through restoration of old usages and festivals, the rebuilding of temples on a more magnificent scale, and the discouragement of superstitious importations. Ovid made himself the poet of a similar inspiration in his *Fasts*, wherein he tried, by revivifying the old forgotten ceremonials, to reawaken the spirit from which these had sprung. This revival of religion together with emperor-worship had, however, also a political motive behind it. Later emperors interposed from time to time in the same cause; but in vain. Religion and

morals deteriorated with a rapidity that helps to explain the steady, irresistible advance of that religion of which Rome became the seat.

See the chapters on Roman religion in the standard histories of Mommsen, Marquardt, Boissier, &c., the references in Frazer's *Golden Bough*, and the articles in Pauly-Wissowa, *Realencyclopädie der klassischen Altertumswissenschaft*; Preller, *Römische Mythologie* (1881-83); Aust, *Die Religion der Römer* (1889); F. Cumont, *Les religions orientales dans le paganisme romain* (1906; Eng. trans. 1911); several books by W. Warde Fowler, including *Roman Festivals* (1899), *Religious Experience of the Roman People* (1911), and the article in Hastings's *Encyclopædia of Religion and Ethics*; Toutain, *Cultes païens de l'Empire romain* (1911-20); Wissowa, *Religion und Kultus der Römer* (2d ed. 1912); W. R. Halliday, *Roman Religion from Numa to Augustus* (1923); J. B. Hannay, *Rise, Decline, and Fall of Roman Religion* (1928).

On Rome, its history and antiquities, see also the articles in this work on CÆSAR, AUGUSTUS, and the great men of ancient Rome; those on the Roman gods; the maps of Italia Antiqua and Roman Empire; and the following articles:

Agrarian Laws.	Censor.	Jugurtha.
Alphabet.	Church History.	Justinian.
Amphitheatre.	Church (States of the).	Latin Language and Literature.
Apotheosis.	Consul.	Legion.
Arch.	Dictator.	Numerals.
Army.	Divination.	Numismatics.
Art.	Emperor.	Painting.
Auguries.	Equestrian Order.	Pope.
Baths.	Family.	Prætor.
Byzantine Empire.	Gladiator.	Rienzi.
Camp.	Hannibal.	Roman Empire
Canon Law.	Inscriptions.	(Holy).
Carriage.	Italy.	Sculpture.
Catacombs.		

Rome, (1) capital of Floyd county, Georgia, on the Coosa River, 72 miles by rail NW. of Atlanta. It has iron-foundries, brick-yards, manufactories of ploughs, &c., and ships cotton. Pop. 13,000.—(2) A city of New York, on the Mohawk River, 109 miles by rail WNW. of Albany, and at the junction of the Erie and Black River canals. The chief industries are manufactures of machinery, iron, brass, copper, and other goods. Here is Fort Stanwix, which was successfully defended against St Leger, and 6 miles to the south-east the battle of Oriskany was fought during the Revolution. Pop. 26,000.

Rome, PRIX DE, the great prize given by the École des Beaux Arts and the Conservatoire in Paris, consists of a certain sum for four years, during which the recipient is expected to study painting or music at Rome. Brussels Conservatoire also awards a Prix de Rome for music.

Rome-scot, a name for Peter's-pence (q.v.).

Romford, a market-town of Essex, on the Bourne or Rom, 12 miles ENE. of London. It has great cattle and corn markets, iron-foundries, and market-gardens, and a very large brewery of 'Romford ale.' The church of St Edward the Confessor was rebuilt in 1850. Romford is the capital of the Liberty of Havering-atte-Bower, once part of the lands of the Saxon kings. Pop. of urban district, 20,000.

Romilly, SIR SAMUEL, English lawyer and law reformer, was born son of a watchmaker of Huguenot descent at London, 1st March 1757. At sixteen he was articled to one of the Chancery clerks, at twenty-one entered himself at Gray's Inn, and afterwards went the Midland Circuit, but found his chief employment in Chancery practice. In 1784 he made the acquaintance of Mirabeau, who introduced him to Lord Lansdowne; in 1790 he published an able pamphlet on the French Revolution. In 1806 he was, at Fox's instance, appointed Solicitor-general in the Grenville administration, and was compelled to accept the honour of knighthood. He took his seat for Queenborough, as in

later parliaments for Horsham, Wareham, and Arundel. He now devoted himself, by pamphlet and parliamentary agitation, to mitigate the severity of the criminal law, which at that time inflicted Capital Punishment (q.v.) on over 200 different offences. His bills were session after session rejected, but Romilly nevertheless persevered, and, if he saw little fruit of his labours in his lifetime, made his name famous over Europe. He took an active part in the anti-slavery agitation, and in opposing the suspension of the Habeas Corpus Act, the spy system, and the despotic acts of the government. In July 1818 he was spontaneously chosen by the electors of Westminster as their representative. His wife died on the 29th October of that same year, and the shock so preyed upon his mind that three days after (November 2, 1818) he put an end to his life. See his *Speeches in Parliament* (2 vols. 1820), and his *Autobiography* (3 vols. 1840).—His second son, JOHN, BARON ROMILLY, born in 1802, was educated at Trinity College, Cambridge, and called to the bar at Gray's Inn in 1827. He was made Solicitor-general in 1848, Attorney-general in 1850, Master of the Rolls in 1851, and created a Baron in 1866. As Master of the Rolls Romilly incidentally rendered great services to his country, by superintending the publication of public records tending to throw much light upon English history and events. He died on December 23, 1874.

Romney, NEW, a municipal borough and Cinque Port in the south of Kent, 8 miles SW. of Hythe. It ceased to be a port in the days of Edward, and is not now either on the seashore or on a navigable river. Pop. (1881) 1007; (1921) 1605. Old Romney, a small village, is 1½ mile further inland. New Romney is the capital of the Romney Marsh district of fertile pastures, has a great sheep fair, and is connected with Lydd by a railway line 3 miles long. Of its five churches only one (St Nicholas) remains.

Romney, GEORGE, painter, was born at Bockside, near Dalton-in-Furness, Lancashire, on 26th December 1734. He was the second in a family of ten sons and one daughter, his father a clever carpenter and cabinet-maker; and after a very brief schooling he worked for ten years at his father's trade. Meanwhile he saw much of one Williamson, a watchmaker, philosopher, and alchemist; and meanwhile also he carved wood and drew. In 1755 he was articled to a 'Count' Steele at Kendal to be taught 'the art or science of a painter'; in 1756 married Mary Abbot of Kirkland; in 1757 set up as a portrait-painter on his own account; and in 1762 came up to London alone, leaving behind wife, boy, and baby girl—the last died a twelvemonth after. Of Romney's next thirty-seven years there is little to record, beyond his two visits to France (1764; 1790) and his two years' residence in Italy (1773-75), after which, for twenty-two years, he lived in Cavendish Square. He slaved at his art, and his art so far rewarded him that Lord Thurlow said, 'Reynolds and Romney divide the Town: I am of the Romney faction,' and that in the single year 1786 he made by portrait-painting 3500 guineas. Of all his sitters the most celebrated is Lady Hamilton (q.v.), the 'divine lady,' so Romney called her. He painted her as 'St Cecilia,' as 'Joan of Aro,' as 'A Magdalene,' as 'A Bacchante,' and in some thirty other characters. This Lady Hamilton series, Miss Sneyd as 'Serena' and 'The Parson's Daughter,' are probably his masterpieces. Romney was not an intellectual painter, suffering, too, from the lack of a sound early training, but his best portraits make an inevitable appeal, because of their natural freshness and sympathy. They are full

of charm, with the most delicate flesh-tints and colouring of draperies. About 1791 his health began to give way. His habitual sensitiveness and reserve developed into deep melancholy, and this with a corresponding weakening of his physical powers caused his art rapidly to deteriorate. In 1799 he returned to Kendal to die there on 15th November 1802. *Finis!* No; the true *finis* is given by Edward FitzGerald: 'How touching is the close of Romney's life. He married at twenty-one, and, because Sir Joshua and others had said that marriage spoilt an artist, almost immediately left his wife in the north, and saw her but twice till the end of his life, when old, nearly mad, and quite desolate, he went back to her, and she received him, and nursed him till he died. This quiet act of hers is worth all Romney's pictures.'

See *Lives of the painter by his friend Hayley* (1809) and by his son, the Rev. John Romney (1830); Lord R. Gower, *Romney and Lawrence* (1882); H. Gamlin, *Romney and his Art* (1894); the study by 'G. Paston' (1903); the large work by T. H. Ward and Roberts, with a catalogue raisonné (1904); Chamberlain, *A Romney Folio* (1911); and R. W. Lloyd, *The Cult of Old Paintings and the Romney Case* (1917).

Romorantin, a town of France (dept. Loir-et-Cher), 45 miles by rail E. of Tours; pop. 8000.

Romsdal, the valley of the impetuous Rauma in central Norway, which reaches the sea half-way between Bergen and Trondhjem. It is celebrated for its magnificent scenery; the mountains rise precipitously to 5000 feet—the Trolltinder or Witch Needles are 5880 feet high—the floor of the valley is strewn in places with gigantic blocks from mountain landslips; and cascades dash 3000 feet down the sides of the mountains.

Romsey, a municipal borough of Hampshire, on the Test, 8 miles N.W. of Southampton. The fine cruciform abbey church, mainly Norman, but with Transition, Early English, and Decorated features, was the church once of a Benedictine nunnery, founded about 907 by Edward the Elder. Sir William Petty was the son of a Romsey clothier; and Lord Palmerston, of whom there is a bronze statue (1868) in the market-place, lived close by at Broadlands. A corn exchange was built in 1865, a town-hall in 1866. Pop. 4800.

Romulus, legendary founder and first king of Rome, son by Mars of Rhea Silvia, the daughter of king Numitor of Alba Longa, was along with his twin-brother Remus exposed by their uncle Amulius, who had usurped Numitor's throne, but was suckled by a she-wolf, and brought up by the shepherd Faustulus and his wife Acca Laurentia. In 753 B.C. he founded his city on the Tiber, slew his brother, and invited for his citizens all homeless fugitives around, who carried off Sabine maidens for their wives. After Romulus had seen the Romans and Sabines united, and firmly established his city, he was carried up to the heavens in a chariot of fire (716 B.C.), and later worshipped as Quirinus.

Romulus Augustulus. See ODOACER; and ITALY.

Ronaldshay. See ORKNEY.

Roncesvalles. See ROLAND.

Ronciglione, a town of Central Italy, 30 miles N.W. of Rome; pop. 6500.

Ronda, a town of Spain, stands on each side of a grand gorge through which flows the Guadiaro, and across which two bridges are stretched, one 255 feet from the water, 43 miles W. of Málaga; pop. 30,000.

Rondeau (Fr.), a form of poem characterised by closely-knit rhymes and a refrain, and, as defined in the 17th century, consisting of thirteen

lines, divided into three unequal strophes; the two or three first words of the first line serve as the burden, and recur after the eighth and thirteenth lines. It was brought into vogue by Swinburne.

Rondo (Ital.), the most obvious and elementary form in music, in which the first subject, clearly marked out, followed by a second, more or less definite, recurs again in its original key. In later developments the repetition may take place twice, thrice, or even four times, sometimes in part only, or in modified form, the intervening sections being varied in different ways. A large proportion of songs and instrumental pieces are in this form; and the final movement of a sonata, symphony, or concerto is frequently a rondo.

Ronge, JOHANN. See GERMAN CATHOLICS.

Ronsard, PIERRE DE, French poet, was born of good family at the Château de la Poissonnière, in Vendôme, 11th September 1524 (though there exists some doubt about the date). Except for six months at the Collège de Navarre, he remained at home till his twelfth year, when he entered the service as page, first of the Dauphin François (who died August 1536), and second of the Duc d'Orléans, third son of the king, François I. In 1537 Ronsard accompanied to Scotland Madeleine, daughter of the French king and bride of James V. She died shortly after, but Ronsard remained in Scotland over two years, and after being six months in England returned to France to re-enter the service of the duke. Ronsard's youth was precocious; by the time he was sixteen he had a knowledge of English, Italian, and German, was an accomplished diplomat, and had been sent to Flanders, again to Scotland (being shipwrecked on the way); and to Germany, part of the time with the cultured ambassador, Lazare de Baiff. But his career was cut short by deafness, the result of an illness, whereupon he determined to abandon arms for letters. In 1544 he began studying at Paris under the hellenist Daurat (q.v.), who became principal of the Collège de Coqueret in 1547. Under Daurat there studied others of the group, later known as *La Pléiade* (see *PLÉIADES*), of whom the best known, after Ronsard, is Joachim du Bellay (q.v.). The *Défence et Illustration de la Langue Française*, written by the latter, appeared in 1549, the manifesto of the movement—a revolution in French poetry. Ronsard's period of study lasted till 1550, when he published the four books of his *Odes*, the best practical illustration of the *Pléiade* doctrines that humanity is worth studying in all its phases, and that beauty is to be appreciated just for its own sake. The members of the *Pléiade*, led by Ronsard, were true followers of the Renaissance; though they had diligently studied the Latin and Greek poets (especially Anacreon and Pindar), they resolved, first, to make the vernacular tongue, and not Latin, the ordinary accepted means of artistic expression, and, second, to allow any subject, however lowly, to be sublimated into something of æsthetic value. This necessitated a great increase of vocabulary, for appropriate language must always be used to express the thought; a simple subject must not be overloaded with conventional epithets, but the machinery of mythology was not to be discarded if the occasion demanded it. It was this 'corruption' of vocabulary, the free use of 'unlawful' rhymes, of diminutives, of colloquialisms, the use of the same language for poetry and for prose, that roused the opposition of the classicists, begun by Malherbe and continued by Boileau. From 1630 to 1828 no new editions of Ronsard's poetry were published, but the reaction came with Lamartine, de Vigny, and the romantic movement of the 19th century, when the work of the *Pléiade* was appreciated at its full value again.

Fortune favoured Ronsard, however, in his lifetime. The years 1550-60 were the most prolific as regards output. After the *Odes* in 1550 came the *Amours* in 1552; *Le Bocage*, a collection of serious pieces; and *Les Meslanges*, a collection of gayer pieces, in 1554; *La Continuation des Amours* in 1556; and, finally, a complete edition of his works in 1560. Ronsard is a stylist, a master of delicate rhythms; his sonnets and odes have a charm and vitality that fully compensate for any mannerisms of expression or contemporary allusions that tend to 'date' or disparage his work. Ronsard's contemporaries certainly appreciated him, calling him the 'Prince of French poets'; Montaigne admired him, and Spenser and other Elizabethans acknowledged their indebtedness to him. He was a favourite of Marguerite, sister of Henri II., was pensioned both by Henri II. and François II., and received presents from Elizabeth and Mary, Queen of Scots. Before his death there had appeared six complete editions of his works, each edition usually containing a certain amount of new material. Charles IX. heaped further favours on the lucky poet, who after the king's death, feeling the burden of enfeebled health, retired to the abbey of Croix-Val in Vendôme, where he spent most of his remaining years in lettered ease. Ronsard died at the priory of St Cosme at Tours, 27th December 1585.

See RENAISSANCE, and books there cited, dealing with France. Complete editions of Ronsard have been published by Blanchemain (8 vols. 1857-67), Marty-Laveaux (6 vols. 1887-93), Laumonier (8 vols. 1914-19), and Vaganay (1910-24), and numerous volumes of selections have been made by various editors. See Binet, *Vie de Ronsard* (1886; ed. Laumonier, 1910); Sainte-Beuve, *La Poésie Française au seizième siècle* (1828); G. Wyndham, *Ronsard and La Pélidée* (with translations into English, 1906); *Ronsard poète lyrique* (1909) and other important works by Laumonier; good critical studies by Jussereaud (1913), de Nolhac (1921), Cohen (1924), Champion (1925), all in French.

Röntgen, WILHELM KONRAD VON, physicist, born 27th March 1845 at Lennep in Rheinland, studied at Zürich, was professor at Strasbourg, Giessen, Würzburg, and Munich. He contributed to science on specific heat in gases, elasticity, compressibility, capillarity, the absorption of heat in steam and gases, and especially the X-rays, usually called after him. He died at Munich 10th February 1923.

Röntgen Rays (X-RAYS).—When experimenting upon the passage of an electric current through highly rarefied gases contained in glass tubes, Röntgen in 1895 found that photographic plates placed in the vicinity, though screened from the action of light, were affected as though light had penetrated the opaque envelope which contained them. It was soon observed that the effect was due to an influence proceeding in straight lines from the glass tube. This previously unknown radiation was called X-radiation or Röntgen radiation. For some years there were differences of opinion regarding its nature; it is, however, now known to consist of electric waves similar to wireless waves and light waves, but of enormously shorter wavelength than either. The differences between the properties of X-radiation and light are differences of degree rather than of kind.

What appeared the most remarkable property was that of penetrating comparatively thick sheets of substance opaque to ordinary light, and even thick sheets of the lighter metals as aluminium. Unlike light, the radiation could not be detected by its direct action upon the eye—it produced no sensation of sight; but it was observed that a number of substances when exposed to the radiation emitted light. These fluorescent substances thus acted as detectors of the 'invisible' X-radiation.

The best known of these is barium platino-cyanide, which glows with a greenish yellow light when exposed to X-rays. Such a substance when spread over a sheet of cardboard forms an X-ray screen.

Though the photographic and fluorescent methods are the most easily applied, a third method known as the ionisation method has proved the most useful from a purely scientific standpoint, for it gives accurate measures of intensity of radiation. Thus when X-rays traverse a gas, such as air, they make the gas into a good conductor of electricity. As a current of electricity can then be passed through the air, the current may be measured and used to give a measure also of the intensity of the X-rays.

X-ray Tubes.—As the radiation proceeded from the portion of the glass tube struck by electrons (the cathode radiation) known to be shot across the tube from the surface of the cathode, the cathode was made cup-shaped, and the electrons were thus focussed to a definite spot on a target of metal—the antikathode. The spot on the antikathode struck by the cathode rays was then the source of the X-radiation. Heavy metals with high melting-points, as platinum and tungsten, are usually employed as targets in which the X-rays are excited, but for special purposes many other metals are used.

In many X-ray tubes the targets are cooled by water circulation and by other devices.

The more modern Coolidge tube is so highly exhausted (10^{-6} atmosphere) that a current cannot be sent through it in the ordinary way. A stream of electrons is provided by electrically heating to incandescence a small coil of wire situated inside the tube. The electrons emitted by this hot wire are directed on to the target by an applied electric field. The number of electrons used to generate the X-rays can then be controlled by varying the current through the coil: thus the intensity of the radiation may be varied. Also the potential applied to the tube can be controlled, and thus the velocity of the electrons when they strike the target. This controls the character—the wavelength—of the radiation emitted.

Very recently metal instead of glass X-ray tubes have been constructed with targets situated very near to the thin metal windows through which the X-rays pass into the space outside. Enormously increased intensity has thus been obtained.

Theory of Excitation.—The radiation emitted by an X-ray tube is a mixture of (a) a general radiation of all wave-lengths between wide limits, and (b) a characteristic radiation of certain definite wave-lengths, characteristic of the metal of which the target is made. The one gives a continuous spectrum, the other a line spectrum in X-rays of wave-length depending on the particular target.

The constituent radiation of highest frequency is related to the maximum speed v of the exciting electrons by the equation $h\nu = \frac{1}{2}mv^2$ when m is the mass of an electron and h = Planck's constant. It is thus as if all the energy of an electron ($\frac{1}{2}mv^2$) was transformed into one quantum of radiation, the quickest electrons producing radiation of highest frequency or shortest wave-length. (See QUANTUM THEORY.)

When a gas-tube (distinguished from a Coolidge tube) is highly exhausted, it requires a large potential difference to send a discharge through it, and the electrons acquire a high speed. Consequently the radiation is of high frequency; it is a highly penetrating or 'hard' radiation, and the tube is described as a 'hard' tube. Softer rays (of longer wave-lengths) are emitted by a tube containing gas at higher pressure.

There is strong evidence that the wave motion which constitutes X-radiation is emitted by electrons in vibration near to the central nucleus of an atom. (Surface electrons in vibration emit light which is of longer wave-length; electrons vibrating in the nucleus emit γ -rays of even shorter wave-lengths than X-rays).

The mechanism by which radiation is emitted is unknown, but by Bohr's theory a characteristic X-radiation is emitted when an electron striking the target knocks an electron from its orbit in an atom, and another electron falls from an outer orbit to take its place. The fall from an outer orbit to an inner orbit necessitates an emission of radiation of frequency n where hn = energy lost by the falling electron. This quantum relationship is still a mystery. It is probable that the general radiation is emitted by the electrons which strike the target during their passage through atoms of the target.

Fundamental Properties of X-rays.—During transmission through material substances an X-radiation loses intensity in two ways: some radiation is scattered by the substance traversed as light is scattered by smoke; some of it is used up in ejecting electrons from atoms. The latter appears to be the only way in which X-radiation can be absorbed, the energy being in some way transferred to these electrons. All the properties of X-rays seem to be fundamentally dependent on this power of ejecting swiftly moving electrons; other actions are secondary actions due to this primary action of the rays themselves. In general, more electrons are ejected from heavy atoms than from the same number of light atoms traversed by the same radiation, the number being approximately proportional to (atomic number)⁴. The maximum velocity of ejection depends not upon the parent substance nor on the intensity of the radiation, but only upon its wave-length, a fact which has received no explanation on the wave-theory. Thus X-ray effects are much greater in heavy elements, and these correspondingly absorb the radiation most strongly. Consequently lead, gold, platinum, &c., and substances containing these are very opaque, while carbon, silicon, aluminium, and other light elements are comparatively transparent. Thus screens used for protection from X-rays are of lead; windows are of paper, cardboard, or aluminium.

Electrons ejected from certain atoms pass through surrounding atoms, detaching other electrons here and there in their path, and they finally settle on other atoms. The total path in atmospheric air of the original ejected electron is of the order of 1 inch and less, but in a rarefied gas the length of path may be increased almost indefinitely. The path of the electrons in the human body is about $\frac{1}{100}$ inch and less. Each high-speed electron thus ionises (electrifies) many atoms around, hence the greatly increased conductivity of the substance traversed by X-rays; hence also the photographic action, and the many chemical actions which are stimulated by this ionised state.

Subsequent to the emission of the high-speed electrons, a vibration in the atom is set up when electrons of the outer orbits fall into the orbit previously occupied by the ejected electron. Thus characteristic X-radiation is emitted by the substance traversed by the X-rays, and in this way any substance may be made to emit its characteristic X-radiations.

X-rays are regularly reflected from a crystal, for in this the atoms are arranged on a system of almost perfect parallel planes. The reflection from each layer of atoms is very faint, but, provided the wave-trains from the parallel layers agree in phase (are in step), all the feebly reflected

trains add their effects, and a strong reflection is produced. This, however, is not surface reflection. The condition for agreement of phase is that $2d \sin \theta = n\lambda$ where d is the distance apart of the crystal planes, θ is the 'glancing angle,' λ is the wave-length of the radiation, and n is an integer. Thus, radiation of given wave-length when incident on a certain crystal is reflected only when the angle of incidence has very precise values, as when $\sin \theta = \frac{1, 2, 3 \dots \times \lambda}{2d}$. This important

relation forms the basis of measurements of two kinds—(1) the measurement of wave-length λ when the spacing d of a set of planes in a crystal is known; (2) the measurement of the spacing of the various sets of planes in a crystal when the wave-length is known. Such measurements are usually made by an X-ray spectrometer. The wave-length ranges from about 10^{-8} cms. (very soft rays) to about 3×10^{-8} cms. (very hard rays). From measurements of the second kind the arrangement of the atoms of various kinds in a crystal has in many cases been deduced.

Practical Applications.—Owing to the high penetrating power of X-rays and to the fact that the absorption varies rapidly with the atomic number of a substance, they are very useful for observation of internal structures. Rays are passed through the substance and the luminosity produced on a screen beyond is observed directly, or the effect on a photograph plate is made permanent by developing and fixing. Any lack of homogeneity of the substance is shown by a variation in intensity of the rays transmitted—that is, by shadows cast by the heavier elements. Thus the position of (or fractures in) bones, the position of foreign bodies, the position and size or even any pronounced change in the organs themselves are shown by the shadow density. The position of a foot in a shoe, the sphericity of the core of a golf-ball, faults in castings, and in the fibrous structure of wood, the presence of foreign matter in coal, can all be observed.

X-rays have been found to be beneficial in the treatment of ringworm, rodent ulcer, and possibly in some cases of cancer. The action is doubtless due to chemical action stimulated by the ionisation produced in the diseased tissues, but the detailed actions are too complicated to be fully understood; some are beneficial, some harmful. X-ray treatment is still in the empirical stage.

Theoretical Applications.—As the scattering of X-rays is due to the electrons in material substances, the intensity of radiation scattered by a substance gives a measure of the number of electrons in that substance, and consequently the number of electrons in an atom. This is found to be precisely the atomic number of the atom: hydrogen, 1 electron; carbon, 6 electrons; nitrogen, 7 electrons; aluminium, 13 electrons; and so on.

The investigation of electrons ejected from substances by X-rays gives valuable information regarding the energy required to extract them, and thus of the structure of atoms.

X-ray spectroscopy reveals the atomic structure of crystals used to reflect the X-rays (see CRYSTALLOGRAPHY), and shows practically all solid substances to be composed of small crystals.

A study of the electrons ejected, and of the secondary X-rays emitted by substances exposed to primary X-rays, is the most promising line of investigation of those problems regarding radiation and matter, and the relation between them which are so baffling to the present generation; in particular, the problem of reconciling with the wave-theory those facts which seem to indicate that radiation is made up of indivisible bundles of energy or quanta. (See QUANTUM THEORY.)

Rood, is used of the Cross of Christ, the Holy Rood, and of crosses and crucifixes generally, but especially the great crucifix which in mediæval churches stood on the rood-screen (see SCREEN). As a measure of surface, a rood is the fourth part of an acre, and contains 40 square poles or perches, or 1210 square yards.

Roof. In warm countries, such as India, flat roofs, covered with cement, are usual. Those of Palestine, Egypt, and Assyria also were flat, and were composed of wooden beams covered with thick layers of earth. In milder and rainier climates, roofs sloping from a central ridge are the ordinary form. Great Greek

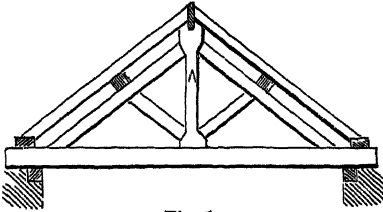


Fig. 1.

buildings were covered with marble slabs, carefully grooved together; in common Greek and Italian buildings roofing tiles are used. In the rainy climate north of the Alps steeper roofs are needed to throw off rain and snow.

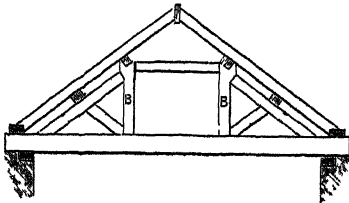


Fig. 2.

Roofs well constructed serve to bind the walls together and strengthen the building; if too heavy they crush the walls. The actual covering of the roof and its supports are therefore made as light as possible, and the strength concentrated in 'principals' or 'trusses.' Fig. 1 represents a king-post roof (A being the king-post), and fig. 2 a queen-

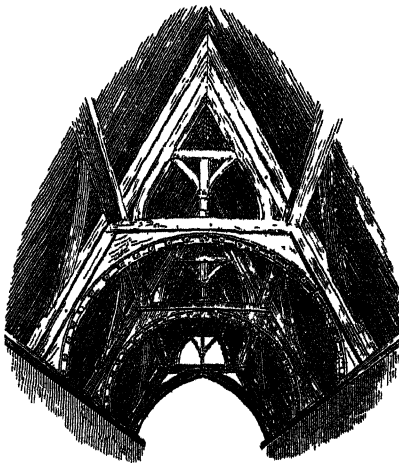


Fig. 3.

post roof (B, B being the queen-posts). The latter is used for wider spans, and leaves the centre clear for attics. Early Christian basilicas (and prob-

ably the Roman basilicas) had such roofs. In the early Gothic style the king-post was carved and the tie-beam moulded. The Decorated style introduced an arch or a series of cants (fig. 3). As the style progressed curved braces were placed under the tie-beam, to support it; these were carved, and rested on elegant corbels, the spandrels between the braces and the wall being filled with tracery. In the Perpendicular style the central part of the tie-beam is cut away, and the beautiful hammer-beam roofs of the period become usual (see fig. 4). The roof of Westminster Hall is one of the finest examples of this kind of roof. These open timber-roofs are much used in England both in churches and halls, but abroad chiefly in the latter, as the church roofs were more frequently vaulted. In

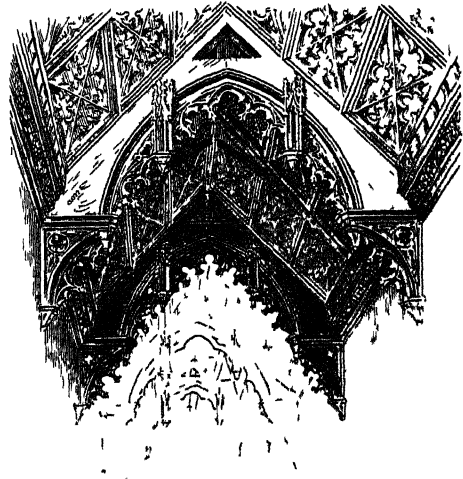
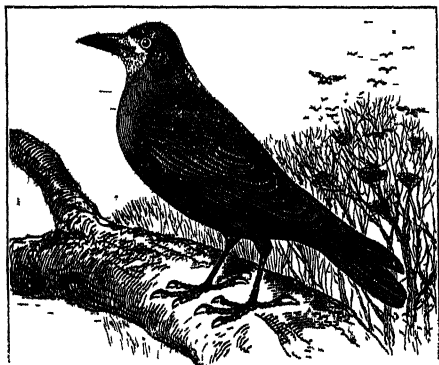


Fig. 4.

modern times, when great spans have to be roofed over, combinations similar to those used in lattice Bridges (q.v.) are required. Iron has been introduced, and by means of it, spaces of almost any width can be roofed over. See also CEILING, MANSARD ROOF, FAN-TRACERY, &c.

Rook (*Corvus frugilegus*), a species of 'crow, common in Britain and in many parts of Europe and Asia, especially in northern and central regions. In late autumn there is a migration from the continent to the eastern shores of Britain, and a return in early spring. Some of the characters of the rook have been contrasted with those of other species of *Corvus* in the article CROW. The plumage is bluish black; the forehead, cheeks, and throat are bare; the bill, legs, and feet are black. White and piebald spots sometimes occur. The rook does not breed till it is about two years old. The nest, built of twigs with a lining of grass and roots, is almost always on a lofty tree. The noisy cawing of the builders in March is one of the familiar signs of departing winter. The eggs (three to five) are bluish green with olive-brown markings. As to food, the rook is almost omnivorous, but it depends in great part on insects and grubs. Unlike the crow, the rook is characteristically a social bird, feeding in great flocks, nesting in rookeries, and sometimes combining to beat off a common foe. Confident perhaps in their numerical strength, and reliant on their habit of posting sentinels, rooks are by no means shy, for they sometimes nest in the trees of a town garden, and, though much afraid of a gun, soon grow accustomed to scarecrows and noise. They are very wide-awake birds, exhibiting no small degree of that sentience which is often displayed by gregarious birds and

beasts. They show sagacity in choosing fit trees on which to nest, in posting sentinels who warn the others when danger threatens, and in distinguishing real from fictitious sources of alarm. Though quarrelling and mutual robbery are common during the nest-building, there is no doubt that rooks have a sort of social feeling, which manifests itself sometimes in the punishment which they inflict on an offending member. The same rooks seem to take possession of their old nests year after year, repairing the damage done by the winter storms. The male rook feeds the female assiduously during incubation, and sometimes takes her place on the nest. Both parents bring food to their young ones, and the nestlings are provided with little stones essential to the grinding of the food in the gizzard. The rook can be tamed, and may exhibit something of the imitative power possessed by several related birds. While rooks are useful in so far as they destroy



Rook (*Corvus frugilegus*).

many injurious insects and grubs, they sometimes damage trees by breaking off the twigs, they root up grass and young corn, and do other damage to the crops. In moderate numbers they are useful, but in multitudes they are compelled to leave their natural food and become injurious.

Rooke, SIR GEORGE, British admiral, was born in 1650, near Canterbury, at the country-seat of his father, Sir William Rooke. Entering the navy, he found himself at thirty a post-captain, and in 1689 was promoted to the rank of rear-admiral of the red. He took part in the action off Beachy Head between the Earl of Torrington and a French fleet under Tourville; and in 1692 he distinguished himself greatly in the memorable battle off Cape La Hogue, fought between the French fleet and the combined English and Dutch force under Admiral Russell. For this he received the rank of vice-admiral of the red, knighthood, and a pension of £1000 a year. In 1702 he commanded the expedition against Cadiz, and destroyed the Plate-fleet in the port of Vigo. In conjunction with Sir Cloudesley Shovel he accomplished the capture of Gibraltar, 21st July 1704. On the 9th August of the same year he engaged off Malaga a much heavier French fleet under the Comte de Toulouse, and fought one of the bloodiest of naval battles, the honours of which remained with the English. Finding the government hostile to him on political grounds, he retired from public life and led the life of a Kentish gentleman till his death, 24th January 1709. See his *Journal*, edited by Oscar Browning for the Navy Records Society (1897).

Roon, ALBRECHT THEODOR EMIL, COUNT VON (1803-79), born near Kolberg in Pomerania, entered the Prussian army in 1821, joined the general staff in 1833, and in 1839 was made war minister, and in

1861 marine minister as well. The effects of his labours in reorganising the army were brilliantly realised in the wars of 1866 and 1870-71, and he was made count (1871) and field-marshal (1873). He wrote two books on geography. See *Life* by Von Gossler (1879) and another *Life* (1888), and various collections of his reminiscences, letters, and speeches, edited by his son (1892-96).

Roosevelt, THEODORE, President of the United States, was born at New York on 27th October 1858, his father being of an old Knickerbocker family, his mother Georgian-Scots, while there was in his veins also Irish and Huguenot blood. At Harvard he was a distinguished athlete, and as a rancher in the wild west he became a mighty hunter of big game. In 1882-84 in the New York legislature he became known as a strenuous reformer of Civil Service abuses, was leader of the House in 1884, and as President of the New York Police Board (1895-97) carried through some much-needed improvements. As Assistant-secretary of the Navy in 1897 he did much to secure the efficiency displayed in the Cuban war; and at the outbreak of the war he raised a famous regiment of cavalry volunteers, the Roosevelt Rough Riders, and commanded them with brilliant success. In 1898 he was made governor of New York, in 1900 vice-president of the United States; and on the death by assassination of McKinley (September 1901) succeeded him as president. A Republican, a reformer of all administrative abuses, a declared foe to Tammany and the spoils system, an upholder of the Monroe Doctrine, and an expansionist, he substantially continued McKinley's policy, but showed more personal initiative, and was forward to recognise the independence of Panamá (1903). He sought to secure full commercial rights for Cuba, insisted on the necessity for strict supervision of syndicates and rings, and incurred some loss of popularity by his resolute endeavours to give coloured persons the full rights of citizens and even social privileges. He took an active part in arranging peace negotiations between Russia and Japan after the war of 1904-5. On the expiry of his second term of office (1909) he went to hunt big game in Africa. His subsequent attitude towards President Taft and his 'Insurgent' movement were followed by disaster to the Republican party at the polls in 1910. In 1912 as head of the 'Bull Mooses', a 'third party' of progressive Republicans, he stood, against Mr Taft, for progressive social, economic, financial, and constitutional legislation, as candidate for a third term of the presidency, and during his candidature was shot by an intending assassin and seriously wounded. In 1914 he explored the Brazilian Rio Duvida or Teodoro. He wrote books on hunting, ranching, zoology, history, an *Autobiography* (1913); and, with others, an elaborate book on the Deer family. He died 6th January 1919. See *Lives* by Thayer (1919) and Bishop (1920).

Root is the name applied commonly to the subterranean organs of flowering plants which absorb nutrient chemical solutions from the soil, and by growing and spreading in the latter serve also to maintain the plant in the best position for the development of its aerial portion, or shoot. But organs of the same kind, from the morphological point of view, may have different forms and different functions; thus shoots may function as roots, and roots may grow up into the air as shoots. See **PHYSIOLOGY (VEGETABLE)**.

As the leaf surface of a seed plant is developed, the root system grows; in a large sunflower it occupies about one cubic yard, in a large tree hundreds of cubic yards. This system, resulting from the branching of the primary, secondary, and other roots, the ultimate divisions consisting of

root-hairs, is so complete that scarcely the space of a quarter cubic inch is unoccupied. Abundance of water, to balance the transpiration, and of salts, for other purposes of plant life, is thus secured. The root system of aquatic plants is small, water being easily obtained and transpiration slight.

All roots at first are thin hair-like organs; the greater thickness that those of the dicotyledons attain is due to a secondary growth. The thickened roots serve only as organs of attachment, and of course as conducting channels, but not at all as organs of absorption. These absorbing parts, root-hairs, are protuberances of the outer layer of cells of the roots. They arise shortly behind the growing tip, and they die off in a few days, so that only an inch or two of root bears root-hairs. In this way the root-hairs are continually brought into contact with portions of untouched soil.

A longitudinal section near the apex of a root of a dicotyledon shows the following arrangement of parts. Near the developing apex a mass of actively dividing cells, known as the growing-point, gives origin to an exterior tissue of simple cells; this usually has the form of a thimble, well seen in common duck-weed, and is called the root-cap. In its rear the growing-point produces other cells but of a different nature. These cells soon enlarge and undergo modifications according to the elements of the root anatomy they are destined to produce. At about $\frac{1}{4}$ inch from the growing-point such cells have differentiated into three distinct layers recognised from without inwards as dermatogen, periblem, and plerome. These undergo further differentiation, so that a mature root consists of the following parts: (1) an outer layer, the epidermis, developed from the dermatogen; (2) several layers of simple cells, the cortex, developed from the periblem; (3) the fibro-vascular cylinder, and often a central pith, both developed from the plerome. The root-cap serves as a protection to the delicate growing-point of the root as it forces its way through the soil. It is continuously worn away by the particles of the soil, and as continuously reformed behind by the growing-point. The epidermis encircles the whole, and many of its cells develop into long hairs, the absorbing root-hairs already mentioned. The cortex, when young, may also absorb fluid from the soil, which together with that taken in by the root-hairs is passed inwards to the young wood-vessels, by which it is carried upwards to the shoot as the ascending sap. The cells of the cortex also conduct upwards for some distance a smaller proportion of the absorbed water of the soil. The bundle sheath, when it occurs, separates the cortex sharply from the rest of the root. The wood-vessels not only conduct the ascending sap, but afford, together with the wood-fibres and bast-fibres, strength, toughness, and rigidity. The young fibro-vascular core, or cylinder when there is a central pith, is composed of from 2 to 8 or more groups of woody tissue and bast tissue, with arcs of cambium between them. These are arranged alternately in a star-like manner when there is no pith, or alternately in a circle about the central pith, when seen in a transverse section of the root.

Secondary thickening may occur in roots as in stems, and is due to the continued development of the arcs of primary cambium, combined with new cambial cells formed by the pericycle around the outside of the groups of woody tissue, until a complete girdle of cambium is produced. The new cambium ring seen in transverse section waves in and out so that it passes inside the bast bundles and outside the wood bundles. This cambium produces a new and entire ring of wood and bast similar to that formed by secondary thickening of stems (see STEM). Thickened roots always lose

their original cortex and epidermis, and gain a fresh covering in the following way. The young bast and woody tissues are surrounded by a ring of cells called the pericycle. This, besides taking part in the completion of the cambial girdle as just mentioned, forms by division of its outer cells an entirely new layer of cambial tissue termed the cork-cambium or phellogen outside of the bast or wood-cambium. This phellogen then produces on its inside a layer of tissue known as the phelloderm, and on its outside a similar, often thicker, layer termed the periderm or cork. The original tissues lying outside of the pericycle are thus split off and discarded as the root thickens. A third function of the pericycle is that of giving origin to all branches, i.e. rootlets which may arise. This delicate cylinder of pericyclic cells is therefore of the utmost importance to young roots.

Forms of Roots of Seed Plants.—The primary root is merely the enlarged radicle of the seedling: it is the direct prolongation of the stem. All secondary roots of dicotyledons arise from this first root; the secondary roots may give rise to others, and so on until a much-branched root is formed. If the primary root is very thin the whole system is called a fasciculated root; if the secondary fibres are also very fine it is called a fibrous root; if the fibres are very much thickened it is said to be a tuberous root (e.g. the dahlia). When the primary root is much thicker than the secondary roots it is called a tap-root, and may be further classified according to its shape, as spindle-shaped (e.g. the carrot) or turnip-shaped. Much-thickened roots are usually store-houses of food material—e.g. the fasciculated root of the Turk's cap lily, or the tap-root of the turnip. Roots are also described as fleshy (e.g. the beet-root), or as woody (e.g. the roots of trees). Fleshy roots usually die in the autumn of their first or second year; woody roots may live for many years, even when the shoots die down every autumn. Roots usually burrow in the soil, but they may be aerial, as for instance the roots of climbing plants such as ivy; these arise from the stem and fix the plants to their supports. In the tropics many plants have aerial roots, like the mangrove which forms forests in brackish swamps. The Indian fig has aerial roots from which, after they have become fixed in the ground, new plants may spring. Orchids are examples of the epiphytes, which have roots which merely fix the plants to trees but do not derive any nourishment from them. Aquatic plants often have roots which do not penetrate into the mud but float freely in the water. Many plants will form new roots after all the old ones have been cut off if they are placed in water or in a damp soil. This is taken advantage of by gardeners in their method of propagating such plants as fuchsias, oleanders, &c. from cuttings.

Esculent roots are numerous, and many roots also contain secretions either peculiar to themselves, or more abundant than in the other parts of the plant, and become therefore useful in medicine or in the arts, while some are very poisonous. The roots used for food are generally those which are thick and fleshy. The plants to which they belong are of very different genera and orders—some of the natural order Cruciferae, as the horse-radish, turnip, radish, and kohl-rabi—some of the order Chenopodiaceae, as beet and mangold wurzel—some of the order Umbelliferae, as the carrot, parsnip, &c.—and some of the order Compositae.

Comparative.—Most of the Thallophytes (Algae, Fungi, and Lichens) have only a rudimentary differentiation into stem, leaf, and root, or none at all; but the most highly developed members of each division have an outward distinction of parts to which such terms may be given; still the roots

even of these are distinguishable from the roots of vascular plants not only by anatomical structure but by the absence of a root-cap, and by their branching, which is never endogenous.

The Vascular Cryptogams—ferns, horsetails, lycopods, &c.—are highly differentiated in form and in their tissues. The roots arise in acropetal succession on the stem, or in many ferns on the petioles; their branching is monopodial or dichotomous; they are all alike—the first root never becomes like a tap-root, the lateral roots arise from the innermost layer of the cortex, and the roots grow by successive divisions of an apical cell. The Selaginellæ, a group of the Lycopodiaceæ, are remarkable in that the growing-point is formed by a primary meristem similar to that of flowering-plants and not by an apical cell as in ferns and horsetails.

The roots of the Seed Plants have already received a general description, and a few other points may now receive consideration. The primary root is a continuation of the primary stem; it is directed towards the micropyle of the ovule and seed (see OVULE), and is of endogenous origin, its first rudiment being covered by the nearest cell of the suspensor. All the parts of the seed plants, shoots and leaves as well as roots, are distinguished from the parts of all other plants, except the Selaginellæ and for a short time the embryos of some Coniferæ, by having a small-celled primary meristem at the growing apices instead of the typical apical cell of many Algae, and of the Bryophyta, Ferns, and Horsetails. The root-cap is formed, not as in the cryptogams, by transverse divisions of an apical cell, but by rapid division in the direction of the apex of the cells of the apical meristem. Also the first rudiments of lateral roots, shoots, and leaves do not arise from single cells, as in the cryptogams, but from protuberances of a few small cells. The formation of a complete cambium ring in the primary and stronger lateral roots, and the subsequent secondary increase in thickness, is a characteristic of gymnosperms and dicotyledons, and does not occur in the cryptogams. This habit often results in the formation of persistent root systems, which in the monocotyledons are often replaced functionally by rhizomes, tubers, and bulbs.

Many epiphytes of tropical forests, like Philodendron and other Aroidæ as well as many Orchids, produce large and long aerial roots that hang down into the moist air, from which they absorb water by means of a modification of the root-cap. (On the other hand certain swamp plants, like *Jussiaea* (Onagraceæ) and *Taxodium* (Coniferæ), which, owing to the water-logged soil of their habitat find respiration of their lower parts difficult, overcome this disadvantage by sending up into the air, vertically from the swamp, special roots called pneumatophores modified for the absorption of air.)

The stems of the Cycadæ are exteriorly not unlike those of the Tree-ferns, but unlike them they have tap-roots and secondary roots which may appear above ground. In the Coniferæ the endosperm bursts the seed-coat at the root end, and the root, which develops a strong tap-root with lateral members, is thrust out.

The primary root of monocotyledons soon ceases to grow, lateral roots spring from the axis, each new root springs from a point higher up the stem, and the new being stronger than the older ones, there is no secondary thickening and no persistent root system. Some saprophytic monocotyledons as well as many aquatic plants form no roots at all. In dicotyledons an axis below the cotyledons is called the radicle, but the upper and often the larger portion consists of a part of the stem called the hypocotyl; the lower part is the true embryo

root. The root is the first part to issue from the burst seed-coat; it grows and gives rise to lateral roots. If the primary stem grows vigorously the primary root also grows rapidly and forms a tap-root. If the growth ceases adventitious roots are often formed between the former lateral ones, which may themselves give rise to lateral roots. For further information, see the larger text-books of general or morphological botany.

Root, in Algebra, denotes any value of the unknown quantity in an equation which will render both sides of it identical. The determination of the roots of equations, either formally or actually, constitutes the greater portion of the science of Algebra (see EQUATIONS). The *square* root is that number which, multiplied by itself, produces the given number; the *cube* root, the number which, multiplied into itself and then into the product, produces the given cube; so with fourth root, fifth root, &c. (see INVOLUTION).

Root and Branch Men, a party in the Commons and out of it who supported a petition signed by 15,000 London citizens, praying that episcopacy might be destroyed 'root and branch.' Nathaniel Fiennes, Sir Henry Vane, and Hampden were of the party. A bill to give effect to the petition was read a first and a second time in 1641, but was ultimately dropped.

Rootstock. See RHIZOME.

Ropes. The staple fibre for ropes has long been Hemp (q.v.), but since the middle of the 19th century several other fibres have come largely into use. Hemp is better suited for cordage (the general term for ropes, cords, and twine of all kinds) than for weaving purposes, because it gives way when much folded into sharp folds more readily than other important textile fibres—flax, for example. Manila hemp (*Musa textilis*; see ABACA), belonging to a quite different order of plants from the common hemp, is largely employed. Coir fibre, from the husk of the coconut, is another important rope-making material which, though long used in India, has in Europe only taken its place as a valuable cordage fibre more recently. It is fairly strong, and, size for size, it has the advantage of being considerably lighter than either hemp or manila. Unlike these, coir rope is never tarred for preservation. Sisal hemp, from the *Agave sisalana* of Yucatan though not nearly so strong as common hemp, is also much used, especially for ropes of small size. For certain purposes, such as driving parts of textile machinery, cotton ropes are largely employed. The British Admiralty accepts ropes supplied to it consisting of Italian hemp or Russian hemp, or a mixture of the two up to a *circumference* of six inches, while Bombay hemp may be used in the mixture or alone between six and sixteen inches. Manila fibre is accepted for ropes of three-quarters to three inches. There are two other rope fibres which are of increasing importance in Britain—viz. the Sunn hemp (*Crotalaria juncea*) of India and the *Phormium tenax* of New Zealand. A large number of plants valuable for cordage grow in India, for a list of which, as well as for an account of the native process of rope-spinning, see Balfour's *Cyclopædia of India*, or the Indian exhibit at the Imperial Institute.

As regards the strength of ropes, it will be readily understood that in this respect specimens of the same kind of vegetable fibre will vary considerably. Healthy plants will yield a better fibre than those of more feeble growth, and some supplies of the same kind of material will have been more carefully prepared for spinning than others. The amount of care and skill bestowed upon the spinning process itself will also vary in the case of

different manufacturers. Tarred ropes, again, though more durable, are not so strong as those left untarred; and as tar is liable to be impure it will happen that it weakens or injures the fibre more at one time than at another. Ropes are made in coils to a finished length of 113 fathoms, and are tested by ascertaining the breaking strength of a free length of one fathom. The size of yarns is given thus, 40 thread, 30 thread, &c., and the number of yarns to be worked into a given size of rope is specified, together with the weight of a coil of finished rope. The table gives particulars of a few representative cases:

Size in Inches Circumference	Breaking Strength of Yarn in lb	No of Yarns in Rope	Threads	Approximate Breaking Strength of Rope in lb	Approximate Weight of a Coil in lb.
Hemp 1	85	15	40	1840	27
" 2	85	54	40	4000	96
" 3	120	120	80	9400	211
Manila Fibre 1	120	15	40	1120	25
" 2	120	54	40	3700	83

The safe load for new ropes may be obtained by dividing the breaking strength by a 'factor of safety' of from 5 to 7. Tarred rope is 10 to 15 per cent. weaker.

The term rope is applicable only when the circumference of the cordage exceeds 1 in.; smaller cordage is called cord-line or twine. Ropes 1 in. to 2½ in. circumference are 'hawser' laid, 3 to 10 in. circumference are 'hawser' or 'cable' laid, and above 10 in. circumference are 'cable' laid. The general method of procedure in making ropes by machine is as follows: 'The yarns being wound round on the bobbins in suitable numbers, according to the size of the rope to be made, they are from each bobbin threaded through a head-runner (register-plate) of six holes, and gathered at a die, at which they are closed into strands, there being a separate die for each of the three strands. The strands being formed, they are then threaded through a main head-runner of the holes, and immediately closed at the main closing die into finished rope. The rope is drawn through the die by means of strong hauling-off drums, and ultimately wound on a storage reel.' In making cables, sufficient fibre is taken and twisted to the right to form yarn, then yarns are taken and twisted to the left to form strands, then these strands are twisted to the right to form hawsers, and hawsers are twisted to left in the formation of cables. This reversal tends to keep the rope together and the fibres parallel to the direction of stress.

In this country ropes were usually specified by their circumference, but in America the diameter is more usually given; both methods are now in common use, and it is necessary to state whether diameter or circumference is meant, in order to avoid confusion.

Ropewalk Spinning.—Notwithstanding the successful application of machinery to the manufacture of ropes, the old process of ropewalk spinning is still practised on a considerable scale. The successive stages in the process are (1) heckling the fibre; (2) spinning the yarn; (3) tarring in 'haws' consisting of about 300 yarns, laid close and parallel in lengths of say 100 yards; (4) winding the yarn on bobbins and mounting these on hobbin-frames; (5) forming the strands; and (6) laying the strands into a rope. The heckling of hemp is done in the same way as the heckling of flax (see LINEN), the object being to remove the tow or short fibres and to place the long fibres called 'line' parallel to each other. Spinning in this process is done by hand, but either an iron whirl-hook, forming the spindle of a small pulley, or, what is of more recent intro-

duction, a similar hook with a small cone upon it, is kept in motion for the spinner. Several of the former are mounted on a circular frame, and driven by hand or power; but a set of the latter, which automatically fall out of gear by weights, when the spinning is interrupted, are arranged in a straight line, because they are driven by the friction of larger cones fixed on a shaft, and there may be twelve of either kind of hooks forming a set. The spinner wraps a quantity of the heckled hemp round his waist, and attaches some of the fibres to one of the hooks, which by its revolving motion twists them as he continues to pull out and regulate the supply of fibres with one hand, and press them into proper form with the fingers of the other. He carries in his right hand a piece of woollen cloth, with which he grasps the fibres, and walks backwards, while he spins, to the farther end of the long covered walk.

The hauls of yarn are tarred by passing them through Archangel tar, heated to 240° F., a nipping apparatus being used to regulate the quantity taken up by the fibre. The next step is to wind the yarn on bobbins, which are then placed on a vertical frame. In order to form a strand of say ten yarns, one from each of ten bobbins is drawn through as many holes in a metal disc or register-plate, and immediately afterwards brought together and formed into a compact bundle of yarns by passing them through a stranding tube. On emerging from this the strand is fastened to the rotating hook of a forming machine on a travelling carriage, which, by means of proper gearing, is drawn along the walk, giving at the same time the proper twist to the strand. In this way three or more strands are formed at the same time by the machine. These are then laid into a three-stranded rope or 'hawser' by attaching them at one end to the centre hook of the machine, while the other extremities of the strands are attached to three hooks. At that end where they are hung together on one hook the three strands are kept equidistant by placing them into the three longitudinal grooves of a conical piece of wood, called a 'top.' The twisting of the strands is effected by the rotation of the hook, from which the top recedes as the rope is formed. As the twist of the laying is in the opposite direction to the twist of the strands, the single hook requires to be turned in a contrary direction to the other three. A hawser has either three or four strands, the latter being said to be 'shroud hawser laid.' It requires a core-piece, and is much used for trawling. A 'Cable (q.v.)' is a thick rope with usually nine, sometimes twelve strands.

Rope-making by Machinery.—By this is understood the making of ropes by machines which do their work without the necessity of having a ropewalk. The heckling, the drawing, and the spinning frames for preparing rope yarns are the same in principle as the corresponding machines used for spinning linen yarn for weaving purposes. There is, however, some difference in detail, owing to the greater average weight of rope yarn, so that, for example, there are comparatively few bobbins on the spinning-frame proper. Separate machines are perhaps less generally used for making strands and for laying these into ropes than compound machines which perform both operations, except for very thick ropes. All these are now made of different designs, and with a good deal of variety in their details.—Wire-ropes and textile fibre ropes are now largely employed for driving machinery instead of belting. See also *Rope, Twine, and Thread Making*, by H. R. Carter.

Roque (Lat. *Rocheus*), St. the patron saint of those sick of the plague, and the enemy of cattle-plague. He was born in Montpellier about 1295,

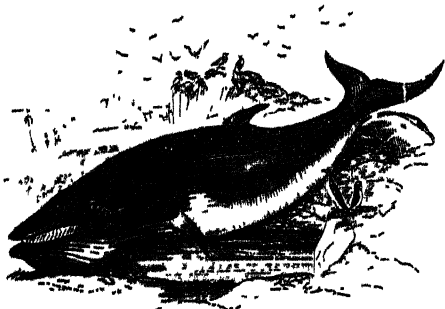
devoted himself to the care of persons suffering from the plague, especially in Italy, and died in 1327.

Roquefort, a village in the French department of Aveyron, situated on the western edge of the Causse plateau, 44 miles N. by W. of Béziers and 10 SW. of Millan, and celebrated since Roman times for its ewe-milk cheeses.

Roraima, an isolated, table-topped sandstone mountain, near the west border of British Guiana. First sloping gradually upwards 5000 feet above sea level (2500 above the plain on which it stands), it next shoots up 2000 feet more in a perpendicular stupendous cliff, over which drop numerous waterfalls. It was first scaled by Sir E. F. in Thurn on 18th December 1884.

Rorke's Drift, a station on the Buffalo River, Zululand, South Africa, memorable for the heroic defence of Lieutenants Chard and Bromhead, with eighty men of the 24th Regiment, who had been left to guard the commissariat stores and the hospital of Lord Chelmsford's force, against 4000 Zulu warriors during the night of the 22-23d January 1879, the night after Isandula. The only defences of the British were an extemporised rampart of rice bags and biscuit boxes, yet they kept the enemy at bay, and six times in succession drove out parties who had got within the barricade.

Rorqual (*Balaenoptera*), a kind of balcen whale, to which the names of *Fin-back*, *Finner*, and *Razor-back* are also applied. The genus includes the largest and some of the commonest whales, and is represented in all seas. The head is flat and pointed, the body is slender, the skin of the throat is deeply folded in longitudinal plaits, the whalebone is short and coarse, and there is not much blubber. The 'blue whale' (*B. sibbaldii*), the largest living animal, may attain a length of 80 or 85 feet. It seems to pass the winter in the open sea, and approaches the coast of Norway at the end of April or beginning of May, and is sometimes stranded on British coasts—for instance, in the Firth of Forth. The Common Rorqual (*B. musculus*) attains a length of 60 to 75 feet, and it often comes ashore on British coasts. Rudolphi's Whale, or Northern Rorqual (*B. borealis*), does not exceed



Northern Rorqual (*Balaenoptera borealis*).

50 feet in length; and yet smaller is the Lesser Rorqual (*B. rostrata*), which measures about 30 feet. The former is not uncommon in the more northern seas, while the range of the latter extends from the Mediterranean to Davis Straits. The rorquals seem to feed on small crustaceans, and sometimes on small fishes. Though not nearly so valuable as species of Balæna, they are often captured by the whalers. See WHALE.

Rosa, CARL, whose real surname was ROSE, impresario, was born at Hamburg on 22d March

1843, and studied music at Leipzig and Paris. After conducting a concert and operatic tour in the United States in 1871-72, he came to England, his intention being to produce standard operas with an English text. But it was 1875 before he was able to carry out his intention. London gave him little encouragement; the prejudice against English opera was too strong. The provinces, however, welcomed the new undertaking and made it successful. Carl Rosa may be called the father of English opera in two senses: he not only produced the great operas of German, French, and Italian composers with English texts, but he encouraged native composers to write opera, by giving them commissions for works. He died on 30th April 1889.

Rosa, MONTE. See MONTE ROSA.

Rosa, SALVATOR, was born at Arenella, in the neighbourhood of Naples, on 20th June (or 21st July) 1615. In his youth he got a little instruction from Falcone, a painter of battle-scenes, but spent most of his time wandering amongst the wild and romantic scenery of Southern Italy, copying from nature. Some of his landscapes attracted the notice of the painter Lanfranco, who encouraged the young artist to go to Rome (1635). The next three years he passed alternately in Naples and in Rome, and leaped into fame with a picture, 'Tityus tortured by the Vulture.' He then settled down in Rome, but seems to have been in Naples at the time of Masaniello's revolt (1647), though it is uncertain whether he bore arms in support of the Fisher Lad. (It seems not to be true that he lived with bandits in the mountains in his youth.) At Rome his social talents—he was a skilful musician, improvisatore, actor, and poet—his merry humour, his wit, and his princely generosity made him a great favourite. But he made powerful enemies by his satires, clever productions in verse, and withdrew to Florence, where he remained nearly nine years. After that he returned to Rome, and died there on March 15, 1673. Salvator has a great reputation as a painter; this he owes mainly to his landscapes, which, though in many respects faulty, are original in subject and treatment, being generally representations of wild and savage scenes, executed with considerable freedom and energy. His historical pictures are not so good, though they are those he himself thought most of. He executed numerous etchings, highly characteristic of his peculiar style. His *Satires* were published in 1719. See Life by Baldinucci (new ed. 1830) and by Canthi (1844). Lady Morgan's book (1824) is a blending of fact and romance.

Rosacea. See ACNE.

Rosaceæ, a family of dicotyledons, containing many species of great usefulness, and many that are in the highest esteem for their beauty and fruit. It contains trees, shrubs, and herbaceous plants, natives chiefly of cold and temperate regions, and far more abundant in the northern than in the southern hemisphere. Within the tropics they are chiefly but not exclusively found in elevated situations. The leaves are alternate, have stipules, and are either simple or compound. The flowers are generally hermaphrodite, but sometimes unisexual; the inflorescence various. The calyx is 4 to 5 lobed, generally 5-lobed; the petals as many as the divisions of the calyx, or occasionally wanting, perigynous. The stamens are few or many, arising from the throat of the calyx; the ovary is sometimes solitary, sometimes there are several ovaries, each one-celled, with a lateral style, or a number of ovaries are united into a many-celled pistil; the ovules generally two or more. The fruit is sometimes a drupe; sometimes a pome; sometimes follicular; sometimes a nut;

sometimes a collection of nuts enclosed in the fleshy tube of the calyx; sometimes a collection of small drupes forming a head, as in the raspberry; and sometimes, as in the strawberry, it is an enlarged fleshy receptacle with the seeds imbedded on its surface. This family contains about 2000 known species; but in some of the genera, as *Rosa* and *Rubus*, the determination of the species is attended with great difficulty, and varieties—sometimes reckoned species—are numerous. See *APPLE*, *PLUM*, *ROSE*, *RUBUS*, *STRAWBERRY*, *POTENTILLA*, *AGRIMONY*, *GEUM*, *SPIRÆA*, *CUSO*, &c.

Rosamond. See *ALBOIN*, *CLIFFORD*.

Rosario, the second city of the Argentine Republic, and the largest in Santa Fé, is on the west bank of the Paraná, 190 miles by rail NW. of Buenos Aires, 210 miles by river. It has an excellent harbour, accessible to steamers of 10,000 tons, and carries on a large commerce direct with Europe. It is especially a great wheat-port, and is also the junction of three separate systems of railway. The houses for the most part are of a single story; and for the rest, the city is laid out, on a smaller scale, on the lines of Buenos Aires. It has an extensive tramway system, an exchange, a theatre, a great bull-ring, a racecourse, hospitals, factories, &c., as well as two institutes—one for mathematics and chemistry, and the other for economics. Pop. (1887) 55,000; (1901) 112,461; (1922) 265,000.

Rosary, a string of larger and smaller beads used by Catholics as an aid to memory in keeping account of the number of Paternosters and Ave Marias recited. There are various patterns in use; a very ordinary one is a rosary of fifty-five beads, fifty small ones for the Ave Marias, separated into groups of ten by five large ones to mark Paternosters. The custom of reciting the Lord's Prayer many times in succession dates from a very early period of the Christian church; the custom of keeping a note of the prayers recited by means of strings of beads was so common in the East amongst Hindus and Mohammedans that the use of the rosary for this purpose has been said to have been introduced into Christian Europe by the Crusaders. The name (Lat. *rosarium*, 'a garden of roses' or 'chaplet of roses') first occurs in the 13th century, and seems to be derived from *Rosa mystica*, a term given to the Virgin herself, or from a set of prayers being thought of as the Virgin's rose-garden; less probable is the suggestion that the name comes from the beads being originally made of rosewood. The beads are now of various material—berries, wood, stone, ivory, metal, &c., and are often of costly workmanship, and of considerable intrinsic value. They are blessed for the use of the people by the pope, by bishops and superiors of religious orders, and by others having special power for the purpose. The name is also given to a series of prayers ('Rosary of the Blessed Virgin') consisting of fifteen decades, comprising fifteen Paternosters and Doxologies, and 150 Ave Marias, divided into three parts. The Lesser Rosary consists of one of the three parts, comprising five decades or mysteries.

ROSARY SUNDAY, the first Sunday in October, is a feast instituted by Gregory XIII. for the Confraternity of the Rosary, and made of universal observance after the victory of the Emperor Charles VI. over the Turks, in gratitude to the Blessed Virgin. An impetus has been given to the devotion of the rosary by Leo. XIII., who enjoined its daily use in public during October. In London roses are blessed and distributed as souvenirs, and the rosary recited continually during the day.

Rosas, **JUAN MANUEL**, Argentine dictator, was born in Buenos Aires, 30th March 1793, entered the army of Buenos Aires in 1820, was

appointed commander-in-chief in 1826, and was governor of the province from 1829 to 1832. Then, being disappointed of re-election, he headed a revolt, and in three years succeeded in obtaining office again, with extraordinary powers. From 1835 to 1832 he governed as dictator, not of Buenos Aires alone, but practically of the interior also. His rule was a rule of terror and nearly constant bloodshed; one of his chief opponents published, so early as 1843, a detailed list of 22,405 victims of the relentless savagery with which he pursued his policy of extirpation against the Unitarians (the advocates of centralisation, that is to say, as opposed to the Federalists, for whose principles Rosas professed to contend). Many refugees found an asylum in Uruguay, and therefore Rosas willingly supported the attempt of his partisan, General Oribe, to make himself master of the neighbouring republic; and, after the fall of Oribe's government, Rosas in 1839 invaded Uruguay with 7000 men, was defeated, and in 1843 sent Oribe back with an army of 14,000 men to attack Montevideo. The long siege which followed led to the joint intervention, in 1845, of England and France, the blockade of Buenos Aires (1845-47), and the temporary opening of the Paraná to free navigation. But the river provinces could not be induced to rise against Rosas, until in 1849 a treaty was signed by which he secured for Buenos Aires the entire navigation of the Plate, the Uruguay, and the Paraná. This roused the other provinces, and in 1851 Urquiza, the governor of Entre Ríos, supported by Brazil with both money and men, defeated Oribe in Uruguay, and won over his troops; then, with a force of 30,000, he marched against Rosas, and on 3d February 1852 routed him at Monte Caseros, near Buenos Aires. Rosas escaped to England; and, although the Argentine congress in 1861 condemned him to death as a 'professional murderer and robber,' specifying 2034 assassinations carried out by his orders, he lived comfortably near Southampton till his death, 14th March 1877.

Roscellinus. See *SCHOLASTICISM*.

Roscher, **WILHELM**, the most eminent expounder of the historical school of Political Economy (q.v.) in Germany, was born at Hanover on 21st October 1817. He studied at Göttingen and Berlin, and in 1843 was appointed professor of Political Economy at Göttingen, but in 1848 was called to fill the corresponding chair at Leipzig. His principal books are *System der Volkswirtschaft* (5 vols. 1854-94; 21st ed. 1894; English translation, 2 vols. Chicago, 1879), *Die Nationalökonomie des Ackerbaues* (10th ed. 1882), *Grundlagen der Nationalökonomie* (17th ed. 1884), *Geschichte der Nationalökonomie in Deutschland* (1874), *Zur Geschichte der englischen Volkswirtschaftslehre* (1851-52), *Kolonien, Kolonialpolitik und Auswanderung* (3d ed. 1885). He died 3d June 1894.

Roscius, **QUINTUS**, was born at Solonium, a village near Lanuvium, and rose to be the greatest comic actor in Rome. So much was he admired that many of the Roman aristocracy befriended him, and the dictator Sulla, as a token of favour, presented him with a gold ring, the symbol of the equestrian order. Among his most admiring and affectionate patrons Roscius also numbered Cicero, who, at the commencement of his career, received lessons in the art of elocution from the great comedian, and even in later life used to make trials of skill with his instructor as to which of them rendered a thought most clearly and effectively—the orator by his diction, or the comedian by his gesticulation. So sensible was Roscius of the distinction he enjoyed in sharing the intimacy, and even the friendly emulation of the great orator, that he came to look upon his art as one of no

small importance and dignity, and wrote a treatise on the comparative methods and merits of eloquence and acting. Cicero's friendship was of use to him in another way, for on his being sued at law by C. Fannius Chærea for the sum of 50,000 sesterces, (Cicero defended him before the *iudex* Piso (probably 68 B.C.) in his extant oration, *Pro Q. Roscio Comedo*. He died 62 B.C., having attained such perfection in his peculiar art that to be a 'Roscius' became synonymous with pre-eminence in the profession, and leaving, like his famous contemporary, Æsopus the tragedian, an immense fortune, realised upon the stage.—For the 'Young Roscius,' see BETTY.

Roscoe, WILLIAM, historian, was born at Liverpool on 8th March 1753, his father being a market-gardener. In 1769 he was articled to an attorney at Liverpool, and began to practise there on his own account in 1774. During this period he assiduously cultivated his mental powers, turning his attention especially to the Italian language and literature. In 1773 he first appeared in print as the author of a poem, *Mount Pleasant*, now forgotten; and in 1787–88 published *Wrongs of Africa*, a courageous protest against the slave-trade. But it was his *Life of Lorenzo de' Medici, called the Magnificent* (1796), which established his literary reputation; it went through several editions, and was translated into German, French, and Italian. In 1805 appeared his second important book, *Life and Pontificate of Leo X.* This, like the former, appeared in German, French, and Italian, and was received with much commendation, though its tone and spirit, especially with reference to the Reformation, were severely criticised. 'About the year 1800 he became partner in a Liverpool bank, a step which involved him eventually in great pecuniary embarrassment. From his pen came, besides the above-mentioned books, a collection of *Poems* (1857), of which by far the best known was the *Butterfly's Ball*; also a *Memoir of R. R. Jones* (1822). He issued an edition of Pope in 1825. Roscoe died at Liverpool, June 30, 1831. During the later years of his life he gave much attention to the study of botany, and wrote a monograph on Monandrian plants. See *Life* by his son Henry Roscoe (1833), and Espinasse's *Lancashire Worthies* (2d series, 1877).

SIR HENRY ENFIELD ROSCOE, chemist, born in London 7th January 1833, was a grandson of the above, and the son of Henry Roscoe, barrister. He was educated at the Liverpool High School, and later at University College, London, and at the university of Heidelberg. He was professor of Chemistry in Owens College, Manchester, for thirty years from 1857, and rendered valuable services towards the organisation of that institution, and the furthering of scientific education in England. He was member of parliament for the south division of Manchester in 1885–95, and served on various Royal Commissions. He was elected a Fellow of the Royal Society in 1863. He was president of the Chemical Society in 1880, of the Society of Chemical Industry in 1881, and of the British Association at the Manchester meeting in 1887. He was vice-chancellor of London University 1896–1902, and in 1909 was made a privy councillor. Of his original contributions to chemical science the most important are researches on the measurement of the chemical activity of light, and on vanadium and its compounds. His published works include *Spectrum Analysis* (1868); his well-known *Lessons in Elementary Chemistry* (1870); his *Treatise on Chemistry* (with Schorlemmer, 1878–89; new ed. 1905–7); and books on Dalton and the atomic theory. See his autobiographical *Life and Experiences* (1906). He died 18th December 1915.

Roscoff, a seaport on the north coast of the French department of Finistère (long the headquarters of smuggling into England), 33 miles NE. of Brest. The men are all sailors; the women grow vegetables, as the soil is considered to be especially fertile. The place is resorted to for sea-bathing, and there is a marine zoological station. The garden of the Capuchin monastery contains a fig-tree whose branches, trained over scaffolding, could give shelter to 200 people. Pop. 4000. Here Mary, Queen of Scots, landed in 1548, and the Young Pretender after his escape from Scotland.

Roscommon, an inland county of Connaught, Ireland, is bounded on the E. by the Shannon, and on the W., in part, by the Suck; it is 62 miles long from north to south, by 35 miles from east to west. Area, 608,290 acres, of which about one-fifth is under crops; more than one-half is permanent grass. It belongs to the central plain of Ireland, but rises in the north into the Curlew (800 feet) and Braulieve (1377 feet) Mountains. Several lakes occur, as Allen, Boderg, and Ree, expansions of the Shannon, and Key, Gara, and Glinn in the north-west. The soil in the central districts is in general light, but fertile, and affords some of the finest sheep-pasture in Ireland in the 'Plain of Boyle.' The chief industry is the feeding of sheep and cattle, especially the former. Coal and iron exist, but are not worked; there are no manufactures. The chief towns are Roscommon, Boyle, Castlereagh, Elphin, and Strokestown. Pop. (1841) 254,551; (1861) 157,272; (1881) 132,490; (1911) 93,956; (1926) 83,504, mostly Roman Catholics. Roscommon sends four deputies to the Dáil Eireann. It possesses a number of Celtic antiquities, *rathis*, &c., several remains of strong castles, and some fine ecclesiastical ruins.

ROSCOMMON, the county town, 96 miles W. by N. of Dublin, dates from the 13th century, when it arose around a Dominican abbey, founded by the O'Connor in 1257, and a castle built ten years later by Sir Robert de Ufford; the remains of both still exist. Pop. (1926) 1830.

Roscrea, a market-town of Tipperary, Ireland, 77 miles SW. of Dublin, is a very ancient town; here St Cronan built a church, and had a celebrated school in the 7th century. Considerable remains of a castle, a lofty round-tower (80 feet high), and ruins of two abbeys exist. Pop. (1926) 2694.

Rose. The rose, the most lovely and fragrant of flowers, the favourite of poets and the national emblem of England, is a shrub or sometimes a tree, very widely distributed, giving name to the large and comprehensive family *Rosaceæ*, to which some of our choicest fruits belong. Restricting ourselves to the genus *Rosa*, which alone we acknowledge as the rose, we find the characteristics thus: shrubby growth, stems generally prickly, leaves alternate, stipulate, flowers terminal, often corymbose, spreading with five petals, in colour white, yellow, pink, or red, stamens numerous, styles exserted, seeds (achenes) numerous, enclosed in a fleshy berry, globular or ovate, which is known as the hip or *hep*, and is in some sort edible. The calyx is generally five-lobed, and the lobes are more or less pinnatised, and sometimes (as in the moss rose) furnished with a beautiful process of filament.

(1) Wild roses are natives of the northern hemisphere, found in all temperate climes, and even as far south as Abyssinia, the Indian Peninsula, and Mexico, extending also to the arctic zone, and of such variability that the discrimination of species is difficult. In Britain we find indigenous *Rosa spinosissima* (the Burnet-rose, from which descend the many varieties of Scotch rose); *Rosa canina* (the Dog-rose of our hedges,

with several sub-varieties); *R. Eglanteria* and *R. micrantha*, well known as the Sweet Briars; *R. arvensis*, a prostrate and unfragrant kind; *R. tomentosa* and *R. villosa*, having downy foliage and deep-red blossoms; and some others.

(2) The cultivated rose is a fuller and generally larger form, obtained by the nurture and skill of the gardener, and still receiving improvement by skilful crossing and loving observance. Garden roses have been marshalled into groups: *Simplicifoliae*, *Systylae*, *Banksianae*, *Bracteatae*, *Centifoliae*, and *Caninae*. But the general grower may be well content to classify roses as 'summer' and 'perpetual'; though the principle of division is not botanical, neither is the division always justified by fact.

Summer roses bloom for the most part in June and July. Many of them are of the greatest beauty—for instance, the Moss rose, perhaps the loveliest of all flowers; and some are the best of all



Rosa rugosa.

for trellis or for pillar, and the hardiest in bad weather. A Perpetual, or *Remontant* rose, as the French more correctly term it, instead of making growth alone after the gorgeous summer show, affords a succession, more or less continuous according to variety and weather, of bud and bloom until the frosts forbid. Yet even with these it is rare to find the aftermath of beauty as free or as fine as the summer crop had been; and many of the so-called perpetuals retire as meekly as the summer rose, especially in dull seasons. Perpetual roses include: the Chinese or Monthly, the Hybrid Perpetual, the Tea-scented, Bourbon, Noisette, Macartney, *Rugosa*, *Microphylla*, *Lawrenceana*, and Perpetual Scotch. The old Chinese, *Rosa indica*, commonly called the Monthly Rose, is still popular as an early and abundant bloomer; so are the Bourbons and Noisettes. But the Hybrid Perpetual and Tea-scented are chief favourites. Of these, many place the Tea first, for its exquisite refinement, grace, and delicacy, bewitching modesty, and pensive charin. But the hybrid perpetual claims bolder brilliance, more velvety damask, and profundity of glow. And indeed it seems difficult to achieve or conceive more perfect beauty than has already been attained by loving ingenuity and persevering skill in many of the roses we now possess; though many gardeners are hankering still for a blue rose, which would not accord with the form and tint of the foliage if they got it.

Roses are also divided, according to the form of flower, into globular, cupped, compact, and expanded, the last named often becoming reflexed in the later stage of bloom; and again, according to modes of culture, into standards, half-standards, pyramids, bushes, pendulous, pillar, and trellis form.

The question of stock must also be discussed, without acrimony if possible, though upon no other has there been so hot a war of roses. For any kind that is strong enough in constitution to support itself its own roots are the best feet and feeders, ousting all trouble of suckers, and often affording renewal by means of young shoots. But many of the fairest and sweetest, especially of the tea-scented class, require stouter sustenance, and must be budded or grafted on a more robust variety. The stocks chiefly used by our nurserymen are the Dog-rose, Manetti, and De la Grifferae; and the first is procured in three different ways—from its home in the hedges, or from cuttings, or from seed; and each way has its advocate. Others prefer the Manetti, a seedling Italian rose, as stock; and some, especially of the tea varieties, do best upon La Grifferae. But as a rule the Manetti is a treacherous foster-mother, affording brief vigour, and encroaching with deceptive suckers. Whatever stock may be chosen, the nobler rose is worked upon it, either by budding or grafting, and must engross the entire resources.

Again there are roses not a few, of delicate constitution or feeble habit, which should be grown in pots and sheltered through the winter. Many also of the stronger kinds are cultivated thus to bloom in the winter and spring, and some are of little value otherwise. But they must have plenty of air and light, and will not endure strong forcing.

New varieties of the rose are loudly heralded every year, and every season adds one or two lasting names to the lengthy catalogue. But old friends also pass out of date, and are no longer heard of; sometimes from a real advance upon them, sometimes from their own relapse. The crossing of the flowers is a process needing both judgment and dexterity. But the general grower will be content to cultivate the established kinds, which require no great trouble. Their abode must not be overhung, nor beset with stagnant water, the soil should be rich and deeply delved, and well-compressed round the neck of the plant. Plenty of water must be given in time of drought, and a mulching of good manure is welcome, and the growth of leaf and bud must be secured from countless enemies by daily and even nightly care. Three-quarters of the buds should be nipped off when true discretion orders it. As soon as the first flush of bloom is past, a little judicious pruning helps the prospect of a later crop; for the winter there should not be much shortening of the branches, unless they are threatened by the wind; but the general pruning remains for March.

See Ella Willmott, *The Genus Rosa* (1914); books by W. Paul (new ed. 1908), Dean Hole, Ellwanger (New York), Baker, Cranston, Rivers, Shirley Hibbard, Sauer; and French books by Jamain and Forney, Singer, and Lachaume. See also *PERFUMERY, OTTO OF ROSES*; and for the Roman de la Rose, see *CHAUCER, MEUNG*, and *FRANCE*. Rose is a name for *Erysipelas* (q.v.).

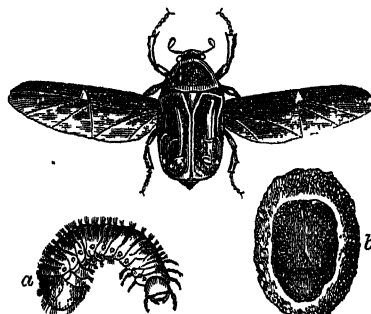
Rose, SIR HUGH. See *STRATHNAIRN*.

Rose, JOHN HOLLAND, born at Bedford in 1855, became professor of Naval History at Cambridge in 1919. He wrote *A Century of European History, The Rise of Democracy*, a critical *Life of Napoleon I.*, and other works on Napoleon and on Pitt, *The Development of the European Nations, 1870-1914*, and *Food and the Defence of Toulon*.

Rosebery, ARCHIBALD PHILIP PRIMROSE, EARL OF, was born in London, 7th May 1847, was educated at Eton and at Christ Church, Oxford, and succeeded his grandfather as fifth earl in 1868. He entered parliament in 1871, acquired in unusual measure the goodwill of the democracy, and was everywhere welcomed as an effective and entertaining speaker. In 1874 he became president of the Social Science Congress, in 1878 Lord Rector of Aberdeen University, and in 1880 of Edinburgh. From 1881 to 1883 he was Under-secretary for the Home Department, and in 1884 became First Commissioner of Works. In Mr Gladstone's next short administration (1886) he was Secretary for Foreign Affairs, an office he held till the fall of the government six months later; but even in that short period he established for himself a high reputation. In 1883-84 he visited Australia; and he has strongly supported Imperial Federation. In 1884 he moved for a select committee to inquire how best the efficiency of the House of Lords might be improved. He presented a magnificent swimming-bath to the People's Palace in the east end of London, in token of his interest in all movements for the social improvement of the people. In 1889 he was elected by the City Division to the London County Council, and was successful and assiduous as its first chairman till he resigned in 1890. He was re-elected and acted for a few months in 1892, till the political duties of an approaching general election led to his resignation. When Mr Gladstone resumed office in 1892 Lord Rosebery again became Secretary for Foreign Affairs, displaying, as on the former occasion, a tact and firmness that secured the approval of all parties. On the resignation of Mr Gladstone in 1894, Lord Rosebery became the head of the Liberal ministry; but having failed to conciliate the hearty support of the various sections of his party, he resigned the premiership. A general election (July 1895) returned an overwhelming majority for Lord Salisbury; and in 1896, finding himself out of sympathy with Mr Gladstone on Armenia, he resigned his leadership of the Liberal party. Thenceforward he 'ploughed a solitary furrow'—often, as in the troubles with France about Fashoda and in foreign policy generally, supporting the Unionist government. He became the head of the Imperial League on the Liberal side during the Boer war; the Nationalists thought him worse than lukewarm on Home Rule; and in the crisis preceding the Unionist *débâcle* of 1906, while keenly opposing both Mr Chamberlain's and Mr Balfour's schemes of tariff reform, he declared he would never fight under a Home Rule banner. In the crisis of 1909-10 he again took up a position apart from either party, and in 1910 brought forward a scheme for reform of the House of Lords. He was made Earl of Midlothian in 1911. During the Great War he delivered patriotic speeches, but ill-health has withdrawn him from public life. Lord Rosebery is keenly interested in Scottish history and literature, and as president has taken active part in the work of the Scottish History Society. A devotee of the Turf, he won the Derby in 1894 and 1895. An eloquent orator, he is also gifted with a superb literary style, which has found expression in several publications, including *Pitt* (1891), *Napoleon; the Last Phase* (1900), and *Chatham: Early Life and Connections* (1910). Two volumes of his speeches were published in 1921. See the Life by Miss Stoddart (1900) and E. T. Raymond, *The Man of Promise* (1923).

Rose-Chafer (*Cetonia aurata*), an injurious beetle, whose grubs destroy the roots of strawberries and other plants, while the adults spoil the flowers of roses, strawberries, and seed-turnips. The eggs are laid in the ground; the full-grown

grubs are whitish and about an inch and a half in length; after two or three years they pupate inside earthen cocoons. The adults, which are well able to fly from place to place, measure about an inch in length, are golden green above, coppery with a tint of rose beneath. Where they are likely to do



Rose-chaffer (*Cetonia aurata*):
a, larva; b, cocoon.

harm the adults and grubs should be collected and destroyed, and recourse may be had to remedies similar to those used against cockchafer.—The 'rose-bug' of the eastern United States is another beetle (*Macroductylus subspinosus*), a voracious pest which often appears in immense numbers and destroys the flowers of rosaceous plants.

Rosecrans, WILLIAM STARKE, an American general, was born at Kingston, Ohio, 6th September 1819, graduated at West Point in 1842, and was employed as an engineer until 1854, when he resigned, became a civil engineer, and afterwards engaged in coal-mining and the manufacture of kerosene. In 1861 he volunteered as an aide to General McClellan, won an action at Rich Mountain in July, was commissioned brigadier-general in the United States army, and succeeded McClellan as head of the Department of the Ohio, and kept Lee out of western Virginia. In 1862 he commanded a division at the siege of Corinth, and after its capture was given the command of the Army of the Mississippi; on 19th September he defeated General Sterling Price at Iuka, and on 3d and 4th October he successfully defended Corinth against Price and Van Dorn. From October 1862 to October 1863 Rosecrans was in command of the Department of the Cumberland; in the battle at Stone River (December 31 and January 2), against Bragg, he by his personal exertions converted what nearly had been a defeat into a victory, after each side had lost over 9000 men; but at Chickamauga, September 19-20, 1863, he was defeated by Bragg, with a loss of 16,179, although he held Chattanooga, and the Confederates lost 17,804 men. Rosecrans was relieved of his command by General Grant; but in 1864 he was placed over the Department of the Missouri, and repelled Price's invasion of that state. He afterwards received the brevet of major-general, and resigned from the army in 1867. In 1868-69 he was minister to Mexico, in 1881-85 a member of congress, and in 1885 appointed registrar of the U.S. treasury. He died in March 1898.

Rosemary (*Rosmarinus*), a genus of plants of the natural order Labiate, and nearly allied to Sage (*Salvia*), from which it differs in its filaments having an awl-shaped tooth, directed downwards a little above the base. Only one species is known, *R. officinalis*, an evergreen erect shrub of 4 to 8 feet high, with linear leaves, and pale bluish flowers, growing in sunny places, on rocks, old walls, &c., in the countries around the Mediterranean Sea,

and cultivated elsewhere as an ornamental and aromatic shrub. The leaves have a short whitish-gray down beneath, a penetrating camphor-like odour, and a pungent aromatic and bitter taste. They contain a large quantity of an essential oil, *Oil of Rosemary*, which is not unfrequently used as a stimulating liniment, to promote the growth of the hair, and as a perfume. *Spirit of Rosemary*, made by distillation of sprigs of rosemary with rectified spirit, is used to give a pleasant odour to lotions and liniments. Rosemary has been advantageously administered internally in cases of chronic diarrhoea, and of a relaxed state of the system.—



Rosemary (*Rosmarinus officinalis*).
(Bentley and Trimen.)

Oil of Rosemary is a principal ingredient of the perfume called *Hungary Water*. The celebrated white honey of Narbonne owes its reputation to being collected from the flowers of rosemary. In some places, by a confusion of similar names, the totally distinct plant Costmary (q.v.) is called Rosemary. The name Wild Rosemary is given to *Ledum palustre*, a shrub with narcotic acrid properties.

Roseneath, or ROSNEATH, a peninsular parish of Dumbartonshire, on the SW. shore of the Gare Loch, with a palace of the Duke of Argyll.

Rosenkranz, KARL, philosopher, a pupil of Hegel, was born at Magdeburg on 23d April 1805, studied at Berlin, Halle, and Heidelberg, taught at Halle as *privat-docent* (1828), and as professor of Philosophy (1831), in 1833 was called to the chair of Philosophy in Königsberg, and there he died, blind, on 14th June 1879. He was a man of wide culture and a voluminous writer, his works including *Encyclopädie der theologischen Wissenschaften* (2d ed. 1845), *Psychologie* (3d ed. 1863), *Kritische Erläuterungen des Hegelschen Systems* (1840), criticisms of Schleiermacher's (1836) and Strauss's Doctrines of Belief (1845), *Meine Reform des Hegelschen Systems* (1852) and *Wissenschaft der logischen Idee* (1858-59) in philosophy, and books on the History of Poetry, *Diderot's Leben und Werke* (1866), *Leben Hegels* (1844), *Goethe und seine Werke* (2d ed. 1856) in literature. He also edited, with Schubert, *Kant's Werke* (12 vols. 1838-40).

See his autobiographical *Von Magdeburg nach Königsberg* (1873) and *Life* by Qußbicker (1879).

Rose-noble. See NOBLE.

Rose of Jericho (*Anastatica hierochuntica*), a plant of the Cruciferae, which grows in the sandy

deserts of Arabia, and on rubbish, the roofs of houses, and other such situations in Syria and other parts of the East. It is a small, bushy, herbaceous plant, seldom more than six inches high, with small white flowers; and after it has flowered, the leaves fall off, and the branches become incurved towards the centre, so that the plant assumes an almost globular form, and in this state it is, perhaps, sometimes blown about in the desert. When the rainy season begins the branches expand again, and the pods open and let out the seeds. Numerous superstitions are connected with this plant, which is called *Rosa Mariae*, or *Rose of the Virgin*. If taken up before it is quite withered the plant retains for years its hygrometric property of contracting in drought and expanding in moisture. Other such 'resurrection plants' are *Selaginella lepidophylla* (Central America) and the scrophulariaceous *Chamaejasme intrepidus* (South Africa).

Rose of Sharon, a name given to an ornamental malvaceous plant, the *Hibiscus syriacus* (see HIBISCUS). But the Rose of Sharon of the Bible was doubtless a bulbous plant, probably a kind of narcissus.

Rose'ola, or ROSE-RASH, is a name sometimes applied to the milder varieties of Erythema (q.v.), where the eruption consists merely of a reddening of the skin, with little or no swelling. Such an eruption sometimes occurs as an early symptom in smallpox, and during the stage of reaction in cholera; it is also one of the commonest of syphilitic eruptions. But it frequently appears independently of any such disease, and is then usually an indication of some slight disorder of digestion, or of some other internal source of irritation. It usually subsides in the course of two or three days at most, and causes very little constitutional disturbance. Occasionally it is attended by slight fever and sore throat, and may then be extremely difficult to distinguish from a mild case of scarlet fever. No treatment is usually required, but a mild saline laxative (e.g. a seidlitz powder) may be administered with advantage. The name roseola is also given to rubella or German measles.

Roses, WARS OF THE, a disastrous dynastic struggle which desolated England during the 15th century, from the first battle of St Albans (1455) to that of Bosworth (1485). It was so called because the two factions into which the country was divided upheld the two several claims to the throne of the Houses of York and Lancaster, whose badges were the white and the red rose respectively. The Lancastrian claim to the crown came through John of Gaunt, third son of Edward III., created Duke of Lancaster in 1362, having married three years before the heiress of Henry, Duke of Lancaster. On John of Gaunt's death King Richard II. seized his lands, whereupon his son Bolingbroke, then in exile, returned to assert his rights, and, finding his cause exceedingly popular, was emboldened to claim the crown, which was granted him by the parliament after the deposition of his cousin Richard II. After the House of Lancaster had thus possessed the throne for three reigns (Henry IV., V., VI.), Richard, Duke of York, during the weakness of the last reign, began to advance, at first somewhat covertly, his claim to the throne. He was the son of Richard, Earl of Cambridge, by Anne, sister of Edmund Mortimer, the last Earl of March, and he was thus the nearest actual heir to Edward III. through his second son, Lionel, Duke of Clarence. The reigning family had become unpopular from its loss of France and its clericalism, but its strength was great in the north, where the power of the Percies was alone rivalled by that of the Nevilles. The

Yorkist strength lay chiefly in the mercantile population of the southern counties. The effect of the war was the almost complete destruction of the old nobility, the weakening of the power of the church, and an enormous increase in the power of the crown, together with the great advance of the commercial classes and the large towns, destined a few generations later to measure strength with the crown itself. In 1454 Richard was appointed Protector of the realm during Henry's insanity, and on his recovery soon after took up arms against his rival Somerset, and crushed him at the first battle of St Albans (1455). A second period of insanity again gave him the protectorship, but the king recovered in 1456. His weak attempts at reconciliation proved failures, and in 1460 the Yorkist earls of Salisbury, Warwick, and March defeated and captured the king at Northampton (1460). The Lords now decided to grant the reversion of the crown to York, passing over Prince Edward. The queen refused assent, and fled to Scotland, returning only after the death of York at Wakefield (December 30, 1460); but York's son Edward quickly gained a victory at Mortimer's Cross (1461), though Warwick was defeated by the queen's main body in the second battle of St Albans (1461). But London rallied to young Edward, and in June he was crowned at Westminster after the great victory of Towton (1461). Next year Queen Margaret again appeared in the north, but in 1464 her forces were utterly routed by Warwick's brother Montague at Hedgely Moor and Hexham. The estrangement of Warwick and his alliance with Queen Margaret's party drove Edward IV. from England and restored Henry VI. But Edward returned in the spring of 1471, defeated (and slew) Warwick at Barnet, and next the queen at Tewkesbury. The murder of Prince Edward after the battle, and the convenient death of Henry VI. in the Tower, cleared away his two chief dangers and left him to reign in peace. The accession of Henry VII. after the death of Richard III. on Bosworth field (1485), his marriage with Elizabeth, daughter of Edward IV. (1486), and the blending of the red and white rose in the Tudor badge, marked the termination of the Wars of the Roses, although the reign of Henry, whose own title was not good, was from time to time disturbed by the pretensions of Yorkist impostors.

See Sir J. H. Ramsay, *Lincolnshire and York* (2 vols. 1892); Wylie, *England under Henry IV.* (4 vols. 1884-98); R. B. Mowat, *The Wars of the Roses* (1914), and the articles on the HENRIES IV.-VI., EDWARD IV., &c.

Rosetta, a town of the Nile delta, on the old Bolbitic arm, 9 miles from the Mediterranean and 44 miles by rail N.E. of Alexandria, which outstripped it. In the time of the Crusades it was a place of great strength; and St Louis made it the basis of his crusading operations. Sultan Beybars, after that (in 1251) founded the present city farther inland. The Arabs call it *Raschid*, believing that Haroun al-Raschid founded the whole city. Population, 17,000. A few miles to the north of the town was discovered the Rosetta Stone, which gave the first clue to the interpretation of the Hieroglyphics (q.v.).

Rose-water. See PERFUMERY.

Rose-window, a circular window with tracery, such as is shown in our illustrations to the articles AMIENS and PARIS.

Rosewood is the wood of *Cordia Gerascanthus* and *C. Sebestena*, Brazilian trees of the Boraginaceae, while *C. scabra* of Martinique also furnishes a kind. The genus yields also edible fruits and several kinds of fibre. Indian rosewood is *Dalbergia latifolia* (Leguminosae). *D. Sissoo* and *D. cultrata* also closely resemble the Brazilian rosewoods. The cellular structure of the wood is

similar in the whole of them. They are all rich in resinous colouring matter, and all except *D. latifolia*, which is slightly lighter, have a specific gravity ranging between .9 and 1, so that they just float in water. The South American and Indian kinds named above are all hard and durable, and take a fine polish. They are in every way excellent furniture woods, the Brazilian kinds being only more valuable because they are more beautifully figured. Indian rosewood is often elaborately carved. An inferior rosewood is brought from Honduras. The name is said to have been given because of a striking rose-like odour that the wood gives out when freshly cut.

Rosicrucians. The mystery which has surrounded this brotherhood of Hermetic philosophers has afforded a wide field to romantic fiction, and has much exaggerated their own pretensions. A German pamphlet, *Fama Fraternitatis of the Meritorious Order of the Rosy Cross*, published at Cassel in 1614, advertised for the first time the existence of such an association, which then claimed an antiquity of over 120 years. From subsequent publications it is inferred that the fraternity was established, on its own showing, by Christian Rosencreutz in 1459. On this point there is no evidence outside Rosicrucian manifestoes, and all that concerns the founder is of fabulous or allegorical character. If the society existed as a corporate body when the *Fama Fraternitatis* appeared, that date may be accepted as marking at least the beginning of its public history. The other documents which claim to have been issued by the Rosicrucians are *Confessio Fraternitatis R.C.*, addressed to the Learned of Europe (Cassel, 1615); *Chymical Marriage of Christian Rosencreutz* (Strasbourg, 1616); *Perfect and True Preparation of the Philosophical Stone, according to the Secret of the Brotherhoods of the Golden and Rosy Cross* (Breslau, 1710; contains the unabridged laws of the order); and *Secret Symbols of the Rosicrucians of the Sixteenth and Seventeenth Centuries* (Altona, 1785-88). Whether the later publications emanated from the original society it is not possible to say, but it has been supposed that associations in imitation of the fraternity, bearing its name and emblems, were formed soon after the appearance of the first manifestoes. By these documents the Rosicrucians are represented as adepts in Hermetic mysteries, including metallic transmutation, power over elemental spirits, and knowledge of magical signatures—the *signatura rerum* of Paracelsus. They aimed at a general reform in arts and sciences, especially alchemy and medicine, and posed chiefly as professors of the healing art. They invited all students of nature to join them; but, as they gave no clue to their whereabouts, the manifestoes were by some regarded as a laborious hoax, an opinion which does not seem justified by a review of the entire evidence. An immense controversy took place at the time in Germany, whose literary centres became a battle-ground for rival pamphleteers on the merits of Rosicrucian pretensions. The foremost defenders of the order were Michael Maier in Germany, Robert Fludd, Thomas Vaughan, and afterwards John Heydon, in England. Among its adverse critics were Andrew Libavius, who afterwards changed his standpoint, and Johann Valentin Andreae (q.v.). The authorship of the original manifestoes has, at the same time, been generally attributed to Andreae, and he certainly wrote the *Chymical Marriage of Christian Rosencreutz*. The question of the authorship offers a curious field for investigation, and has exercised the controversial skill of many ingenious critics; but no satisfactory solution has ever been reached. Rosicrucians flourished in France during the period of the Revolution; there was a lodge in Mauritius

about 1794; and there are traces of such a fraternity at the beginning of the 19th century both in England and Germany. A *Societas Rosicruciana in Anglia* was formed as an offshoot of masonry by Robert Wentworth Little about 1857, which is to be distinguished from the original order, and from the Rose-cross degree in freemasonry. The latter, notwithstanding its name and symbolism, disclaims all connection with the objects and history of the alchemical brotherhood.

Among works to be consulted on the subject of the Rosicrucian mystery a first place should be given to Solomon Semler's *Impartial Collections for the History of the Rosicrucians* (Leip. 1768). De Quincey's *Rosicrucians and Freemasons* is brilliant but misleading. A review of the whole controversy, with the documents that concern it, is contained in *The Real History of the Rosicrucians* (Lond. 1887), by A. E. Waite. A MS. *Treatise of Rosie Crucian Secrets*, attributed to Dr John Dee, and preserved in the British Museum, is a forgery of the 18th century.

Roskilde. See ROESKILDE.

Roslin, a Midlothian village, near the wooded glen of the North Esk, $6\frac{1}{2}$ miles S. of Edinburgh. Its castle, dating from the 14th century, was the seat of the St Clairs, Earls of Orkney from 1379 to 1471, and afterwards of Caithness, and hereditary grand-master masons of Scotland from 1455 to 1736. The exquisite 'chapel,' built about 1450, is really the choir of an intended collegiate church, and is only 70 feet long, 35 broad, and 42 high. Its beauty lies not in the outline, but in the profusion of stone-carving lavished on pinnacles, niches, vaulted roof, and clustered columns, and especially on the famous 'Prentice pillar.' The building, essentially Scottish, has often been wrongly ascribed to Spanish, at any rate to foreign, masons. Much damaged by an Edinburgh mob in 1688, it was restored by the third Earl of Rosslyn, and has served since 1862 as an Episcopal church. On Roslin Moor the Scots are said to have thrice defeated the English in one day, 24th February 1303.

Rosmini. ANTONIO ROSMINI-SERBATI, one of the most original philosophers of the 19th century, was born of noble family at Roveredo, 25th March 1797. He decided for the priesthood against his parents' wishes, and began the course at Padua in 1817 and three years later his father's death gave him an ample estate. He was ordained priest in 1821, and devoted the next five years at home to study, meditation, and prayer. From 1826 to 1828 he lived mostly in Milan, thought out the rule of a new Order for the training of priests, visited Rome, gained the approval of Pius VIII. both for his special studies and for the institution of his Order, and published his *New Essay on the Origin of Ideas* (4 vols. 1830), which at once carried his name over the Catholic world. After a few years of labour at Trent, he settled in 1837 at Stresa on the western shore of Lago Maggiore, and two years later received from Gregory XVI. the formal approval of his Institute. The next few years were fruitful in volumes of philosophy, which, however, roused much opposition both from the Jesuits and from the rationalists. His dream in politics, as expressed in his *Constitution according to Social Justice* (1848), was a confederation of the states of Italy under the pope as perpetual president. For a brief period he basked in the papal favour, and was promised by Pius IX. a cardinal's hat; while for seven weeks in 1848 he served as the envoy of Piedmont at the papal court. He followed the pope in his flight to Gaeta, but now found his mind influenced against him by Antonelli and the reactionary party, and never afterwards regained his confidence. His *Constitution and The Five*

Wounds of Holy Church (Eng. trans. ed. by Canon Liddon, 1883) were next prohibited by an irregular meeting of the Congregation of the Index called at Naples. Rosmini submitted without a word of protest, and retired to Stresa. His enemies still continued to pursue him with charges of heresy, but their malignity overshot its mark. The pope subjected all Rosmini's published works to a careful scrutiny, and finally, in 1854, the Congregation of the Index, the pope presiding, declared them to be entirely free from censure, and enjoined perpetual silence on all his accusers. But he did not long survive a triumph, dying at Stresa, 1st July 1855.

The fundamental idea of the 'Institute of the Brethren of Charity' is the principle of passivity, the aim holiness or the moral perfection of the soul. The *elective* or contemplative part of the discipline prepares for the *assumptive* or active part, whose constant aim is the well-being of others. The brethren, who include both clerical and lay members, take the three ordinary vows, but wear no distinctive dress and conform to the laws of the country in which they happen to be. The Institute of Charity was a large-minded attempt to adapt the monastic system and Catholic Christianity generally to the needs of the day, but it encountered much opposition from the obscurantist party in the church.

The foundation of Rosmini's philosophy is *being* considered as the form of the intelligence—an elemental intuition implanted by Nature herself. Intuition, an attitude rather than an activity, gives us possible objects—ideas; affirmation, things subsistent. Of ideas we may affirm (1) that they are not nothing; (2) that they are not ourselves; (3) that they have a mode of existence of their own, entirely different from that of real or subsistent things. Their two essential characteristics are *universality* and *necessity*; for real objects and sensations are always particular, instead of being universal and generic, and every object which involves no contradiction is necessarily possible. These two characteristics involve two others, infinity and eternity; the origin of the ideas comes from God, for man does not receive them from the things themselves. The one *indeterminate* and wholly universal idea is that of existence; we cannot determine the subsistence of an object until we first have the idea of it, therefore the truth of a thing is in its being. When the ideas are all fully or perfectly determined, they are called *concrete*; when they remain to a certain extent indeterminate, they are *abstract*. By the process of universalisation then we form those ideas which are completely determined; by abstraction, those which are determined only to a certain extent. It is this idea of being which makes intelligence possible. It is cognisable by itself, as otherwise there is nothing else that could make it known; the idea of being gives us itself the essence of the thing. *Being* is incorporeal, independent of space, spiritual, and therefore incorruptible and immortal. It is independent of time; as *being* in its essence is always *being*, and, as it would be a contradiction in terms for being to cease to be being, it is eternal. But since it was united to the soul in time, it must have existed before it, and be independent of it. And thus we reach an Intelligence anterior to human intelligence—an Eternal Mind. This eternal mind is God's, and therefore God exists, and his existence and the immortality of the soul remain the true foundation of morals. But *being*, as intuitively seen by nature, merely gives the certainty that God exists; it cannot make God known to us until we are illumined by a new faculty—an influx of objective light, the Light of Grace. Thus a necessary place for revelation is found in the essential limitations

of man's nature, and this revelation of God is contained in the Gospel of Jesus Christ.

Rosmini's most important works were his *New Essay on the Origin of Ideas* (1830; Eng. trans. 3 vols. 1883-84) and his *Psychology* (1846-48; Eng. trans. 3 vols. 1884-88). The *Theosophy* (5 vols. 1859-74) was left unfinished. A complete Bibliography of his writings, ninety-nine in number, is prefixed by Davidson to his translation with introduction (1882) of the *Sistema Filosofico* (1845). See the studies by Paoli (1884-86), and Lockhart (1886); the translation with introduction by Lockhart of the *Sketch of Modern Philosophies*; and the Lives by Pagani (1907) and Palhoriès (1908).

Rosoglio, a variety of liqueur, made in Italy, flavoured with flowers or fruits, especially orange-blossoms.

Ross, a Celtic word, meaning a headland, occurring as the name or part of the name of many places in the British Islands, and in other parts of Europe, as Roslin, Culross, Dunrossness, Montrose, Ardrossan.

Ross, a market-town in Herefordshire, is finely situated on the left bank of the Wye, 14 miles SSE. of Hereford. In the parish church (1316), whose 'heaven-directed spire' is 208 feet high, is buried John Kyrle (q.v.), celebrated by Pope as the 'Man of Ross.' The town trades in cider, corn, malt, and wool. Pop. 5000.—For Ross in Leinster, see NEW ROSS. 'The Rosses' is a wild district in the west of Donegal.

Ross, Sir John, Arctic voyager, born June 24, 1777, was a son of the minister of Inch, Wigtownshire, and was little more than nine years old when he entered the navy, serving with distinction in the French wars. His most important services were rendered in the Arctic regions, whither in 1818 he proceeded with Parry as his second in command; the objects of the expedition were to explore Baffin Bay and attempt a North-west Passage. Ross published the results of his investigations in *A Voyage of Discovery* (1819). In May 1829 he commanded a fresh expedition to the Arctic regions (fitted out by Sir Felix Booth), and discovered the peninsula of 'Boothia Felix.' Ross received, on his return in 1833, the honour of knighthood. The results of this expedition were written down in *Narrative of a Second Voyage in Search of a North-west Passage* (1835). He made yet another voyage to the Polar regions—an unsuccessful attempt to find Sir John Franklin, in 1850. Ross wrote *Memoirs and Correspondence of Admiral Lord de Sumner* (2 vols. 1838), a *Treatise on Navigation by Steam* (1828), and other works. He died in London, August 30, 1856.

Sir James Clark Ross, his nephew, also distinguished himself as an Arctic navigator. He was born in London, April 15, 1800, entered the navy in his twelfth year, accompanied Sir John in his first and second Polar voyages, and in the interval between visited the same regions with Parry in his expeditions. He discovered in 1831 the North magnetic pole, and on his return was rewarded with a post-captaincy. After being employed by the Admiralty in a magnetic survey of Great Britain and Ireland, he was placed in command of the *Erebus* and *Terror* for an expedition to the Antarctic seas (1839), and approached within 160 miles of the South magnetic pole. He was knighted after his return home in 1843; and in 1847 published *Voyage of Discovery in Southern Regions, 1839-48* (2 vols. 1847). In 1848 he made a voyage in the *Enterprise* to Baffin Bay in search of Sir John Franklin. He died at Aylesbury, April 3, 1862. See Mackinder, *Ross and the Antarctic* (1892).

Ross, Sir Ronald, born in 1857 at Almora in India, studied at Bartholomew's, and was in the Indian Medical Service from 1881 to 1899. From 1892 he gave himself to the special study of

the cause and prevention of malaria, and worked out the life-history of the parasite. See his articles GNAT and MALARIA in this work. He was professor of Tropical Medicine at Liverpool. The Ross Institute for Tropical Diseases at Putney Heath (opened 1926) was founded in his honour. Besides his writings on malaria, he is author of poems, a novel, mathematical works, and *Memoirs* (1923).

Rossall College, a large public school on the coast of Lancashire, 2½ miles SSW. of Fleetwood, was founded in 1844 for the education of the sons of clergymen and others. See the *Jubilee Sketch* by Canon Beechey (1894).

Ross and Cromarty, a Highland county, the third largest in Scotland, extends from the North Sea to the Atlantic, and is bounded N. by Sutherland, S. by Inverness-shire. In 1890-91 it was finally formed into a single county by the boundary commissioners, who also added to it the small Ferintosh (detached) district of Nainshire, and a much smaller fragment from Inverness-shire. Its mainland portion measures 75 by 67 miles, and the total area is 1,977,248 acres or 3089 sq. m., of which 103 are water and 736 belong to a dozen islands—the Lewis, Tanera, Ewe, &c. The east coast is indented by the Dornoch, Cromarty, and Moray Firths; the west coast by eight sea-lochs (Broom, Gruinard, Torridon, Carron, &c.). The chief of the innumerable streams are the Oykel, Alness, and Conon; the Falls of Glomach, on a head-water of the Elchaig, in the SW. are 370 feet high; and beautiful Loch Maree is the largest of nearly a hundred good-sized fresh-water lakes. Mam Sodhail (3862 feet), on the Inverness-shire border, is the largest of more than thirty summits exceeding 3200 feet above sea-level, others being Ben Dearg (3547), Benmore (3505), Ben Wyvis (3429), and Ben Attow (3383). The high grounds afford good pasture, and systematic sheep-farming dates from about 1764. It reached its zenith during 1860-70, when 400,000 sheep were grazed in the county. The glens and low grounds in the more favoured portions have a fertile soil, which, with the fine climate, especially in Easter Ross, bears crops of superior quality. More than half the county, however, is occupied by mountain and heath land. Whisky is distilled, and the sea fisheries are valuable. Montrose was defeated at Invercharron (1650), and a small Jacobite force in Glenshiel (1718). Sir Thomas Urquhart, Lord Lovat, Hugh Miller, Sir Roderick Murchison, and Hector Macdonald were natives. The chief places are Dingwall, Tain, Stornoway, Portrose, Cromarty, Strathpeffer, and Invergordon; the county with Inverness-shire returns three members to parliament. Pop. (1801) 56,318; (1851) 82,707; (1921) 70,818. See CROMARTY, DINGWALL, LEWIS, MAREE, HEBRIDES, &c.; W. J. Watson, *Place Names of Ross and Cromarty* (1904), and two books (1924) by the same author on county history and geology.

Rossano, a city and archiepiscopal see of Southern Italy, 24 m. NNE. of Cosenza. It was the ancient Roscianum. Totila took it in 548. In the 14th century it became a principality for the family of De Baux, but was finally united with the crown of Naples in 1558. St Nilus was born here in the 11th century. Pop. 16,000.

Roszbach, a village in Prussian Saxony, 22 miles W. by S. of Leipzig and 9 SW. of Merseburg, is celebrated for the victory of the Prussians under Frederick the Great (q.v.) over the combined French and Austrian armies on 5th November 1757. The 'route of Roszbach' remained for a long time a term of reproach in the French army. The Prussians lost 540 killed and wounded, while the loss of the allies was more than 2700 killed and

wounded, 5000 prisoners (among whom were 5 generals and 300 officers), and nearly 70 cannon.

Ross Barrier, an ice barrier, almost entirely afloat, situated about the 78th parallel of latitude in the Ross Quadrant of Antarctica (q.v.).

Ross Dependency, by Order in Council of 1923, consists of all lands south of 60° S. lat. between 160° E. and 150° W. long. (South Victoria Land, the Ross Barrier, Edward VII. Land). Its government is vested in the Governor-general of New Zealand.

Rosse, WILLIAM PARSONS, third EARL OF, an astronomer, was born in York on 17th June 1800, and educated at Trinity College, Dublin, and Magdalen College, Oxford, where he graduated first-class in Mathematics in 1822. During the life of his father he sat in the House of Commons as Lord Oxmantown, representing King's County from 1821 to 1834; he succeeded to the peerage in 1841, and was elected a representative peer for Ireland in 1845. As early as 1826 he had begun to make experiments in the construction of fluid lenses; but he subsequently devoted his powers to the construction of a speculum for the reflecting telescope. Certain defects had hitherto baffled opticians—namely, spherical aberration and absorption of light by specula, and in casting specula of large size cracking and warping of the surface on cooling; but Lord Rosse succeeded in obviating the last defect, and in counteracting in great part the other two. He began the construction of his great reflecting telescope in 1845; it weighed in all 12 tons, and was mounted in his park at Parsonstown at a cost of £30,000. The first addition to astronomical knowledge made by this telescope was the resolution of certain nebulae into groups of stars; next came the discovery of numerous binary and tertiary stars, and a description of the moon's surface. P.R.S. in 1848-54, he died 31st October 1867.—The Hon. Sir Charles Algernon Parsons, his fourth son (born 1834), educated at St John's, Cambridge, developed the steam-turbine for the generation of electricity and the propulsion of vessels, naval and mercantile, and designed the earliest steam-turbine to be made commercially successful (see SHIPBUILDING, STEAM-TURBINE). He became proprietor and director of several great electrical and engineering works, and in 1919 was elected president of the British Association.

Rossendale, a parliamentary borough (1918) of north-east Lancashire, consisting of Bacup (q.v.), Haslingdon (q.v.), and Rawtenstall (q.v.).

Rossetti, CHRISTINA GEORGINA, younger daughter of Gabriele and Frances Rossetti, was born in Charlotte Street, Portland Place, London, on 5th December 1830. She was brought up entirely at home under her mother's tuition, as a member of the Anglican Church. She began writing verse in early girlhood. Before she was seventeen a little volume of her poetry was privately printed by her maternal grandfather, Gaetano Polidori, who kept a printing-press for his own convenience at his residence in London. Her publications are *Goblin-Market and other Poems* (1862), *The Prince's Progress and other Poems* (1866), *Commonplace and other Stories* (in prose, 1870), *Singsong* (1872), *A Pageant and other Poems* (1881), *Verses* (1893), and a few devotional volumes, among them *Time Flies, a Reading Diary* (with verses, 1885), and *The Face of the Deep* (on the Apocalypse, 1892). Most of her poems were re-issued in 1890; and after her death her brother William undertook a complete edition of her works. Miss Rossetti, whose health was weak, died 29th December 1894. She had lived a very secluded life, divided between devoted attention to her mother (who died at a

very advanced age in 1886), and earnest religious thought and practice. In direct poetic gift and intrinsic quality of poetry she may be regarded as fully equal to her brother Dante Gabriel, although the outcome is of a less conspicuous kind. Her poems have a singular degree of grace, delicacy, and spontaneity, deep in feeling, sensitive and certain in touch, and marked by great purity of emotional thought, and by an unfailing instinct of style. Several of her lyrics have been set to music, and cantatas for two of the longer poems—*Goblin-Market* and *Songs in a Cornfield*—were composed by Aguilar and Macfarren. See her *Life* by Mackenzie Bell (1898).

Rossetti, DANTE GABRIEL (or properly Gabriele Charles Dante), elder son of Gabriele Rossetti (q.v.), was born in Charlotte Street, Portland Place, London, on 12th May 1828. He was educated in King's College School, London; but, having from his earliest years evinced a wish to become a painter, he was taken from school in 1843 and commenced the study of art, entering soon afterwards the antique school of the Royal Academy. Here he associated with the young painters John Everett Millais and William Holman Hunt, and the sculptor Thomas Woolner; along with these three he founded the so-called Pre-Raphaelite Brotherhood, which was completed by the addition of three other members. The chief incentive to the foundation of this society, and of the school of art which it initiated, was the distaste and disrespect felt by the youthful artists for the poverty-stricken conceptions and sturred execution which marked most of the art then current in England, mingled with a sincere and reverent delight in those qualities of genuine and spontaneous invention, lofty feeling, and patient handiwork, which had been developed by the European schools of art preceding the culmination of Raphael and his followers. A natural result of this frame of mind was a disposition to realise objective details to the utmost, with a view to the thorough authenticity of the visible means through which ideas are conveyed; but it was a mistake of some observers, who noticed a scrupulous exactness and sometimes a plethora of details, to suppose that the main concern of the associated artists was really with the details and not with the ideas. The English Pre-Raphaelites wished to exhibit true and high ideas through the medium of true and rightly elaborated details. Two other mistakes have been frequently repeated concerning these artists: first, that they were an offshoot of the 'Tractarian' movement, guided by religious pietism; and second, that they were set going by Ruskin. Rossetti's earliest oil-picture, exhibited in 1849, was 'The Girlhood of Mary Virgin'; his next (1850), now in the National Gallery, 'The Annunciation.' After this he withdrew from exhibiting almost entirely, and his art developed through other phases, in which the sense of human beauty, intensity of abstract expression, and richness of colour were leading elements. He produced numerous water-colours of a legendary or romantic cast, several of them being from the poems of Dante, others from the Arthurian tradition. Among his principal oil-pictures are the Triptych for Llandaff Cathedral, of the 'Infant Christ adored by a Shepherd and a King,' 'The Beloved' (the Bride of the Canticles), 'Dante's Dream' (now in the Walker Gallery, Liverpool), 'Beata Beatrix' (National Gallery), 'Pandora,' 'Proserpine,' 'The Blessed Damsel' (from one of his own poems), 'The Roman Widow,' 'La Ghirlandata,' 'Venus Astarte,' 'The Day-dream.' He designed several large compositions, such as the 'Magdalene at the door of Simon the Pharisee,' 'Giotto Painting Dante's Portrait,' 'Cassandra,' and the 'Boat of Love' (from a sonnet by Dante); but these he

failed to carry out as pictures on an adequate scale, partly owing to his receiving constant commissions to execute smaller works, consisting mostly of female half-figures ideal in invention or feeling, and executed in life-size. The early studies of Rossetti in art had not been so steady or systematic as might have been wished. Afterwards, beginning in 1848, he had the advantage of some friendly training from his constant intimate, Ford Madox Brown, the historical painter; but, notwithstanding his passionate impulse as an inventive artist, and his impressive realisation of beauty in countenance and colour, some shortcomings in severe draughtsmanship and in technical method, and some degree of mannerism in form and treatment, have often, and not unjustly, been laid to his charge. Rossetti began writing poetry about the same time that he took definitely to the study of painting. Besides some juvenile work, and some translations from the German (that of *Henry the Lepor*, by the mediæval poet, Hartmann von der Aue, is preserved), he executed a number of translations from Dante and other Italians, published in 1861 as *The Early Italian Poets*, and again in 1874 as *Dante and his Circle*. Two of his best-known original poems, *The Portrait* and *The Blessed Damsel*, were written in his nineteenth year, and many others followed. These were about to be published in 1862 in a volume (some of them having been previously printed in magazines—chiefly in *The Germ*, 1850, and *The Oxford and Cambridge Magazine*, 1856), but a domestic calamity intervened, and all idea of a publication was set aside for some years. Rossetti had fallen in love towards 1851 with a very beautiful girl, a dressmaker's assistant, named Elizabeth Eleanor Siddal; he married her in 1860, but she died suddenly in February 1862. In the first impulse of desperation he buried his MSS. in her coffin. In 1869 he thought fit to recover them, and in 1870 he issued his volume named *Poems*, containing the bulk of those compositions and several others written not long before the date of publication. This volume was a success with poetical readers, and was reviewed with great admiration and even enthusiasm by some leading critics. Late in 1871, however, Robert Buchanan, writing in the *Contemporary Review* under the pseudonym of Thomas Maitland, attacked the book on literary, and more especially on moral grounds, and soon afterwards he republished his article, *The Fleshly School of Poetry*, as a pamphlet. Rossetti was now in a depressed state of health, suffering much from insomnia, from an abuse of chloral as a palliative, and from weakened eyesight (he often thought he would become blind, as his father had very nearly been). The literary detraction, conspiring with physical malady, produced a strong and exaggerated effect upon him; and from about the middle of 1872 he became morbidly sensitive and gloomy, and very reclusive in his habits of life, though his naturally strong sense, and his turn of mind, in which a good deal of humour and practicality was blended with idealism, continued to form a substantial counterbalance. In 1881 he published a second volume of poems named *Ballads and Sonnets* (containing some of his finest work, 'Rose Mary', 'The White Ship', 'The King's Tragedy', and the completed sonnet-sequence, 'The House of Life'), and at the same time he re-issued, with some omissions and interpolations, the *Poems* of 1870. His health was by this time extremely shattered. A touch of paralysis affected him towards the end of 1881, and, retiring in the hope of some improvement to Birchington-on-Sea, near Margate, he died there of uræmia on 9th April 1882. The poetry of Rossetti is intense in feeling, exalted in tone, highly individual in personal gift,

picturesque and sometimes pictorial in treatment, and elaborately wrought in literary form. These characteristics are sometimes made consistent with simplicity, but more generally with subtlety, of emotion or of thought. As in his paintings, there is a strong mediæval tendency. It is now generally allowed that Buchanan's charges of immorality against the writings were wide of the mark; indeed, he himself admitted and proclaimed as much. Rossetti was intimate at one or other period of his life with many of the best men of the day. In politics he took no part. His religious views were vague—at times negative enough; but he had a strong sense of reverence, and a tendency to superstition rather than distinct faith. His portrait, a pencil-drawing executed by himself towards the age of eighteen, is in the National Portrait Gallery. He was generous, unthrift, warm-tempered, and very natural and unaffected in manner.

See William Sharp, *Dante Gabriel Rossetti, a Record and Study* (1882); Hall Caine, *Recollections* (1882); Joseph Knight, *Life of Dante Gabriel Rossetti* (1887); the *Portfolio* monograph by F. G. Stephens (1894); the book by H. C. Marillier (3d ed. 1904); the *Recollections* of him by H. T. Dunn (1903); the *Life* by A. C. Benson (1904); the article by Watts-Dunton in the *Encyclopædia Britannica*; and the *Memoir, Letters, and Family Papers* (1895-1903) by his brother William Michael (1829-1919), author of the above article, who published annotated editions of several poets, including Shelley and D. G. Rossetti (2 vols. 1886), books on art and *Some Reminiscences* (1906). See PRE-RAPHAELITISM.

Rossetti, GABRIELE, Italian poet, man of letters, and Dante critic, was born in 1783 at Vasto, in Abruzzo Citeriore, then forming part of the kingdom of Naples. His father, Nicola Rossetti, was engaged in the iron-trade of the district; his mother was Maria Francesca Pietrocola. The parents were not in easy circumstances, and had a large family: besides Gabriele, two of the sons attained some eminence, Andrea becoming a canon in the church, and Domenico being well reputed in letters and antiquities. Gabriele gave early signs of more than common ability, and was placed by the local grandee, the Marchese del Vasto, to study in the university of Naples. The boyhood and youth of Rossetti passed in a period of great political commotion, consequent upon the revolutionary and imperial wars of France. The Bourbon king of Naples, Ferdinand I., was ousted by the Parthenopean Republic, and again by King Joseph, the brother of Napoleon, and his successor King Joachim (Murat), the emperor's brother-in-law, and Ferdinand had to retire to Sicily. Rossetti obtained an appointment as Curator of Ancient Bronzes in the Museum of Naples, and also as librettist to the operatic theatre of San Carlo: he wrote the libretto of an opera, *Giulio Sabino*, was well received at the court of the Napoleonic sovereigns, and in 1813 acted as a member of the provisional government sent to Rome by Murat. After the restoration of Ferdinand to Naples in 1815 he continued his connection with liberal politicians, and joined the widely-diffused secret society of the Carbonari. In 1820 a military uprising compelled King Ferdinand to grant a constitution on the model of that which had recently been established in Spain. Rossetti saluted its advent in one of his most celebrated odes, beginning 'Sei pur bella cogli astri sul crine' ('Beautiful indeed art thou, with the stars in thine hair'). The good faith of the king was highly dubious from the first, and in 1821 he abrogated the constitution, and put it down with the aid of Austrian troops. The constitutionalists were proscribed and persecuted, Rossetti among them. Two verses in one of his lyrics are said to have given

especial offence to the king—'Chè i Sandi ed i Luveli Non sono morti ancor' ('For Sands and Louvells are not yet dead')—alluding to the assassination of Kotzebue and of the Duc de Berri). Rossetti had to escape from Naples with the kindly connivance of the British admiral, Sir Graham Moore, who shipped him off to Malta in the disguise of a British naval officer. In Malta he was treated with great liberality and distinction by the governor, Hookham Fieie; and towards 1824 he came over to London, with good recommendations, to follow the career of a teacher of Italian. In 1826 he married Frances Mary Lavinia Polidori, daughter of a Tuscan father and English mother; soon afterwards he was elected professor of Italian in King's College, London. They had four children; (1) Maria Francesca, born 1827, died 1876 (author of *A Shadow of Dante*, &c.); (2) Gabriel Charles Dante, otherwise Dante Gabriel (q.v.); (3) William Michael, 1829-1919 (critical writer, and editor of Shelley); (4) Christina Georgina (q.v.). In London Rossetti lived a studious, laborious, and honourable life, greatly respected by his pupils, and by Italian residents and visitors; he was a man of strong and steady affections and vivacious temperament, earnest and single-minded in all his pursuits. In politics he was a vigorous Liberal, but more inclined to a constitutional monarchy than a republic; in religion he was mainly a freethinker, but tending in his later years towards an undogmatic form of Christianity. Though totally opposed to the papal system and pretensions, he would not openly abjure, in a Protestant country, the Roman Catholic creed of his fathers. His health began to fail towards 1842, and his sight became dim, one eye being wholly lost. After some attacks of a paralytic character he died in Albany Street, London, on 26th April 1854. Besides some poems published in Italy, Rossetti produced the following works: *Dante, Commedia* (the *Inferno* only was published), with a commentary aiming to show that the poem is chiefly political and anti-papal in its inner meaning (1826); *Lo Spirito Antipapale che produsse la Riforma* ('The Anti-papal spirit which produced the Reformation'—an English translation also was published), reinforcing and greatly extending the same general views (1832); *Iddio e l'Uomo, Salterio* ('God and Man, a Psalter'), poems (1833); *Il Mistero dell'Amor Platonico del Medio Evo* ('The Mysterious Platonic Love of the Middle Ages'), 5 vols., a book of daring and subtle speculation tending to develop the analogy between many illustrious writers as forming a secret society of anti-Catholic thought, and the doctrines of Gnosticism and freemasonry (1840); this book was printed and prepared for publication, but withheld as likely to be deemed rash and subversive; *La Beatrice di Dante*, contending that Dante's Beatrice was a symbolic personage, not a real woman (1842); *Il Veggente in Solitudine* ('The Seer in Solitude'), a speculative and partly autobiographical poem (1846); it circulated largely, though clandestinely, in Italy, and a medal of Rossetti was struck there in commemoration; *Versi* (miscellaneous poems), 1847; *L'Arpa Evangelica* ('The Evangelic Harp'), religious poems (1852). The views of Rossetti regarding Dante, along with Petrarca and many other Italian authors, excited a great deal of controversy. His memory is much revered in his native place, where the house of his birth has been bought as public property, and a theatre and the chief square have been named after him.

The work of Aroux, entitled *Dante Héretique, Révolutionnaire, et Socialiste* (1884), is founded chiefly on Rossetti's researches, which it presents in an exaggerated form.

Rossi, PELLEGRINO, was born of a noble family at Carrara, 13th July 1787. He studied at Bologna, and was made professor of Law there at twenty-five. Exiled after the fall of Minati, he obtained a chair at Geneva, and there wrote his *Traité de Droit Pénal*. In 1833 Louis-Philippe called him to Paris, and appointed him professor of Political Economy at the Collège de France. For his *Cours de Droit Constitutionnel* (1836) he was naturalised and made a member of the Chamber of Peers. He was sent to Rome as ambassador in 1845, and there witnessed all the events of 1848, having again become an Italian subject after the fall of Louis-Philippe. When called to the ministry by Pius IX. Rossi strove to oppose the party favourable to the House of Savoy, and devised an alliance with Naples, his object being a confederation of Italian princes with the pope as president. This roused the hatred of the Romans, and Rossi was stabbed to death by an unknown hand on the 15th November 1848.

Rossini, GIOACCHINO ANTONIO, Italian operatic composer, was born at Pesaro, on the Adriatic, February 29, 1792, and was the only child of Giuseppe Rossini, town trumpeter and inspector of slaughter-houses, from whom he inherited his brightness and humour. From the age of seven he studied music and singing at Bologna under various masters, till in 1807, after having appeared as conductor of the local Accademia dei Concordi, he entered the Bologna *Liceo*, or conservatorium. He soon became known in neighbouring towns as accompanist at the theatres, travelling along with his father, now a horn-player. Numerous operatic works, mostly successful, were written for the theatres at Venice, Bologna, Rome, &c. In 1813 *Tancredi*, at Venice, created the wildest excitement, which soon spread over Italy. On 5th February 1816 was brought out at the Argentine theatre in Rome *Il Barbiere di Siviglia*, founded on Beaumarchais's play, and written in thirteen days. From the predilection of the Romans for the aged Paesello, who had written an opera on the same play, and from a series of ludicrous accidents, it resulted on the first night in a complete fiasco; but next night, after the first act had been fairly heard, the public in their enthusiasm proceeded to Rossini's house, and conducted him to the theatre in triumph; and its popularity increased with each succeeding representation. Of all his works, it has the prospect of most lasting vitality. From 1815 to 1823 he is said to have completed twenty operas, including *Otello* (1816), *La Gazza Ladra* (1817), *Mosè in Egitto* (1818), and *Semiramide* (1823). In 1821 he married Isabella Colbran, who had sung frequently in his operas, and the two visited Vienna, Paris, and London, meeting everywhere with the most cordial reception. For eighteen months Rossini discharged the duties of director of the Théâtre Italien at Paris. Finally, there appeared at the Académie, on 3d August 1829, his greatest work, *Guillaume Tell*, conceived and written in a dramatic style entirely different from and superior to that of his Italian operas. Its success was immediate and immense, but, chiefly owing to the wretched libretto, not lasting. From this period till his death he produced nothing except the *Stabat Mater* (1841) containing music little in keeping with the religious nature of the subject, and some charming trifles for the piano first published in 1919 and arranged as a ballet with the title *La Boutique Fantastique*. In 1836 he retired to Bologna, where he raised the *Liceo* to a high position as a school of music, and in 1847 revolutionary disturbances drove him to Florence. In 1855 he returned to Paris, and in his villa at Passy became one of the most noted and attractive personalities of the capital, where he died 13th

November 1868. As a composer, Rossini undoubtedly had an inexhaustible faculty for creating tuneful melodies, which, however, often hover perilously near the commonplace. He effected certain improvements in opera, putting an end to the licence granted to singers to embellish at will the melodic line, and writing all the ornamentation himself. *Il Barbiere* abounds in gaiety and sparkling humour, but Rossini was singularly lacking in self-criticism, and it is very doubtful whether his work, with its florid roulades and insignificant orchestral accompaniments, will ever emerge from its present oblivion.

See the *Life* by Stendhal (1824), in which the author exposes some of his own æsthetic theories; two books on Rossini by H. S. Edwards (1869, 1881); works by Azevedo and Dauriac; chapters in the studies on opera by Streاتفeld and Aphthorp. See *OPERA*.

Rossitten, on the Kurische Nehrung, a strip of sandy dunes between the Kurisches Haff and the Baltic, seat of the *Vogelwarte* of the German Ornithological Society, where notable work has been done in investigating the migration of birds.

Rosslare, a port of County Wexford, 9 miles SE. of Wexford, has a harbour with a great breakwater, from which steamers cross to Fishguard.

Rosso Antico. See *PORPHYRY*.

Ross-shire. See *ROSS* and *CROMARTY*.

Rostand, EDMOND (1868-1918), French poetic dramatist, produced his first play, *Les Romanesques* in 1894, which was followed by *La Princesse Loiraine* (1896), *La Samaritaine* (1897), and his masterpiece *Cyrano de Bergerac* (1897), where brilliant imagination is combined with poetic fancy. Later plays were: *L'Aiglon* (1900), which deals with the Duc de Reichstadt, the son of Napoleon I.; the farmyard drama *Chantecler* (1910), in which the poet expresses the joy in work and in being humbly useful; and *La Dernière Nuit de Don Juan* (1918). In the 20th century Rostand is somewhat of a paradox, a dramatist with a keen sense of the theatre, who writes in verse—and verse of an exquisite clarity and charm. Both Rostand and his wife, Rosemonde Gérard, wrote poems.

Rostock, the most important town of Mecklenburg-Schwerin, and one of the busiest ports on the Baltic, stands on the Warnow, 7 miles from its mouth and 60 miles by rail NE. of Schwerin. It has busy fairs for wool, horses, and cattle; imports coal, wine, herrings, petroleum, groceries, timber, &c.; exports grain, wool, flax, and cattle; owns a large mercantile fleet, and includes Warnemünde, at the mouth of the river. The industries are very varied, the most important being shipbuilding, the making of machinery, tanning, brewing, distilling, the manufacture of hats, tobacco, &c. The university, founded in 1418, but rebuilt in 1867, is the chief of the public institutions; it has a great library, an observatory, and an experimental agricultural colony. Amongst the churches are St Mary's (1398-1472), one of the finest Gothic churches of north Germany, with late Renaissance interior, in which is a monument of Grotius; and St Peter's, with a tower 414 feet high. The former ducal palace (1702) and the 14th-century Gothic town-house deserve mention. Rostock has also a municipal museum, a geological institute, and a handsome public park. The statue of Blücher, a native, adorns one of the squares. Pop. (1875) 34,172; (1910) 65,377; (1925) 71,355. Rostock, an ancient Slav town, was burned to the ground by Waldemar of Denmark in 1161. In 1314 it came to Mecklenburg. About this time it enjoyed great repute as a powerful member of the Hanseatic League, and secured important rights of self-government. It still possessed, under the Grand Dukes, a thoroughly republican municipal constitution,

and formed a separate estate in the Mecklenburg Assembly.

Rostopchine, COUNT FEODOR VASSILIEVICH (1763-1826), Russian general, was born in the government of Orel, was appointed governor of Moscow by the Emperor Alexander in May 1812. He it was, according to the French writers, who planned and began with his own hand the burning of Moscow. But in 1823 he published *La Vérité sur l'Incendie de Moscou* (Paris, 1823), in which he rebuts the charge, affirming that this action was due in part to a few of the inhabitants, and in part to the violence and negligence of the French. Nevertheless, he subsequently recalled this denial and admitted his share in the burning, in that he at least set fire to his own mansion-house. See *Lives* by Schnitzler (Paris, 1863) and by Ségur (Paris, 1872).

Rostov, (1) a town of south Russia, stands at the head of the delta of the Don and on the railway (1875) from Moscow to the Caucasus. It owes its origin to the foundation of a fortress in 1761, since which time the progress of the town, owing to its advantageous situation, has been remarkable. Pop. (1881) 44,500; (1910) 121,300; (1920) 176,770. It exports wheat, linen, and wool, besides other grain. The manufactures have grown rapidly, the principal articles produced being flour, ropes, tobacco, macaroni, soap, and leather: but there are also shipbuilding-yards, wool-cleansing establishments, and caviare-factories. Important fairs are held. In 1918 the Russian university of Warsaw was transplanted to Rostov, and reorganised as the University of the Don.—(2) One of the oldest towns of Russia, stands on a small lake, 129 miles by rail NNE. of Moscow, and has celebrated market-gardens, a large fair, an extensive trade, tallow-works, and coarse linen manufactures. Pop. 15,000.

Roswitha, or HIROTSWITHA, German nun, poetess and dramatist, was born probably about 930 and died about 1002. Her literary talent was carefully developed in the convent of Gandersheim, near Göttingen, and her works have something more than a mere historical value. They include four epics, six legends mainly on the saints, and six dramas. The dramas are skilfully written and are in emulation of Terence, though with a definite moral end. There are several English translations. See articles *DRAMA* and *MYSTERIES* and *MIRACLE PLAYS*.

Rosyth, a dockyard closed in 1925, in the burgh of Dunfermline (q.v.).

Rot. See *FLUKE*, *DRY ROT*, *PLANTS (Diseases)*.

Rotary, a movement started in Chicago by a lawyer, Mr Paul Harris, in 1905, spread to Britain in 1911, and has now reached other parts of the world. A rotary club is an association of business men, each member of a different occupation, who meet regularly for discussion and social intercourse, thereby getting to understand one another's points of view, increasing their mutual helpfulness, and raising the standard of business ethics. 'Service, not self' expresses its spirit. See Thomas Stephenson, *Rotary: its History, Interpretation, and Possibilities* (1915).

Rotation. When all points of a body are moving with the same Velocity (q.v.) the motion is one of pure translation, and is easy to comprehend. When, however, this condition is not fulfilled there must exist the kind of motion known as rotation. As simple examples, take the whirling of a flywheel or the motion of the hands of a watch. In such cases we readily see that there is, in the rotating body, a row of points which does not itself move. This row of points is called the axis of rotation, and every other point in the body

describes a circle about it. To specify the motion completely we must know not only the position of this axis, but also the rate of rotation and the sense, clockwise or counterclockwise, with which the body is rotating about the axis. The rate of rotation may be measured by the number of revolutions made in a chosen time. It is more scientific, however, to measure it in terms of the angular speed. If the body is rotating uniformly the angular speed is the angle described in unit time by any plane drawn in the body parallel to or containing the axis of rotation: e.g. with the unit of time one sidereal day, the earth's angular speed about its axis is 2π or 360° ; but with the second as the unit of time the angular speed is a quarter of a minute of arc, or 0.00073 in radians.

In a simple geometric way a given rotation may be represented by a directed line taken of length numerically equal to the angular speed, and drawn along the axis of rotation in that direction which is related to the sense of rotation exactly as the to-and-fro motion of a right-handed screw is to the rotational motion of the screw. Such a directed quantity of definite length and of definite line position is called by Clifford a *rotor*. It is a Vector (q.v.) under the restriction that its lie in space is limited to a particular straight line.

So long as the axis of rotation is fixed with reference to lines which appear steady to us, there is no difficulty in apprehending the character of the motion. Take, however, the case of a carriage wheel or boy's hoop rolling along the road. Here we may regard the wheel as rotating about an axis drawn through the centre, while the axis is at the same time travelling forward with a definite linear speed—i.e. we may regard the motion as a combination of translation and rotation. In this particular case we may, however, represent the motion at each instant as one of pure rotation about an axis coinciding with the instantaneous line of contact of the wheel with the road. For, with rolling and no slipping, this line of contact with the road is for the moment at rest. And it is almost self-evident that, if at any instant there exists in rigid connection with a moving body an axis momentarily at rest, the instantaneous motion must be of the character of a rotation about this axis. The above is a simple example of what holds generally in uniplanar motion—i.e. motion in which every point of the body moves in a plane perpendicular to a fixed direction. The general theorem is that any uniplanar displacement whatever (which is not a pure translation) can be effected by a pure rotation about a determinate axis. Since any given motion may be regarded as consisting of a succession of displacements, it follows that any such uniplanar motion can be effected by a succession of rotations about instantaneous axes whose successive positions in space and in the body are determinate.

In uniplanar motions generally it is clear that the instantaneous axis of rotation, however much it may move both in space and in the body, must always remain parallel to the same direction. If discontinuous motion be excluded—and all natural motions are continuous—this instantaneous axis will pass continuously from position to position. It will trace out cylindrical surfaces, one in space and one in the body; and at any given instant these surfaces will touch along the line which is for the moment the instantaneous axis. It is not difficult to show that the complete motion of the body may be represented by the rolling of one of these surfaces upon the other. In the simple case of the carriage wheel the rolling surfaces are evidently the circumference of the wheel and the plane of the road. These theorems in uniplanar motion have many interesting applications in the

kinematics of machinery (see Minchin's *Uniplanar Kinematics*, Clarendon Press, 1882).

If the motion is not uniplanar it is no longer possible in general to represent it by a succession of pure rotations. There is, however, a very remarkable theorem, which can be proved without difficulty, but which is hard of apprehension and even of acceptance. It is that after any displacement whatever of a body in space there is, in the body or rigidly connected with it, a line of points which is simply shifted along its own line in space. The whole displacement may then be effected by means of a sliding along this line together with a pure rotation about it—in other words, by a definite screw motion with reference to this line as axis (see SCREW). Even in the simpler case, when by fixing one point of a body we quite exclude translation, it is not easy to grasp the significance of the fact that after any displacement there is always one row of points which occupy exactly the same positions as before the displacement. From this theorem it follows that, however such a body may be moving, there is momentarily a line which is at rest. This line is the instantaneous axis of rotation. It always passes through the fixed point, and will as it shifts in time describe two conical surfaces, one in space and the other in the body. Any given continuous motion can then be effected by the rolling of one determinate conical surface fixed in the body upon another fixed in space. As a familiar example take an ordinary spinning-top. Here to the eye there is in general a rotation of the top about its axis of figure, while at the same time the top executes a conical motion about a vertical line through the point of support. In reality, however, at any instant of time the top is subject to *one* rotation about an instantaneous axis, which coincides neither with the axis of figure nor with the vertical line. This instantaneous axis executes a definite conical motion, both in the body and in space. Clerk-Maxwell (see his collected papers) devised a very ingenious and simple optical method for observing the position of the instantaneous axis, and so studying experimentally its motions with reference to the top. It should be mentioned in conclusion that infinitely small rotations are resolved and compounded according to the same laws as velocities and forces, so that we may regard the instantaneous angular velocity of a rotating body as made up of component angular velocities about any three chosen axes. It is thus that the subject is usually treated analytically. Such a treatment, however, is essentially artificial; and for a natural treatment we must go to geometry or to the Calculus of Quaternions (q.v.).

Rotation of Crops. In successful tillage-farming it is a fundamental principle that the various crops shall be grown in a well-considered rotation. There are solid reasons for this. The plants, like the animals, of the farm differ much in their habits and in the different sorts of food upon which they subsist. Although all plants tend to exhaust the soil, they do so in widely different degrees; they withdraw from the soil different kinds and quantities of ingredients. Some of the farm crops have long, penetrating roots, which draw nourishment from the deeper layers of the soil; others have short or spreading roots, which ramify near the surface. Certain crops occupy the ground for a much longer period than others; some encourage the growth of weeds or interfere with the proper cleaning of the land; others facilitate the work of eradicating weeds; and finally, the 'crop residues' of the various plants of the farm differ greatly. A glance at the following figures, giving the average weight of the principal ingredients removed (per acre in lbs.) from the soil

by the leading farm crops, will show the importance of growing these crops upon a carefully-considered system of rotation.

	Nitrogen.	Potash	Lime	Phosphoric Acid.	Silica.
Wheat (30 bushels).....	43	28.8	9.2	21.1	96.9
Barley (45 bushels).....	43	35.7	9.2	20.7	68.6
Oats (45 bushels).....	55	46.1	11.6	19.4	85.3
Swedes (21 tons).....	153	118.5	63.6	32.5	10.0
Turnips (17 tons).....	112	148.8	74.0	33.1	7.7
Mangolds (22 tons).....	147	300.7	42.9	52.9	17.9
Potatoes (6 tons).....	47	78.5	3.4	21.5	2.6
Beans (30 bushels).....	99	67.1	29.2	29.1	7.3
Clover hay (2 tons).....	102	83.4	90.1	24.9	7.0
Meadow hay (1½ tons).....	49	50.9	32.1	12.3	56.9

It is thus obvious that by alternating the root, the cereal, and the grass and clover crops the producing power of the soil is more easily maintained, and its exhaustion longer deferred. With the fuller knowledge which is now available both as to the wants of the plants and the means of supplying these wants, it is possible, and in certain cases also practicable, for the farmer to grow with success the same kind of crop on the same land year after year for almost any length of time. A more economical method, however, is to alternate the crops, so that the natural resources of the soil and the repairing influences incident to a judicious rotation may be utilised to full advantage. It was long ago demonstrated in practice that when land lies for a few years under grass and clover it becomes enriched with ash constituents and nitrogen. The grasses and clovers not only increase the quantity of nitrogen in the surface soil by drawing supplies of it from the subsoil and from the atmosphere, but they have also the power of conserving that accumulated nitrogen in a form in which it is easily made available to a crop of grain. Points often insufficiently considered in tillage-farming are the period of growth and the season of the year during which the crop occupies the ground. Judging from the table given above, one would imagine that turnips would require in the form of manure far more nitrogen than is required for wheat. In practice, however, it is well known that exactly the reverse is the case. The difference in the points just mentioned, that is in the period and season of the growth of the two crops, is responsible for this important peculiarity. Nitrification (q.v.), or the formation of nitrates in the soil, is most active during summer and autumn, and the cereal crops thus occupy the ground at the time when the soil is comparatively deficient in nitrates. The root-crop on the other hand is in full growth in the autumn, when the supply of nitrates in the soil is at the maximum. Root-crops consumed on the farm are therefore a good preparation for succeeding crops of cereals. The precise form of rotation most suitable for particular farms varies greatly, depending upon various circumstances, and especially the nature of the soil, climate, markets, available supplies of extra manures, amount of live-stock kept, &c. That course of cropping is evidently the most desirable which will economically secure, with thorough cleanness of the soil, a high and increasing state of fertility.

Many rotations are based upon the Norfolk or four-course system, which consists of (1) clover or mixed grass seeds; (2) wheat or, in many parts of Scotland, oats; (3) turnips, swedes, mangolds, potatoes, or bare fallow; (4) barley. The details of this system are generally as follows. The clovers or grasses are mown or grazed; when cut they are either used green or are dried for hay; the second crop is carted home for the cattle or horses; near towns it is sold off; or it is consumed on the ground in racks by sheep, which on most highly cultivated farms receive besides a daily allowance of cake or corn. In districts where the town-manure can be obtained a top dressing is applied as soon as the

first crop of grass is cut. On the poor and worse cultivated soils the grass-crop occasionally remains down for two, or even three years, thus extending a four into a five or six years' rotation. The clovers or mixed seeds are ploughed up in autumn, and followed generally in England by wheat, and in Scotland by oats. These crops are now often drilled, to admit of horse and hand hoeing. After harvest the stubble is, if possible, cleaned by the scarifier, grubber, or plough and harrows; or, where the management for several years has been good, any patches of couch-grass or other weeds are best forked out by hand. The land, especially if heavy, or intended for mangolds drilled on the flat, as practised in the drier parts of England, may then be manured and deeply ploughed: the grubber and harrows, in April or May, suffice to prepare for the drilling of mangolds or swedes. Heavy land, intended either for roots or barley, should, in spring, be disturbed as little as possible. In Scotland, and the cooler moist climates of the north and west of England, turnips and potatoes are grown on raised drills or balks, in which the manure lies immediately underneath the plant. Frequent horse and hand hoeings should ensure the thorough cleaning of the crop. Unless in the neighbourhood of towns, where it is greatly more profitable to sell off the whole of the root-crop, part of the swede or mangold crop is taken home for the cattle, and the remainder consumed by sheep in the field. After the fallow or cleaning crop another cereal crop is grown; under the Norfolk system this is generally barley, with which the clovers or seeds are sown out. Where sewage or tank water is available Italian rye-grass is often used, and on land in high condition early large and repeated cuttings are obtained; but rye-grass has the disadvantage of being a worse preparation than clover for the wheat-crop which usually follows. The chief failing of the four-course system consists in the frequent recurrence of clover, which cannot be successfully grown oftener than once in six or eight years. To obviate this difficulty one-half of the clover quarter is now often put under beans, peas, or vetches, thus keeping the grass or clover seeds eight years apart.

The Norfolk four-course system is unsuitable for heavy land, where a large breadth of roots cannot be profitably grown, and where their place, as a cleaning crop, is taken by bare fallow, vetches, or pulse. Bare fallows are, however, much less frequent than formerly, being now confined to the most refractory of clays, or to subjects that are so hopelessly full of weeds as to require for their extirpation several weeks of summer weather, and the repeated use of the steam or horse ploughs, the scarifier, grubber, and harrows. In such circumstances winter vetches are often put in during September or October, are eaten off by sheep and horses in June or July, and the land afterwards cleaned: this practice is extensively pursued on the heavier lands in the midland and southern counties of England. In such localities the following system is approved of: (1) The clover leas are seeded with (2) wheat; then come (3) beans, pulse, or vetches, manured, horse or hand hoed; (4) on good land wheat succeeds; (5) oats or barley often follow, but, to prevent undue exhaustion of plant-food, this system requires considerable outlay in artificial manures, cake, and corn; (6) a fallow, or fallow crop, deeply and thoroughly cultivated, and well manured, comes to restore cleanness and fertility; (7) barley or wheat is drilled, and amongst this the clover-seeds are sown. On the heavier carse-lands in Scotland the following plan of cropping is practised: (1) Clover; (2) oats; (3) beans; (4) wheat; (5) root-crop, usually including a considerable breadth of potatoes; (6) wheat; (7)

barley, with which the clovers or mixed grasses are sown. Under this system it is difficult, with so few cleaning crops, to keep the land clean; roots, besides, are not produced in quantities sufficient properly to supply either cattle or sheep during the winter. To remedy these defects roots may be introduced after the oats, and would be followed either by wheat or barley. This extends the rotation from seven to nine years.

In most well-cultivated districts, whether of heavy or light land, stock-farming is extending, and a more vigorous effort is being made to raise the fertility of the land. Root-crops are accordingly more largely grown; indeed, it is sometimes found profitable to grow two root-crops consecutively; thus, after turnips, swedes, cabbages, or mangolds, well manured from the town or farmyard, and eaten off by sheep, potatoes of superior quality are produced with one ploughing and a dose of portable manure. Specialities of management occur in almost every locality. Near London, and in other southern districts, early potatoes or peas are grown for market, and are immediately followed by turnips. In many parts of England, where the soil and climate are good, rye or vetches sown in autumn are consumed in early summer, and a root-crop then put in.

Good rotations do not necessarily ensure good farming; they are merely means to an end. And as agricultural education and enterprise extend fixed rotations will be less regarded. The market-gardener, who extracts a great deal more from his land than the farmer has hitherto been able to do, does not adhere to any definite system of cropping. If the farm is kept clean and in improving condition there can be no harm in growing whatever crops it is adapted to produce. Cropping clauses are requisite during only the three or four last years of a tenancy. The restrictions found in some agreements, preventing the growth of clover for seed, flax, and even potatoes, are inadmissible. Equally objectionable are clauses against the sale of particular sorts of produce, such as hay or roots. The farmer, if he is fit to be entrusted with the use of the land, ought to be permitted to grow or sell off any crop he pleases, provided an equivalent in manure be brought back. On well-cultivated land, in good condition, it is now the practice of the best farmers to take oats or barley after wheat; indeed, some of the best malting barley in Essex, on the Scottish carse-lands, and elsewhere is now grown after wheat. The frequent growth of cereals, and the heaviest of hay and root crops, even when removed from the farm, may be fairly compensated for by judicious and liberal treatment with town-dung, sewage, or artificial manures. The plant-food disposed of in the more ordinary sales of the farm is economically restored by the use of bones or superphosphate, guano, or nitrate of soda, or by keeping plenty of stock on the farm, and supplying them liberally with cake and corn. See also the articles AGRICULTURE, FALLOW, MANURE, SOILS, and those on the various crops.

Rotatoria. See ROTIFERA.

Rotche, or LITTLE AUK. See AUK.

Rothamsted, or ROTHAMSTEAD PARK, 4 miles NW. of St Albans, is noted as the scene of the agricultural experiments of Sir J. Bennet Lawes (1814-1900), and has been developed as a centre of research. See AGRICULTURE.

Rothe, RICHARD, one of the greatest speculative theologians of Germany, was born at Posen, 30th January 1799. At the universities of Heidelberg and Berlin he had among his teachers Daub, Hegel, Schleiermacher, and Neander. After a two years' course in the clerical seminary at Wittenberg and a short period of lecturing as *privat-docent* at

Breslau he set out for Rome in December 1823 as chaplain to Bunsen's embassy. In 1828 he accepted a professorship in the Wittenberg seminary, whence in 1839 he migrated to fill a similar position at Heidelberg. In 1849 he obeyed a call to Bonn as professor and university preacher, but in 1854 he returned to Heidelberg as professor of Theology and member of the Oberkirchenrat, and there he died, 20th August 1867. Rothe was one of the noblest types of the theologian that Germany has produced, in his rare combination of simple inward piety with fearless boldness of thought. His conception of the kingdom of God founded by Jesus reminds an English reader of the grand scheme of Hooker in its identification of the religious and moral functions of church and state, in a kind of refined and glorified Erastianism. Indeed the special function of the church will come to an end as soon as the state has become permeated with the religious idea, its purpose being merely that of a temporary instrument in the realisation of this ultimate ideal. The real end of Christianity is to create no hierarchical theocracy, but a spiritualised community with all its social and political functions harmonised with the divine morality. The Catholicism of the middle ages was a grand attempt to realise a visible church, but frustrated its highest end because it denaturalised the true social relations when it gave itself a purpose and a policy antagonistic to the state. The Reformation conception of the *invisible* church was an attempt to avoid the difficulty of the Catholic theory, but it created a purely spiritual community, separated from the ordinary interests of social and national life. This speculative theory is worked out in the first of the three books of Rothe's unfinished work, *Die Anfänge der christlichen Kirche* (1837)—the second and third books are historical. His greatest work is his *Theologische Ethik* (3 vols. 1845-48; 2d ed. completed by Holtzmann from his papers, 5 vols. 1869-71), which supplements the preceding book, being based on the same fundamental identity between religion and morality, the starting-point being the idea of God involved in consciousness, and considered in relation to the world and to man. His *Dogmatik*, posthumously edited by Schenkel (3 vols. 1870-71), completes his ethics. Here he distinguishes sharply between revelation itself and the Bible—its documentary record. The true object of revelation is the knowledge of God; its mode of operation is not magical, but is accompanied by an internal action on the consciousness producing a special receptivity by means of which the external manifestations in history and nature may be understood. It is supernatural in its cause, but natural in its method, although admitting alike of inspiration, of miracle, and of prophecy—not contradictions of nature, but rather inherently constituent elements of a revelation, subverting higher laws of nature unknown to man's limited faculties, but perfectly homogeneous with a divine order. Rothe was an admirable preacher, but with characteristic modesty could hardly be induced to publish his sermons. Schenkel edited three volumes in 1869, but took unwarrantable liberties with the text, in the way of modifying the supernaturalism. A fourth and trustworthy volume was edited by W. H. Hubbe in 1872.

Rothe collected some of his essays under the title *Zur Dogmatik* (1863). After his death, various writings were edited by Weingarten, by Mühlhäuser, by Ruppelius, by Trümpelmann, and by Nippold, who wrote his *Life* (2 vols. 1873-74). See the critical studies by Achelis (1889), Hönig (1896), and Hausrath (1902-6).

Rothenburg, a picturesque town of Bavaria, surrounded by ancient walls, on the Tauber, 38 miles W. by S. of Nürnberg, preserves its medi-

æval character unaltered. Pop. 9000. It produces annually a procession and historic play in memory of its escape from being sacked by Tilly in the Thirty Years' War, during which the town (then a place of 18,000 inhabitants) was repeatedly taken and retaken.

Rothenstein, WILLIAM, painter, born at Bradford in 1872, studied under Legros at the Slade School, and afterwards in Paris. In 1917 he became professor of Civic Art at Sheffield University, and in 1920 Principal of the College of Art, South Kensington. He is principally known by a number of interesting portraits, in which he shows himself the possessor of great powers of observation, together with the faculty of identifying himself with the personality of the sitter. During the Great War he was appointed one of the official war-artists.

Rotherham, a busy manufacturing town in the West Riding of Yorkshire, on the right bank of the Don, here joined by the Rother, 5 miles ENE. of Sheffield by a railway opened in 1838. Its chief glory is the magnificent cruciform church, perpendicular in style, with crocketed spire and line west front, and interesting choir stalls and misereres. It is probably somewhat earlier than its reputed founder, Thomas de Rotherham, Archbishop of York (1423-1500), and in 1875 was restored by Sir G. G. Scott. The grammar-school, founded in 1483, also by the archbishop, at present occupies the building (1875) originally intended for an Independent College. There are also various public buildings, including the infirmary (1870) and the municipal offices (1924); also the Clifton Park, with a fine mansion-house, opened in 1891. Rotherham is a county borough. The manufactures include stoves, grates, chemicals, pottery, glass, railway-carriages, &c. Ebenezer Elliott was a native of the suburb of Masborough, which is included within the municipal borough, incorporated in 1871. Roche Abbey, a ruin, 8 miles ESE., was a Cistercian foundation (1147); and 8 miles NE. is Conisborough Castle, noticed at DONCASTER. Pop. (1851) 6325; (1881) 34,782; (1921) 68,045.

Rothsay, a favourite Scottish watering-place, the capital of Buteshire, is beautifully situated on the north-east shore of the island of Bute (q.v.), 40 miles by water W. of Glasgow and 19 SSW. of Greenock. It is a great yachting centre, the bay offering safe anchorage in any wind. A harbour was constructed 1822-84, and has been considerably extended since. An esplanade was formed in 1870; and among the chief edifices are the county buildings (1832-67), the academy (1869), and Bute Museum, (1926). In the middle of the town are the ruins of Rothsay Castle, founded about 1098, taken by Haakon of Norway (1263), the death-place of Robert III. (1406), reduced to ruin (1885), and repaired in 1871-77 by the Marquis of Bute. Rothsay since 1398 has given the title of duke to the eldest son of the Scottish sovereign. Here the first cotton manufactures in Scotland were started in 1779; but its cotton trade and its boat-building are now extinct. Created a royal burgh in 1400, it returned a member from the Union till 1832. Pop. (1821) 4107; (1881) 8329; (1921) 15,218.

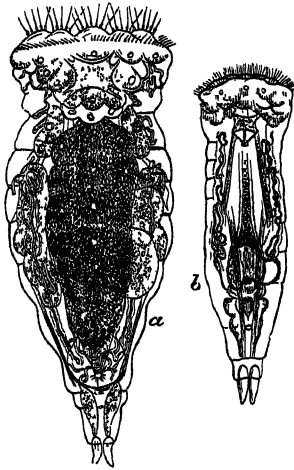
Rothschild, the well-known family of bankers, takes its name from the sign of the house ('Zum Rothen Schilde,' or 'red shield'), in the Jews' quarter of Frankfurt, in which its ancestors lived. The real founder of the family as financial magnates was MEYER AMSCHEL ROTHSCHILD, who was born at Frankfurt in 1743. Although educated for a rabbi, he embarked in the banking business at Hanover, and, having saved a little money, started

for himself as a money-lender and dealer in old coins in the family home at Frankfurt. He won the confidence of the landgrave of Hesse, who entrusted his finances to the Jew's management. The current story, that he successfully hid the fortune of the landgrave from the French invaders in 1806, and was through his patron's gratitude allowed to have the almost free use of it for some years, and so by this means laid the foundation of a large fortune, is extremely doubtful. The beginnings of his fortune were in all probability less romantic: the Rothschild house got a heavy commission for transmitting money from the English government to Wellington in Spain during the eight years of the Peninsular war; they managed the large private fortune of the landgrave; through them the British government made its payments of subsidies to continental princes; they negotiated large loans for Denmark between 1804 and 1812. At his death, on 13th September 1812, Meyer Amschel Rothschild left five sons, all of whom were made barons of the Austrian empire in 1822. ANSELM MEYER, the eldest son (1773-1855), succeeded as head of the firm at Frankfurt. SOLOMON (1774-1855) established a branch at Vienna; NATHAN MEYER (1777-1836), a branch in 1798 at London; CHARLES (1788-1855), a branch at Naples (discontinued about 1861); and JAMES (1792-1868), a branch at Paris. Apart from their very extensive private banking business these houses were very deeply concerned in negotiating many of the large government loans of the 19th century. The cleverest man of the five was Nathan, who really lifted the house into its position as first amongst the banking-houses of the world. He pinned his faith and staked his fortunes on the success of Britain in her great duel with Napoleon; but the story is not true that, having been present himself at the battle of Waterloo, he hastened home to London, where, before the result of the battle became known, he had sold and bought stock that brought him one million sterling clear profit. His son LIONEL (1808-79) distinguished himself by his efforts to effect the civil and political emancipation of the Jews in Great Britain. Lionel's son, NATHAN (1840-1915), succeeded to the baronetcy conferred in 1847 on his uncle Anthony, and was raised to the peerage as Baron Rothschild in 1885. His niece Hannah (1851-90) was in 1878 married to the Earl of Rosebery, and his son LIONEL (b. 1868) succeeded to the peerage. See Reeves, *The Rothschilds* (1887), and I. Balla, *The Romance of the Rothschilds* (1913).

Rotifera, or ROTATORIA, a class of minute aquatic animals, popularly called wheel animalcules. Most are microscopic (yet with a complex multicellular body), very transparent, and exceedingly active. The majority live in fresh water; some occur in brackish and salt water; two or three genera, e.g. *Seison*, are parasitic. Many may be obtained in damp moss from marshes. The body is bilaterally symmetrical, covered with a chitinous cuticle. Anteriorly there is a soft 'disc' fringed by a complex 'wreath' of cilia, the movements of which (suggestive of a rotating wheel) serve for locomotion and food-waiting. The anterior, sometimes ventral, mouth leads into a gizzard or 'mastax,' with a complicated masticating apparatus (often showing two hammers beating on an anvil); the food-canal ends posteriorly, in most cases dorsally. Rotifers feed on microscopic plants and animals and organic particles. The nervous system consists of a ganglion on the dorsal surface of the beginning of the food-canal, sometimes connected with another on the ventral surface. There are usually eyes and bristle-bearing tactile processes. A pair of excretory tubes open into the end of the food-canal. Posteriorly the body

usually bears a 'foot' containing cement glands, and effecting temporary or permanent attachment. In *Pedalion mirum* the body is prolonged into hollow limb-like expansions, suggestive of the limbs of a simple crustacean. The sexes are separate, but parthenogenesis is habitual. The

males are usually pignines compared with the females, and they often have no food-canal. They are usually rare, and in some species they have not been found. Fertilised eggs become 'winter' or 'resting' eggs, suited to resist drought and other adverse conditions. The unfertilised ova are often of two sizes, large ones which develop into females, and small ones (produced in other conditions or by females of different constitution) which develop into males. Many rotifers are viviparous.



Hydatina senta :
a, female dorsal view; b, male ditto.
(*The Rotifera*, Hudson and Gosse.)

Many can remain in a state of latent life for a long time without losing the capacity of reviving; in some cases the individual dies, but the ova live on. Common genera are Rotifer, *Hydatina*, *Floscularia*, *Melicerta*, *Stephanoceros*, *Brachionus*. The affinities of rotifers are dubious; some authorities link them to Chetopods, others to simple unsegmented worms. See the fine monograph by Hudson and Gosse (1889), and Hartog in *Camb. Nat. Hist.* (1896).

Rotomahana. See NEW ZEALAND.

Rotor. See SAIL.

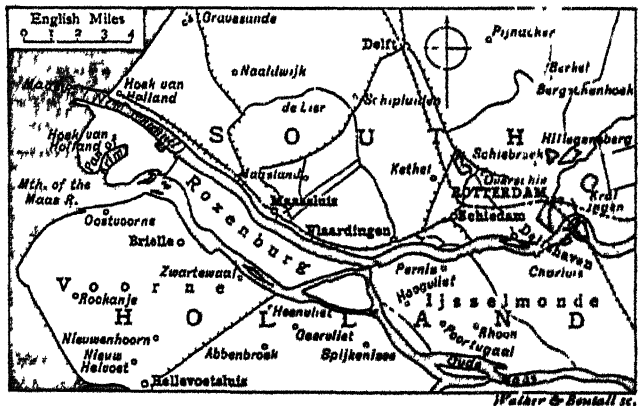
Rotrou, JEAN DE, French tragic poet, was born at Dreux, 21st August 1609, went early to Paris, and became a busy playwright, as well as one of the five poets—the others were Corneille, Colletet, Bois-Robert, and L'Etoile—who worked up into dramatic form the ideas of Richelieu. His first pieces, all in the Spanish romantic style, were followed by a busy period of classical influence, culminating in his last years with his three best works, *Le Véritable Saint Genest*, a tragedy of Christian martyrdom under Diocletian; *Don Bertrand*, a comedy; and *Venceslas*, which kept the stage down to the 19th century. Tradition tells that Rotrou led a dissipated life in Paris, and further was inordinately addicted to gambling; more honourable is the authentic history of his death. He held an official post at Dreux, and when he heard that the plague had broken out there, and that the mayor had fled like Montaigne in the same circumstances from Bordeaux, he hastened to the town to preserve order, caught the pestilence, and died a few hours after, 28th June 1650.

As many as thirty-five of his plays are still extant, but many more are lost. A complete edition was edited Viollet-le-Duc (5 vols. 1820-22); six of the plays by de Ronchoud (2 vols. 1882). See Jarry's *Essai* (1868),

two works by Persor (1882), and G. Steffens, *Rotrou-Studien* (i. 1891).

Rottenstone, a soft and earthy stone, consisting chiefly of alumina, with varying amounts of carbonaceous matter and a little silica. It is supposed to be formed by decomposition of shale or argillaceous limestone. It is found in Derbyshire, England, in Wales, and near Albany, in the state of New York. It is brown—either grayish, reddish, or blackish. It is soft and easily scraped to powder, and is well known to housewives, being much used for cleaning and polishing brass and other metals.

Rotterdam, the busiest port of Holland, stands on both sides of the Maas, 19 miles from its mouth, and 16 miles by rail SE. of the Hague and 45 SW. of Amsterdam. Since Holland was separated from Belgium, the trade of Rotterdam has grown at an extraordinarily rapid rate, especially since the middle of the 19th century. New wharves and quays and new docks have been built almost every year since 1847. In 1850 the docks measured scarcely 100 acres. By the end of the century they had more than thrice that area, and at the end of the first quarter of the 20th century the harbour of Rotterdam covered an area of over 625 acres, with 25 miles of wharves all equipped with the most modern appliances. Since 1872 sea going vessels have ceased to approach Rotterdam by the old channel of Brill (Brielle); they have used instead the New Waterway i.e. the Maas and the Scheldt, the latter of which has been connected with the sea by a canal cut through the Point (Hoek) of Holland. Every effort has been made to render this new waterway available for large ocean going steamers. The absence of locks makes it possible for heavily laden vessels arriving from the sea to lie moored at the quays or buoys within two hours. At the Boompjes, one of the splendid quays in Rotterdam itself, the river is 30 to 40 feet deep. Taking all the vessels that enter all the ports of Holland from abroad, more than 60 per cent. (estimating by tonnage) enter at Rotterdam, and in 1924 this amounted to over 10,000 vessels of over 15,000,000 tons, an increase from 346,000 tons in 1850, 1,412,000 in 1875, and 5,817,000 in 1901. There is an important trade connection with Germany by way of the river Rhine, and the traffic on the inland canals and



streams is also considerable. In addition, fishing fleets from Vlaardingen and other places enter Rotterdam, and sell herring, cod, &c. The imports, to a large extent from the Dutch colonies, consist chiefly of grain (wheat, rye, oats, maize), coffee, sugar, tobacco, rice, tea, spices, and coal), and the exports of dairy produce, linen, and spirits.

Dutch vessels still do a fair amount of carrying trade. There are flourishing industries, such as iron and other metal works, shipbuilding, distilling, sugar-refining, and the manufacture of tobacco, chemicals, &c.

Rotterdam is intersected by canals, which communicate with the Maas, whilst their banks serve as wharves. On the south side of the river, where the town is expanding rapidly, are the busy iron-works and shipbuilding-yards of the island of Fijenoord, besides some of the largest docks. This island is connected with the other bank by two lofty bridges (one a railway bridge). In the city the more important buildings are the Gothic church of St Lawrence (15th century), with a very large organ, the monumental tombs of the Dutch admirals Witt, Cortenaer, Van Brakel, Van Liefde, and others, and a lofty tower (210 feet high); the Boymans Museum (1847), with a fine collection of paintings by Dutch masters; the old yacht clubhouse, containing an ethnological collection; the new town hall (1909-20), containing a huge complete chromatic carillon; the exchange and similar public buildings. The public institutions include an academy of art and science, schools of music, navigation, and the technical arts, and an excellent zoological garden. Pop. (1830) 72,300; (1858) 104,724; (1890) 203,472; (1905) 379,017; (1922) 531,896. Rotterdam counts as her most illustrious sons Erasmus and the poet Tollens; James, Duke of Monmouth, and Grinling Gibbons, the English wood-carver, were also born here. The history of the place is marked by very few notable events, except its capture by Francis of Brederode in 1488, who lost it to the Austrians in the following year, and the occupation by the Spaniards in 1572.

Rotti, an island in the Indian Archipelago, belonging to the Dutch, lies to the south-west of Timor. It is 36 miles in length (655 sq. m.). The surface, though hilly, is nowhere more than 800 feet above the sea, and the fertile soil produces a rich vegetation.

Rottweil, a town of Württemberg, on the Neckar, 68 miles by rail S. by W. of Stuttgart, has manufactures of gunpowder and silk and cotton fabrics, and railway workshops. Near by, on the site of an ancient Roman colony, a number of antiquities, including a valuable piece of mosaic work, have been discovered. Pop. 10,000.

Rotumah, an island in the South Pacific, annexed to the Fiji Islands by Great Britain in 1881, is distant about 300 miles NNW. from the nearest island of that group, of which it is a dependency. Area, 14 sq. m.; pop. 2700, all Christians.

Roturier (according to Littré from *ruptura*, Low Latin for ground *broken* by the plough), under feudalism, when the feudal theory of knight-service was recognised as the only principle of gentle tenure, one who continued to hold by the older or allodial tenure, and was accordingly regarded as ignoble. See FEUDALISM, ALLODIUM.

Roubaix, a town in the north of France (dept. Nord), 6 miles by rail NE. of Lille. It rose into importance during the 19th century, and during the Great War was occupied by the Germans. Here cloth for men's clothing, shawls, stuffs for furniture and ladies' dresses, velvet and similar textiles, chiefly of wool, cotton, and silk, are manufactured. Besides these, thread, beer, spirits, machinery, &c. are produced, and there is a very active trade in them. Dyeing is carried on, and there is a cattle market. Pop. (1810) 9000; (1876) 74,946; (1891) 105,191; (1921) 113,265.

Roubillac, LOUIS-FRANÇOIS, sculptor, was born at Lyons in 1695, studied mainly at Paris,

where in 1730 he obtained the second Grand Prix, and shortly thereafter settled in London. In England he spelt his name *Roubiliac*. He visited Rome in 1745. His statue of Handel for Vauxhall Gardens in 1738 first made him popular. His other more famous statues are those of Shakespeare (executed for Garrick, and now in the British Museum), of Sir Isaac Newton at Cambridge, and another of Handel in Westminster Abbey. The monuments of the Duke of Argyll and of General Wade in the Abbey are also well known. He contributed greatly to the improvement of British taste in sculpture, though his own work is by no means so perfect as his contemporaries imagined; he has been called 'an exquisite executant but poor designer.' He died in London, 11th January 1762. See the Life by Le Roy de Sainte Croix (Paris, 1882); A. Dobson in *Eighteenth Century Vignettes* (1894).

Rouble, the unit of the Russian money system, first cut from silver bars in 1321, and coined in 1655. Russia had nominally a silver standard (though most of the currency was paper) till 1897 when a gold standard was adopted, and gold imperials and half-imperials of 15 and 7½ roubles were coined. Later, gold pieces of 10 and 5 roubles were introduced. The ratio of the gold to the paper rouble was fixed at 1½ to 1. The legal unit of money became the silver rouble, divided into 100 kopecks, of the normal value of 2s. 1½d. During the Great War and especially during the years immediately after, the rouble depreciated enormously, till it was only worth one fifty thousand millionth part of its former value. In 1924 it was re-established approximately at its pre-war rate, and silver and copper coins were issued.

Rouen (Lat. *Rotomagus*), formerly the capital of Normandy, and now the chief town of the department of Seine-Inférieure, and after Lyons perhaps the principal manufacturing city of France, is situated on the right bank of the Seine, 87 miles NW. of Paris by railway. The ramparts have been converted into spacious boulevards, little inferior to those of Paris. The modern streets are well and regularly built, with good stone houses; but a considerable part of old Rouen still remains, consisting of ill-built picturesque streets and squares, with tall, narrow, quaintly carved, wood-framed and gabled houses. The Seine, upwards of 300 yards broad, makes Rouen, although 80 miles from the sea, one of the most important shipping ports of France, with some 30 miles of quays. A stone bridge and a suspension bridge lead to the Faubourg St Sever on the left bank. Rouen possesses several remarkably beautiful Gothic churches—in particular the cathedral (13th century onwards), St Ouen (14th-15th century; perhaps the best specimen of Gothic in existence, larger than the cathedral and containing some good stained glass), and St Maclou (in the florid style of the end of the 15th century). The cathedral, the seat of an archbishop, begun by Philippe Auguste, has a very rich west façade, with two fine west towers—the one on the right (Tour de Beurre) was built (1485-1507) with indulgence money received for permission to eat butter during Lent—but is disfigured by a lofty cast-iron spire (487 feet) erected upon the central tower in 1876 in consequence of an old wooden belfry, which bore the date 1544, having been destroyed by fire in 1822. It contains in its twenty-five highly ornamented chapels numerous monuments of great interest, especially those of Rollo and of his son William Longsword. The cathedral is also noteworthy for its stained glass, the choir, with 96 carved stalls, and the side-portals. The 4th century crypt of the church of St Gervais is reputed to be the oldest Christian building in France. Among other

noteworthy buildings in Rouen are the splendid palais de justice (15th century; the right wing modern), originally built to house the Norman parliament, and now occupied by the law-courts; the hôtel-de-ville (13th century, with Renaissance façade); the Grosse Horloge; the Musée des Beaux Arts, containing one of the finest collections of paintings and sculpture in provincial France, and a large library; and the Hôtel de Bourgtheroulde (15th century, transition period). The principal branches of industry are cotton manufactures of all kinds, including the checked and striped cottons specially designated *rouenneries*. Rouen has also extensive manufactures of hosiery, mixed silk and wool fabrics, blankets, flannels, hats, cordage, linen yarns, chintz, chemicals, paper, &c. Dyeing is carried on, and there are also shipbuilding-yards and engineering works. Pop. (1872) 102,470; (1921) 123,712.

History.—Rouen is specially interesting to Englishmen as the capital of the Northmen in France, and the first home of the Norman dukes. It was the scene of Rollo's baptism and marriage with Gisela, daughter of Charles the Simple, after that monarch had been constrained to cede Normandy under the treaty of Claire-sur-Epte (912), and there he and his successors lived until Duke William transferred his court to Winchester after the conquest of England (1066). At Rouen William died (1087), and till the time of John it continued the seat of government of the Norman possessions of the English kings. In 1204 it was taken by siege by the French king Philippe Auguste, and annexed along with the main part of the duchy to the French crown. During the wars of Henry V. and Henry VI. of England it was under the power of the English from 1419 to 1449, when it was retaken by the French under Charles VII. It was during this occupation by the English that Joan d'Arc was burned alive (1431) as a witch in the Vieux Marché near the square called in memory of her Place de la Pucelle, in which stands her statue. Rouen was occupied by German troops in 1870-71, and was an important Allied military base during the Great War. It was the birthplace of Corneille (1606), of Fontenelle (1657), of Boieldien (1775), of Géricault (1790), of Armand Carrel (1800), and of Flaubert (1821). Clarendon died there.

Rouergue, an old province of southern France, between Languedoc, Auvergne, and Guienne, ruled by counts until 1589, when it passed to the crown. See FRANCE.

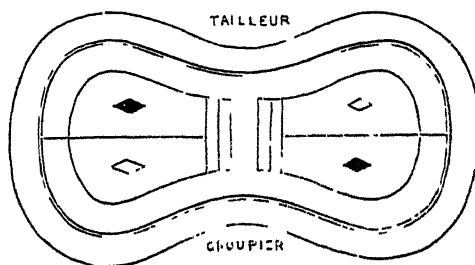
Rouge, a powder used to give artificial colour to the cheeks. For commoner purposes vermilion rubbed up with almond-oil is employed, but the safer and better quality is prepared from carmine (the colouring matter of cochineal), either alone or mixed with the safflower colour. These are generally rubbed up with French chalk, and supplied either as powder, or, along with a little oil, in the form of saucers.

Jeweller's rouge is an impalpable preparation of oxide of iron, obtained by gently heating the yellow oxalate of iron or the sulphate till it decomposes, a red powder being left. It is used for polishing silver, and for this purpose should be of the finest quality. Many cheaper varieties are sold under this name.

Rouge Croix, Dragon. See HERALD.

Rouge et Noir (Fr., 'red and black'), TRENTE-ET-UN ('thirty-one'), or TRENTE ET QUARANTE ('thirty and forty'), is a modern game of chance, which is played by the aid of packs of cards on a table covered with green cloth. The table is of a form similar to that shown in the figure. It is divided into four portions, each marked in the centre with a diamond, the diamonds

being alternately red and black; and these quarters are further separated, two and two, by bands which cross the table at its narrowest part. At the end of the table are a series of concentric bands painted of a yellow colour (not represented in the figure). The game is played as follows: one of the *tailleurs* (or dealers, who manage the table, take charge of the bank, and keep an eye on the players) takes up his position at one side of the table, opposite to the *croupier* (another *tailleur*), and unscals, in the presence of the players, six packs of cards, which



Rouge et Noir.

are first counted, then shuffled by several *tailleurs*, and returned to the first *tailleur*, who presents them to one of the players to be cut. This is performed by the insertion of a blank card in any part of the pack, which is then adjusted, and the game proceeds. Each player must stake his money on some one of the four chances, denominated *noir*, *rouge*, *coulour*, and *l'inverse*, which will be afterwards explained. After the stakes have been laid on the table (those for the *noir* being laid on either of the quarters marked with a *black*, and those for the *rouge* on either of the quarters marked with a *red* diamond, those for the '*coulour*' on one of the transverse bands, and those for the '*inverse*' on one of the yellow circles at the end of the table), the *tailleur* takes a handful of cards from the top of the pack, and deals first for the *noir*, taking one card after another from the top of the handful and placing them on the table side by side, till the number of pips on them amounts to more than thirty, when he stops. He then deals out another row in a similar manner for the *rouge*, till, as before, the number of pips amounts to more than thirty. In reckoning the number of pips, the ace is counted as one, the other plain cards according to the number of pips, and the court cards ten each. It will thus be seen that the number to which each of the two rows of cards amounts, must be more than thirty and not more than forty. If the value of the first row is nearer thirty-one than that of the second, then the first row, or *noir*, wins; if the contrary is the case, then the second row, or *rouge*, wins. *Coulour* wins if the first card dealt by the *tailleur* is of the winning colour: for instance, if the first card laid down is a '*spade*' or '*club*,' and if *noir* wins; but if the first card dealt be not of the winning colour, then *inverse* wins, and *coulour* loses. Two (and no more) of the four chances can be winning chances at one time; and the winning players have their stakes increased by an equal sum from the bank, and then withdraw their stake and winnings, while the stakes of the losers are raked by the *tailleurs* to the bank in the centre of the table. When the value of the first, or *noir*-row, is equal to that of the second, or *rouge*-row, it is a *refait*, and the dealer must commence to deal anew from the cards remaining in his hand; when the *refait* occurs the player may either withdraw his stake, or stake on a different chance, with the same or more or less money as he thinks proper. The game of Rouge et Noir would be an even one

between the players and the bank were it not for the following regulation: When the points dealt for the noir and the rouge each amount to thirty-one ('un refait de trente-et-un') the half of all the stakes on each of the chances belongs to the bank, and thus the players may either pay or have their stakes 'put in prison,' the next deal determining whether they shall belong to the bank or be restored to the player. If a second doublet of thirty-one occurs in the deal immediately succeeding, the stakes which were in prison are diminished by one-half, which goes to the bank, and the other half is 'put into the second prison,' from which it requires two successive winnings of the player to regain them. The chance of 'un refait de trente-et-un' is about once in sixty-four deals. This game superseded *Faro* (q.v.) and *Biribi* in France about 1789, but along with *Roulette* was forbidden by law in 1838. See work cited at *ROULETTE*.

Rouget de Lisle, CLAUDE JOSEPH, author of the *Marseillaise* (q.v.), was born at Lons-le-Saulnier on 10th May 1760. When in 1792 he wrote and composed his celebrated song or hymn he was a captain of engineers stationed at Strasburg. Four months later, as too moderate a republican, he was imprisoned in Paris, but was released after Robespierre's fall. Wounded at Quiberon (1795), he quitted the army, and lived in Paris in narrow circumstances, until Louis-Philippe in 1830 awarded him a small pension. He died at Choisy on 26th June 1836. He published in 1796 a volume of *Essais en Vers et en Prose*; but none of the pieces it contains, nor indeed any of his other books, possess much real merit. The *Marseillaise* was his one inspiration. See books by Poisle-Desgranges (1864), Leconte (1892), and Tiersot (1922, 1915).

Rouher, EUGÈNE, a French statesman, was born at Riom, on November 30, 1814, practised there as an advocate up to 1848, and then was returned to the Constituent Assembly. Towards the end of 1849 he was appointed minister of Justice; and with slight interruptions he was for twenty years a member of the French government. He was chiefly instrumental in negotiating the treaty of commerce between France and England in 1860, and that between France and Italy in 1863, and was thus instrumental in preparing the way for the introduction of the free-trade policy of Napoleon III. In 1863 he was appointed minister of State, and maintained that position until 1870, when he became president of the Senate. A staunch supporter of Napoleon III., and a clever debater, Rouher was, next after the emperor, the chief supporter of the system, domestic and foreign, which came to a disastrous end at Sedan—he was sometimes called the Vice-emperor. After the fall of the empire he fled abroad. But he was returned to the National Assembly for Corsica in 1872, and sat till 1875 as a staunch defender of the emperor. He died at Paris, 3d February 1884.

Roulers (Flem. *Rousselaere*), a town of West Flanders, Belgium, 19 miles by rail SSW. of Bruges, has manufactures of cottons, lace, and chicory, and a trade in linen. Here the French defeated the Austrians on 13th July 1794. During the Great War it was the scene of much fighting. Pop. 26,000.

Roulette (Fr., 'a little wheel'), a game of chance which from the end of the 18th century till the beginning of 1838 reigned supreme over all others in Paris. It continued to be played at German watering-places till 1872, when it ceased in terms of an act passed four years before. *Roulette* then found a home at Monaco. It is played on a table of an oblong form, covered with green cloth, which has in its centre a cavity of a little

more than 2 feet in diameter, in the shape of a punch-bowl. This cavity, which has several copper bands round its sides at equal distances from each other, has its sides fixed, but the bottom is movable round an axis placed in the centre of the cavity, the handle by which motion is communicated being a species of cross or capstan of copper fixed on the upper extremity of the axis. Round the circumference of this movable bottom are 38 holes, painted in black and red alternately, with the first 36 numbers, and a single and double zero; and these 38 symbols are also figured at each end of the table in order that the players may place their stakes on the chance they select. Along the margin of the table and at each end of it are painted six words—*pair*, *passé*, *noir*, *impair*, *manque*, *rouge*, which will be afterwards explained. Those who manage the table and keep the bank are called *tailleurs*. The game is played as follows: One of the *tailleurs* puts the movable bottom in motion by turning the cross with his forefinger, and at the same instant throws into the cavity an ivory ball in a direction opposite to the motion of the bottom; the ball makes several revolutions, and at last falls into one of the 38 holes above mentioned, the hole into which it falls determining the gain or loss of the players. A player may stake his money on 1, 2, or any of the 38 numbers (including the zeros), and shows what number or numbers he selects by placing his stake upon them; if he has selected a number or zero corresponding to the one into which the ball falls, he receives from one of the *tailleurs* 36 times his stake—viz. his stake and 35 times more—if he selected only 1 number, 18 times if 2 numbers, 12 times if 3 numbers, &c. The blank rectangles at the bottom of each of the 3 columns of numbers figured on the table are for the reception of the stake of that player who selects a column (12 numbers) as his chance, and if the ball enters a hole the number of which is found in his column, he is paid 3 times his stake. Those who prefer staking their money on any of the chances marked on the edge of the table, if they win receive double their stake (their stake and as much more), and under the following circumstances: The 'pair' wins when the ball falls into a hole marked by an even number; the 'impair,' if the hole is marked odd; the 'manque,' if the hole is numbered from 1 to 18 inclusive; the 'passé,' if it is numbered from 19 to 36 inclusive; the 'rouge,' if it is coloured red; and the 'noir,' if it is coloured black. If the ball should fall into either of the holes marked with the single or the double zero, the stakes of those players who venture upon the 6 chances last described are either equally divided between the bank and the players, or as is more commonly the case, they are 'put in prison,' as it is called, and the succeeding trial determines whether they are to be restored to the players or gained by the bank. Should it so happen that at this trial the ball again falls into one of the two holes marked with zeros, then half of the stakes in prison are taken by the bank, and the remainder are 'put into the second prison,' and so on. The *tailleurs* thus have an advantage over the players in the proportion of 19 to 18. The player who bets upon the numbers labours under a similar disadvantage, for although the two zero-points do not affect him in the same way as the player who stakes upon one of the other 6 chances, still (supposing him to bet upon a single number) as the chances are 37 to 1 against him, he ought to receive 37 times his stake (besides the stake) when he does win, whereas he only receives 35 times that amount, a manifest advantage in favour of the bank in the proportion of 37 to 35.

Roumania. See RUMANIA.

Roumanille, JOSEPH (1818-91), born at St Remy (Bouches-du-Rhône), was successively teacher, printer's reader, and bookseller, and obtained the fame of being the greatest of modern Provençal poets, next after Mistral. He was one of the founders of the association of the *Félibres* (see *PROVENÇAL LANGUAGE AND LITERATURE*).

Roumelia (Turk. *Rum İli*, 'land of the Romans')—the inhabitants of the Eastern Roman empire, or Byzantine Greeks, being known to the Turks as 'Romans', a name which once applied generally to the whole of ancient Thrace and part of Macedonia. The province aptly enough called Eastern Roumelia is now incorporated with Bulgaria (q.v.). In central Asia *Rum* or *Rumi* means the peoples of western Asia; but the Sultan of Turkey was *Rum-Padishah*. Among the Turks *Rum* means now usually the Greek nation and the Greek Church.

Round, in Music, a short vocal composition, similar to the catch, and like it, peculiar to England. It is in the form of an infinite Canon (q.v.) at the unison or octave, each part in succession taking up the subject at a regular rhythmic interval, and returning from the conclusion to the commencement, and so on, *ad libitum*, till an agreed-on pause. These rounds or *roundelays* are usually termed 'merry,' and many of them deserved the name something too well. The most ancient specimen now extant of vocal composition in polyphony is the famous *Rota* or Round, 'Sumer is i-cumen in,' of the 13th century.

Round Churches (see *ROMANESQUE ARCHITECTURE*) are represented in England by the Temple Church (see *TEMPLARS*); St Sepulchre's at Northampton (q.v.); the Church of the Holy Sepulchre at Cambridge (q.v.); and the Church of Little Maplestead in Essex.

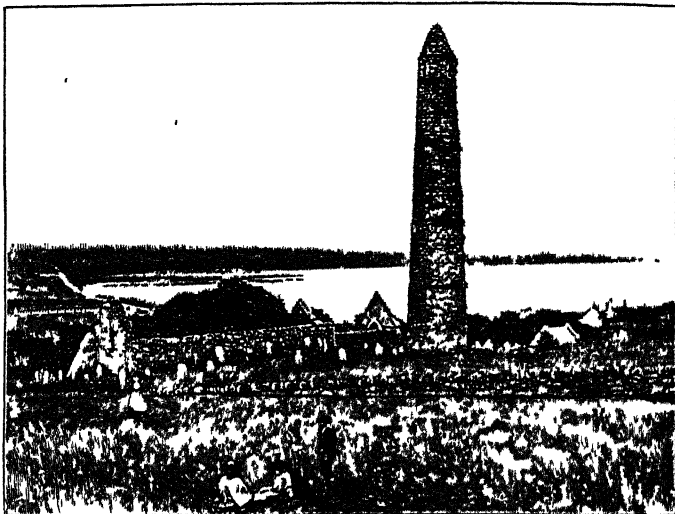
Roundheads, the nickname given by the adherents of Charles I. during the Great Rebellion to the Puritans, or friends of the parliament, who, with Prynne, denounced the 'unloveliness of love-locks,' and were understood to distinguish themselves by having their hair cut close, while the Cavaliers wore theirs in long ringlets.

Round-robin, a word with various homely meanings—e.g. pancake, disrespectfully used in the 18th century of the consecrated host; specifically a protest or remonstrance signed by a number of persons in a circular form, so that no one shall be obliged to head the list, as by sailors threatening mutiny. In literary history a memorable round-robin is that sent by Burke, Gibbon, Reynolds, and others to Johnson, requesting him to amend the epitaph for Goldsmith's monument, and suggesting that it should be written in English, not Latin. Johnson took it kindly, but told Sir Joshua, who carried it to him, that he would 'never consent to disgrace the walls of Westminster Abbey with an English inscription.'

Round Table. See *ARTHUR*, and *ROMANCES*.

Round Towers. Tall narrow circular towers tapering gradually from the base to the summit, found abundantly in Ireland, and occasionally in Scotland, are among the earliest and most remarkable relics of the ecclesiastical architecture of the

British Islands. They have long been the subject of conjecture and speculation, but there is now no doubt that they are the work of Christian architects, and built for religious purposes. They seem to have been in all cases attached to the immediate neighbourhood of a church or monastery, and, like other early church-towers, they were



Round Tower, Ardmore.

(From a Photograph by J. Lawrence, Dublin.)

capable of being used as strongholds, into which, in times of danger, the ecclesiastics could retreat with their valuables. In the Irish records, for two centuries after 950 A.D., they are invariably called *Cloithreach* or bell-towers, and are often mentioned as special objects of attack by the Northmen. About 108 towers of this description are yet to be seen in Ireland, twenty of which are entire or nearly so; and Scotland possesses three similar towers—at Brechin, Abernethy, and Egilsay in Orkney. They are usually capped by a conical roof, and divided into stories, sometimes by yet existing floors of masonry, though oftener the floors have been of wood. Ladders were the means of communication from story to story. There is generally a small window on each story, and four windows immediately below the conical roof. The door is in nearly all cases a considerable height from the ground. The figure represents the tower at Ardmore, County Waterford, which is one of the most remarkable of those remaining in Ireland. Rising from a double plinth course at the bottom to a total height of 95 feet, it is divided into three stages by external bands at the offsets, corresponding to the levels of three floors within, the fourth being also marked by a slight offset. Most of these towers, however, have only a slight batter externally from top to bottom. Some, like that of Devenish, are carefully and strongly built of stones cut to the round, and laid in courses, with little cement; others, such as those at Cahel and Monasterboice, have the stones merely hammer-dressed and irregularly coursed; others, again, like those of Lusk and Clondalkin, are constructed of gathered stones untouched by hammer or chisel, roughly coursed, and jointed with coarse gravelly mortar; while in others, as at Kells and Drumlane, part of the tower is of ashlar, and the rest of rubble masonry. The average height of these towers is from 100 to 120 feet, the average circumference at the base about 50 feet, and the average thickness of the wall at the base from 3 feet 6 inches to

4 feet; the average internal diameter at the level of the doorway is from 7 to 9 feet, and the average height of the doorway above the ground-level about 13 feet. These doorways always face the entrance of the church to which the towers belonged. All the apertures of the towers have inclined instead of perpendicular jambs, which is also an architectural characteristic of the churches of the same period, and the sculptured ornamentation of the apertures or walls of the towers is in the same style as that of the churches. These remarkable structures are assigned to a period ranging from the 9th to the 12th century. The source whence this form of tower was derived, and the cause why it was so long persisted in by the Irish architects, are points, however, on which there is not the same unanimity of opinion. Two round towers, similar to the Irish type, are to be seen in the yet extant plan of the monastery of St Gall in Switzerland, of the first half of the 9th century; and, in the Latin description attached to the plan, they are said to be *ad universa superspicuenda*. The church and towers as rebuilt at that date are no longer in existence; but a passage in the life of St Tenganan of Brittany shows that this type of round tower detached from the church was in use on the Continent in the 7th century, 'wherein to deposit the silver plate and treasure of the church and protect them from the sacrilegious hands of the barbarians should they wish to pillage the church.' Lord Dunraven traced the type from Ireland through France to Ravenna, where there are still six remaining out of eleven recorded examples. Suffolk and Norfolk contain more round-towered churches than does all the rest of England, probably because the flint there prevalent is worked into this form more readily than any other stone. A modern round tower is O'Connell's monument in Glasnevin Cemetery, which is 160 feet in height.

Roundway Down, a hill about 1½ mile N. of Devizes, in Wiltshire, the scene of Waller's defeat by the royalists under Lord Wilmot in July 1643. Waller was besieging Devizes when Wilmot came up to relieve the town, whereupon he turned at once to meet him, but was quickly crushed between Wilmot on the one side and a sally of the garrison on the other. Waller escaped, but only with the loss of his artillery and most of his men.

Round Worms (*Nematode*), a class of worms in which the body is elongated and more or less cylindrical. Most are parasitic, such as *Ascaris lumbricoides* and *Oxyuris vermicularis*, common in man, and numerous species of *Tylenchus*, which infest plants. Many genera, however, live in water or in moist earth, and many of the parasites are free-living during part of their life. They are called round worms, in contrast to the flat worms or Plathelminthes, such as tapeworms and flukes. For classification, see **THREAD-WORMS**.

Roup is one of the most serious diseases which the poultry or pheasant keeper has to fight, because in it there is generally an affection other than the mere cold which develops and makes it apparent. It is usually found that the system is scrofulous, which is the milder form; but sometimes it takes a diphtheric development, and this is the most severe and deadly disease known to poultry-keepers. Whether scrofulous or diphtheric, it is highly contagious, and very seldom is any bird in a yard attacked without nearly all the others being also affected. The difference between ordinary cold and roup is very easy to determine, though the symptoms are in some respects the same. But when it is merely cold the running at the eyes and nostrils is not at all offensive, whereas it is strongly so in the case of roup from scrofula, the breath being most repulsive. This fact, as well as the swelling

of the face, may be taken at once to determine when it is roup. The cause may generally be sought for in bad feeding, housing, or ventilation, which have charged the blood with scrofulous matter, and the outward symptoms are induced by cold. When first noticed the birds affected should at once be isolated, in order to prevent the spreading of the disease, which will speedily follow if all are kept together. The treatment must be dual, namely to cure the cold and to remove the scrofula from the blood. For the former any of the roup pills sold can be used, or it may be removed by homœopathic tincture of aconite given three or four times a day, the birds being kept in a warm and draughtless place. The scrofula is not so easily eradicated, and will require patience. Ordinary-sized pills made of powdered charcoal 10 parts, dried sulphate of iron 1 part, and capsicum 1 part, made up with butter, and given twice a day, form an excellent medicine, when the roup proper in its more active state is removed. To do this, however, it is desirable to clear the mouth, nostrils, and eyes from the mucus which accumulates there and which will suffocate the bird if not removed. In milder cases it is enough to wash the parts with vinegar and water, but in more severe cases it is better to use solution of chlorinated soda, as it is much more effective. Should the nostrils be very full of mucus, a small bent syringe should be filled with the solution, which must be inserted into the slit in the bird's mouth, through which the liquid is forced, and will effectually clear the passages. It is most essential in returning the birds to the house again to see that they are entirely recovered. When diphtheric roup is present the matter assumes a more serious aspect, because of the danger not only to other birds, but also to human beings, who have been known to contract this fell disease from birds. For that reason the greatest care must be taken, and, except in the case of very valuable fowls, it is much safer to kill those affected and bury them in quicklime. The outward symptoms in diphtheric roup are not nearly so apparent at first sight, because less prominent; still, the bird is noticed to be dull and lethargic. Unless checked the disease runs its course in a few hours, and the bird dies. Very often it is not known that diphtheric roup is present until several deaths have taken place. Its presence is easily distinguished by the skin-like substance formed over the throat. Treatment is doubtful, and Professor Whalley recommends that it should take the heroic form of dabbing the throat with carbolic acid, which will kill or cure.

Roup, in Scotland. See **AUCTION**.

Rous, FRANCIS, was born at Halton, Cornwall, in 1579, and educated in Oxford at Broadgates Hall, now Pembroke College. He was a member of the Long Parliament, sat in the Westminster Assembly of Divines, and in 1643 was made provost of Eton. He died at Acton, 7th January 1659, his writings having been collected two years before. Wood is abusive even beyond his wont to 'the old illiterate Jew of Eaton' and his 'enthusiastic canting.' His metrical version of the Psalms was recommended by the House of Commons to the Westminster Assembly, and is still substantially the Presbyterian Psalter. It is easy to abuse his version—Sir Walter Scott's verdict was that, though homely, it is 'plain, forcible, and intelligible, and very often possesses a rude sort of majesty, which perhaps would be ill exchanged for mere elegance.'

Rousseau, JEAN BAPTISTE, a great lyric poet of France, was born at Paris, 6th April 1671, the son of a shoemaker who gave him a sound education. At an early age he became acquainted with Boileau, and began to produce pieces for the theatre,

with but little success. Among his earliest patrons were Breteuil and Tallard, and the latter carried him in his suite to London. His turn for satire soon brought him troubles as well as reputation, and some lampoons upon the literary frequenters of the Café Laurent, chief of whom were La Motte and Saurin, brought down upon his head a quarrel that distressed the remainder of his life. Defeated by La Motte in 1710 in his canvass for T. Corneille's chair at the French Academy, he was soon after taken by everybody for the author of a fresh series of scurrilous and indecent couplets. He charged Saurin with writing them and attempting to foist the paternity upon him, and raised an action against him. Failing to make good the charge, he found himself in 1712 condemned in absence to perpetual banishment *par contumace*. Henceforth he lived abroad under the patronage of the Comte de Luc, French ambassador to Switzerland, and afterwards of Prince Eugene and the Duc d'Arenberg. At Brussels he made the acquaintance of Voltaire, but from a friend the latter soon became a bitter enemy. Rousseau visited England, and there published in 1723 a new edition of his works. He was never successful in getting his banishment annulled, although once at least he visited Paris incognito. He died at Brussels, March 17, 1741. Rousseau was not a great, only a supremely clever poet. His sacred odes and *cantates* are splendidly elaborate, frigid, and artificial; his epigrams, on the other hand, are bright, vigorous, sharp, with stinging satire, and unerring in their aim.

Editions are by Amar (1820) and A. de Latour (1869). See his *Œuvres Lyriques*, by Manuel (1852), *Contes inédits*, by Luzarche (1881), and *Œuvres Poétiques*, with Essay by Auger.

Rousseau, JEAN JACQUES, was born on June 28, 1712, in Geneva, where his family had been settled since 1550, when Didier Rousseau, a French Protestant, sought shelter from persecution. His mother died immediately after his birth, and he was left to the companionship of his father, Isaac Rousseau, a watchmaker and dancing-master, a man selfish and sentimental, passionate, dissipated, and frivolous. In 1722 his father having involved himself in a brawl fled the city to escape imprisonment, and left him to the charitable care of his relations. When he was thirteen his uncle apprenticed him to a notary, who soon found him utterly incompetent, and sent him back as a fool; and thereafter he was apprenticed to an engraver, whose cruelty during the three years he lived with him, he says, made him stupid by tyranny, cunning from fear, and wretched by ill-treatment. One evening, having rambled beyond the city walls till the gates were closed, he was too terrified to face his master, and resolved never to return, but to seek elsewhere his fortune. Now, in 1728, began his adventurous and vagrant career, for the details of which his *Confessions* form our chief authority, in which with picturesqueness and charming vivacity, with marvellous frankness, if not with scrupulous accuracy, he tells the story of his life. As he wandered on he was entertained by a priest of Savoy, eager for proselytes from heresy, and Jean Jacques, pretending to be eager to espouse the Catholic faith, was sent off to Madame de Warens at Annecy, who should look after the Calvinistic vagrant. By her he was hospitably received and then transmitted to a hospice in Turin filled with some fellow-catechumens; and soon initiated into the faith and duly baptised, he was discharged with a few francs in his pocket. He in vain sought work as an engraver, till a shop-keeper's wife gave him employment, and to her he acted in the double capacity of servant and lover, till on her husband's return he was kicked

out of doors. He next became footman to a Comtesse de Vercellis, and on her death not long after he took service again as lackey to Comte de Gouvion, and as nondescript secretary to the abbé, his master's son, till he became intolerable both to his masters and his fellow-servants, and was summarily dismissed.

Now in 1731 he travelled back to Madame de Warens, who welcomed him and installed him as permanent inmate of her house. Madame de Warens or, as her name was otherwise written and pronounced, Vorrans or Vuarrans, lived apart from her husband a very independent life, having a pension, which late investigation suggests may have been earned by acting as a political spy. She was twenty-eight years old, pretty and piquant, kindly in disposition, not rigid in morals, but rich in sentiment. She was clever and flighty, dabbling in chemistry and alchemy, dabbling also in commercial speculations which made her the dupe of adventurers, and indulging in religious speculations which combined Deism in creed with Roman Catholicism in worship. To her Jean Jacques, now nineteen years old, became pupil and friend, factotum, and ultimately lover, through nearly nine years. This period was diversified by adventurous interruptions: he at one time set himself up in Lausanne as a teacher of music though hardly able to play a tune, and as a composer though not able to write a score; became secretary to an archimandrite of the Greek Church, collecting subscriptions to recover the Holy Sepulchre; and then went to Paris as servant to an officer. Thereafter he returned to live with Madame de Warens at Chambéry, and from 1736 at Charmettes, in which lovely retreat his happiest and idlest years were spent, in desultory reading with his *maman*, in music, indolence and sentiment. This attachment and companionship ceased ingloriously at last when on returning from recruiting his health at Montpellier he found himself supplanted in the heart of Madame de Warens by one Vintzenried, whom he describes as a journeyman wig-maker, ugly and a fool, who as a lover was tyrannising over his facile mistress, mismanaging her affairs and dissipating her money. In disgust in 1740 Jean Jacques quitted his beloved Charmettes, the idyllic memories of which lived in his heart, as by his picturesque description they live immortal in literature. He became now tutor in Lyons to the sons of M. de Mably, the brother of the famous Condillac and of the once well-known Abbé de Mably, where he taught with lamentable incapacity.

In 1741 he set off to seek his fortune in Paris, with a little money, some letters of introduction to Parisian notables, and a system of musical notation by which he expected to make his reputation. He had to live in a dirty, shabby inn, and to earn a meagre livelihood by copying music, while his musical system was pronounced by the Academy of Sciences 'neither useful nor original.' After a sojourn of eighteen months at Venice, where he acted as cheap secretary to the embassy till he quarrelled with the ambassador, he returned to his inn, his copying, and a secretaryship with M. de Francueil. Meanwhile he had formed a companionship with a girl he found acting as drudge at the inn, called Thérèse le Vasseur, utterly illiterate, densely stupid, plain-featured, mean and vulgar, although he imagined her possessed of every grace in body, mind, and soul. By her he had five children, each in turn deserted and consigned by him to the hospital for foundlings. He had gained acquaintance with men of letters, with d'Alembert and Diderot, as needy as himself; and when they were producing the famous encyclopædia he wrote articles, of which the most

notable were those on music and political economy. His first distinguished appearance in literature was in 1749 by a *Discourse on Arts and Sciences*, written successfully for a prize offered by the Academy of Dijon on the problem whether science and the arts have corrupted or purified morals. Here with bold paradox he denounces fiercely and eloquently letters, arts, sciences, and all culture as alike proofs of and causes of corruption. The audacious independence of his thought, the freshness of his brilliant style, made him at once celebrated in literary and welcome to fashionable circles of society. In 1753 he next made himself distinguished as a composer by his opera the *Devin du Village*, full of novel and sparkling airs (one of which, slightly modified, is the well-known hymn-tune called *Rousseau's Dream*), which was first played with success before the court at Fontainebleau, and when performed in Paris achieved for him a popularity which was not sustained by subsequent efforts. It was in the same year that there appeared his *Discourse on the Origin of Inequality*, which, though unsuccessful in winning the prize from the Academy at Dijon, was successful in establishing his position as a writer in France. In this discourse he argues that all civilisation is a state of social degradation, that all science and literature, all social institutions and refinements are forms of degeneration from the primeval savage life, which, with all its ignorance and brutishness, he audaciously pronounces the state of human simplicity and perfection. All property is asserted to be derived from confiscation, all wealth is a crime, all government is tyranny, all social laws are unjust.

His brilliant denunciation of society made him the more attractive in society; but hating alike the company of wits and of courtiers, and despising fashionable conventions, he lived poorly, dressed meanly, and acted churlishly to show his independence, with that morose self-consciousness, blended with vanity, which was becoming with him a disease. Gladly he accepted from Madame d'Épinay the offer of a retired cottage, the *Hermite*, on the skirts of the forest of Montmorency, near her own château (Chevette). There he retired with Thérèse, her obnoxious mother, and his meagre chattels. Still earning his living by copying music, which produced about £60 a year, he employed his days amidst the woods of Montmorency with conceiving and writing his romance, *The New Héloïse*, inspired in the composition of its rapturous passages by a passion he had formed for Madame d'Houdetot, sister-in-law of Madame d'Épinay. His suspicious temper fostered misunderstandings with his patroness, and bitter quarrels with her friend Baron Grimm, and with his own warm friend Diderot; and he quitted the beloved *Hermite* with reluctance for a cottage at Montlouis not far off, where he found kind friends in the Duke and Duchess of Luxemburg. In 1760 the *New Héloïse* was published, and was instantly received with applause, and Rousseau became the idol of the sentimental artificial society of Paris. His work was followed in 1762 by the treatise on the *Social Contract*, published in Amsterdam in order to escape French censorship; and there two months later also appeared *Emile*. By the first work the recluse rose to the first rank as a writer of the romance of sentiment; by the second as a political socialist; by the third as an educationist.

But the views in *Emile* on kings and government made him obnoxious to the state, and the parliament condemned the author to be arrested and his book to be burned; while its deistic teaching in the Savoyard vicar's confession made him hateful to the church, and called forth a denunciatory pastoral from the Archbishop of Paris. Rousseau in terror

fled from France, and found shelter at Motiers, an obscure village in Neuchâtel, where he was safe under the tolerant rule of Frederick the Great, and the friendship of the Earl Marischal, George Keith, the governor of the province. Although he lived unobtrusively in botanising rambles, in making lace, and in writing his aggressive *Letters from the Mountain*, and his powerful reply to the Archbishop of Paris, religious rancour followed him to the remote and peaceful Val de Travers. The ministers stirred up the villagers against the heretic, and to escape their open hostility he took flight in 1764. A residence of delicious quietude in St Pierre on Lake Bièvre was ended by threat of prosecution from the government of Berne; and he accepted the offer of a home in England, given through David Hume. Under the charge of the good-natured historian, the irritated and sensitive fugitive came to England in January 1766. During about eighteen months he lived at Wootton in Staffordshire, solitary and quiet: here he busied himself with botany and his *Botanical Dictionary*, and especially in composing his *Confessions*, in which he determined to write his memoirs, to expose his enemies, to reveal himself—in spite of every fault, which he resolved to own—as one of the very 'best of men.' His suspiciousness, his morbid distrust and fears, had increased with his trials and his years. He had quarrelled with almost every friend, imagining the worst meaning in the best of motives; he believed that his truest friends, like Hume, acted with the most sinister designs, that the English government sought his life, and that he was everywhere dogged by spies. Suddenly he quitted Wootton, and, crossing the Channel, got a shelter from the *doctrinaire* Marquis de Mirabeau, and then from the Prince de Conti at Trye; and there he lived, under the name of 'M. Renon,' till he fancied that he was insulted by the domestics and that he was suspected of poisoning a servant. After various shifty changes he lived at Monquin, a retired, quiet spot, where he composed those later parts of his *Confessions*, in which each incident is coloured by his gathering delusions as to the motives of every one with whom he came in contact. In 1770 he returned to Paris, and remained unmolested, following his old life as copyist at ten sous a page, in a fifth story in the Rue Plâtrière, maintaining a surly independence, distrusting his friends, rebuffing admirers, insulting his customers. During these years, in different moods of mind and changing conditions of his broken health, he wrote the wild, half-mad dialogues, *Rousseau juge de Jean Jacques*, in which he vindicates his character in a strain which casts doubt on his sanity, and his *Réveries du Promeneur Solitaire*, which, in singular contrast, are calm in their tone, idyllic in their beauty, and perfect in their style. Still the delusions increased, and his mental misery deepened till he even craved for shelter in a hospital; everywhere he felt watched by spies, hated by the very children in the streets. In 1778 he accepted the last of these many offers of shelter, and retired to a cottage given him by M. de Girardin on his estate at Ermenonville, 20 miles from Paris. There he suffered from the misconduct of Thérèse, and from inveterate delusions, till, with a suddenness which has given much ground for suspicion of suicide, Jean Jacques Rousseau died on July 2, 1778. His body now rests in the Panthéon.

If the character of Rousseau can be learned from the judgment of his friends and foes, it can be also discovered from his own writings, which tell the story of his life—his *Confessions*, his *Letters*, his *Réveries*. We may receive his own version of many of his own acts with doubt, and his interpretation of the acts of others with reserve, while

details in the *Confessions* are known to be in many cases inaccurate; but as a picture of the man they are strikingly truthful. He is moved by a daring determination to conceal nothing, believing that every defect will only show the intrinsic beauty of his character as patches show off better the complexion of the face. Therefore he tells his ignoble intrigues and his paltry actions, how he deserted his companion when he fell in a fit, how he basely accused a poor girl, his fellow-servant, of theft to conceal his own dishonesty. He exhibits his jealousies and his hates, his lofty sentiments and his petty practices, his unbounded confidence in himself not only as a man of genius, but as a man of supreme rectitude. In spite of the worst he confesses and the worst charged against him by others, he needs commiseration in his faults, as arising from a mind disordered, and he deserves respect for his sincerity of thought, his independence of conduct in spite of its coarseness, his spirit of reverence, and his generosity of heart and hand. As a writer his influence has been exercised in diverse directions. His *New Héloïse*, suggested alike in its clumsy form of letters, its didactic passages, and its fervid romance by Richardson's novels, stirred by its strain of passion a spirit of sentiment in the society and literature of France, Germany, and Italy; by its idyllic pictures and exquisite descriptions it awakened a new admiration for nature in its grand and wild aspects, and touched the fashionable world with interest in rural life and in its simple ways. Amidst all its falsetto passion, it taught an artificial society the rights of the poor and the duties of the rich. The *Social Contract* proceeds on the premise that the basis of society is an original compact by which each member surrenders his will to the will of all, on the condition that he gets protection or defence; and arguing that the community is the true sovereign, that each member of it has equal power and right to make its laws, Rousseau arrives at the conclusion that kings are usurpers, that no laws are binding to which the whole people's assent has not been gained. True to his own Genevan traditions and tastes, he considers a republic in which all the people have personal votes as alone valid, and his doctrines of liberty, equality, and fraternity were adopted by leaders of the people, were carried by demagogues to logical extremes he never dreamt of, and became war-cries of the Revolution. By *Emile*, in which the man who abandoned his own offspring becomes the instructor of the age on the nursing of infants, the rearing of children, and the education of youth, with keen observation of life he pointed out the defects of common methods in the nursery and the school-room. The work had marked results in discouraging the faults and neglects in artificial society towards children, and in indicating a more natural and less pedantic method of training and developing the physical, mental, and moral faculties; and his ideas on this head (while many absurdities and whimsicalities in the book were avoided) were in large measure carried out by educationists like Froebel and Pestalozzi, and affected the educational methods of all Europe. By his famous chapter on the Savoyard vicar's confession he gave a confession of his own deistic faith, which disgusted Voltaire, D'Alembert, and D'Holbach by its strain of religious fervour and conviction, and horrified the church by its scornful denial of orthodoxy and supernaturalism. Meanwhile it kindled in France a spirit of severest theism instead of cynical scepticism or blank denial, and inspired Revolutionists like Robespierre with the doctrine that belief in a God is essential for society and the state. George Eliot and Ruskin claimed to have received a life-long impulse from Rousseau.

Among outstanding French monographs on Rousseau are works by Musset-Pathay (1821), Strecker-Moulton (1865), St Marc Girardin (1875), Chiquet (1893), Ritter (1896), Pougin (*J. J. R., Musicien*, 1901), Compayré (*J. J. R. et l'Éducation de la Nature*, 1901), Nourisson (*Rousseau et le Rousseauisme*, 1903), Jules Lemaitre (1907; trans. 1908), Ducros (1908), L. Claretie (1896, 1907), Faguet (1910), Champion (*Rousseau et la Révolution Française*, 1912). The Société Jean-Jacques Rousseau began its *Annales* in 1905. There are English studies by Lord Morley (1873; new ed. 1915), Rev. H. G. Graham (1883), T. Davidson (*Rousseau and Education*, 1898), Churton Collins (*Voltaire, Montesquieu, and Rousseau in England*, 1908), W. H. Hudson (*Rousseau and Naturalism*, 1903), Fredrika Macdonald (exculpatory, 1906), Prof. Gerhart Gran (trans. 1912). See also Gosse's address at the Bicentenary Celebration in Geneva (*Fortnightly Review*, July 1912); Willert in the *Cambridge Modern History* (vol. viii. 1904); *The Political Writings of Rousseau*, ed. Vaughan (1915); *La Nouvelle Héloïse*, ed. D. Mornet (1926); and his *Correspondance Générale*, ed. Dufour and Plan (1924 et seq.).

Rousseau, PIERRE ÉTIENNE THEODORE one of the most distinguished of the modern landscape-painters of France, was born in Paris on the 15th April 1812, the son of a well-to-do merchant tailor of the city, a native of Salines in the Jura. One of his mother's kinsmen, Alexandre Pan de Saint Martin, having seen a landscape, 'The Signal Station on Montmartre,' which the boy painted at the age of fourteen, gave him some instruction, and persuaded his parents to place him under Rémond, the landscape-painter. The classical ideal and methods of this artist were little to the liking of his pupil, who next worked under Guillon-Lethière, and in the École des Beaux-Arts; but his best teachers were the old masters in the Louvre, and his happiest hours were those spent in sketching from nature in the environs of Paris. In 1830 he was painting in Auvergne and Normandy, and he studied landscape in nearly every district of France; but by 1833 he had begun sketching in the Forest of Fontainebleau, which ever after was his favourite painting-ground, and where he finally settled, in the village of Barbizon, in 1848. He first exhibited in the Salon of 1831, and in 1834 his 'Border of the Forest of Compiègne' gained a third-class medal and was bought by the Duc d'Orléans; but in the following year his 'Descent of Cows in Autumn,' painted in the Jura, afterwards purchased by Ary Scheffer, and 'The Alley of Chestnut Trees,' one of his finest works, were rejected—in excellent company—through the influence of Bidault and Rochette, the president and secretary of the Academy. Some twelve years of more or less complete neglect and discouragement followed, and left such baneful effects upon a mind naturally proud and melancholic as may account for the petulance and acerbity which marked certain passages of Rousseau's later life. But in 1848 the painters themselves assumed the management of the Salon exhibitions: he was elected one of the jury; and in the following year he resumed exhibiting, and gained a first-class medal. His works were prominently hung in the Exposition Universelle of 1855; as also in that of 1867, when he was president of the jury, and the only landscape-painter who won a grand medal. Soon afterwards he was appointed an officer of the Legion of Honour; but before he was decorated he had been attacked by paralysis, and, after lingering six months, he died on the 22d of December 1867. Though Rousseau was most deliberate in his art methods, and would often keep his canvases long in hand, altering and retouching them, he was yet an exceedingly prolific, if a somewhat unequal, painter. At his best his works are characterised by true dignity and originality of style, by noble richness of colouring, and are informed by deep

sentiment and emotion. See Sensier, *Souvenirs de Théodore Rousseau* (1872); D. C. Thomson, *The Barbizon School* (1890); Dorbec, *Th. Rousseau* (1910).

Rousselaere. See ROULERS.

Roussillon, formerly a province of France, surrounded by Languedoc, the Mediterranean, the Pyrenees, and the county of Foix. It now forms the French department of Pyrénées-Orientales. In ancient times the capital was *Ruscino*, which stood in the vicinity of the modern Perpignan.

Routh, MARTIN JOSEPH, was born of Yorkshire ancestry at St Margaret's South Elmham, Suffolk, on 18th September 1755. His father, a clergyman, in 1758 settled as schoolmaster at Beccles, whence Martin in 1770 went up to Queen's College, Oxford. In 1771 he was elected a demy, in 1775 a fellow, and in 1791 president, of Magdalen. He took deacon's orders in 1777, but priest's not till 1810, when he was presented to the rectory of Tylehurst, near Reading, worth £1000 a year; ten years later he married Eliza Agnes Blagrove (1790-1869). He died at Magdalen, 22d December 1854, in his hundredth year.

A little shrunken figure, with 'such a wig as one only sees in old pictures,' he had grown very deaf, but till well after ninety retained his eyesight and marvellous memory, could walk six miles and climb a stiffish hill, mount the library steps, and study till past midnight. Newman and Bancroft were among his later friends and acquaintances; the earlier had included Dr Parr, Samuel Johnson, and Porson. He was a great patristic scholar when patristic scholars were few, a Caroline churchman, a liberal Tory, a lover of his dogs and canary and joke, a mighty book-buyer to the last—his 16,000 volumes he bequeathed to Durham University. For just seventy years he was publishing, but his works number only six; and two of these are editions of Burnet ('I know the man to be a liar, and I am determined to prove him so'). He will be remembered by his *Iteliquæ Sacre* (5 vols. 1814-48), but still more for his sage advice, 'Always verify your references, sir.' And Dr Routh it was who in 1783 induced Dr Seabury of New York to apply for consecration as bishop of Connecticut, not to the Danish Church, but to the Scottish episcopate. See Burgon's *Lives of Twelve Good Men* (1888).

Rovereto, a town of the Italian province of Trento, stands close to the left bank of the Adige, 14 miles S. of Trento by rail. It has been since the 15th century the centre of the Tyrolean silk industry; it has also leather and tobacco factories, and carries on an active transit trade. Pop. 16,000. Here the French defeated the Austrians, September 3-4, 1796. It was much damaged in the Great War. Rosmini was born here in 1797. See Bortanza, *Storia di Rovereto* (1883).

Rovigno, a seaport of Italy, stands on the west side of the peninsula of Istria, opposite the mouth of the Po and 40 miles S. by W. of Trieste. The neighbourhood produces olive-oil and the best Istrian wine. The tunny and sardine fisheries, with oil-pressing and the preparation of pastes and tobacco, are the chief industries. Pop. 10,000.

Rovigo, a city in Italy, 27 miles by rail S. of Padua, has a cathedral (1696), some good Renaissance buildings, an academy of sciences, a library, and a picture-gallery. Pop. 15,000.—The province has an area of 643 sq. m. and a pop. of 287,000.

Rovuma, a river of East Africa, rises on the east side of Lake Nyasa, flows eastward, and enters the Indian Ocean, after a course of more than 450 miles, a little north of Cape Delgado. During the greater part of its length it forms the

boundary between Tanganyika Territory and the Portuguese East African possessions. It was first ascended by Livingstone and Kirk in 1862.

Row, JOHN (c. 1525-80), a Scottish Reformer, was born near Stirling, studied at St Andrews, and in 1550 was sent by the Scottish clergy as their representative to Rome. While in Italy he took the degree of Doctor of Laws at Padua. In 1558 he returned to Scotland, and next year abandoned the Roman faith. In 1560 he aided in compiling a *Confession of Faith* and the *First Book of Discipline*, became minister of Perth, and sat in the first General Assembly of the Church of Scotland. He was four times moderator, and took a share in preparing the *Second Book of Discipline*.—His eldest son, JOHN ROW, was born at Perth in 1568, studied at Edinburgh, became minister of Carnock in 1592, and died in 1646. He wrote a dull and prolix but trustworthy *History of the Kirk of Scotland*, which was at length printed by the Maitland Club (2 vols. 1842) and the Wodrow Society (edited by David Laing). The work extends from 1558 to 1637, but was continued after his death to 1639 by his second son, JOHN ROW (1598-1672), rector of Perth grammar-school, minister at Aberdeen, moderator of the provincial assembly there in 1644, and, by appointment of Monk's commission of colonels, principal of King's College in 1651. Like his father and grandfather a learned Hebraist, he published in 1634 *Hebraice Linguae Institutiones*, and in 1644 *Chilias Hebraica seu Vocabularium*.

Rowan Tree, MOUNTAIN ASH, or QUICKEN TREE (*Pyrus Aucuparia*), a tree of the family Rosaceæ, abundant in Britain, especially in the Highlands of Scotland, and in many parts of continental Europe. It does not attain a great size, but is one of the most ornamental trees that



Rowan (*Pyrus Aucuparia*) in flower.

occur in British woodlands. The wood is valued for its compactness and fine grain, and is capable of taking a high polish. In the superstitions of the Highlands, and also of the Lowlands, a peculiar importance was assigned to the rowan tree, a mere twig of which was supposed to be enough to scare away evil spirits. The fruit has much acidity, and a peculiar bitterness. It is used for making jam and liqueur. It is generally red, but there is a variety with yellow fruit, and a very nearly allied species, *P. americana*, a native of North America, has purple fruit.

Rowe, NICHOLAS, dramatist and translator, a contemporary and friend of Congreve, Pope, Addi-

son, and Steele, was the son of a serjeant-at-law, and was baptised at Little Barford, in Bedfordshire, June 30, 1674. He was educated at Westminster under Busby, and studied law in the Middle Temple; but early inheriting a small competency by the death of his father, he devoted himself to literature. Between 1700 and 1714 he produced eight plays, of which three were long popular, and deservedly: *Tamerlane* (1702), *The Fair Penitent* (1703), and *Jane Shore* (1714). The character of Lothario in *The Fair Penitent* was the prototype of Lovelace in Richardson's *Clarissa Harlowe*, and indeed the name is still the proverbial synonym for a fashionable rake. Rowe translated Lucan's *Pharsalia*, and his work, says Dr Johnson, 'deserves more notice than it obtains, and as it is more read will be more esteemed.' His edition of Shakespeare (7 vols. 1709-10) at least contributed to the popularity of his author. Rowe's comedy, *The Biter* (1705), lived only to be damned as it deserved. Rowe, we are told, had no heart, yet his vivacity and engaging manners procured him many friends and several lucrative offices. The Duke of Queensberry made him his Under-secretary of State. In 1715 he succeeded Tate as poet-laureate; and the same year he was appointed one of the surveyors of customs to the port of London; the Prince of Wales made him Clerk of his Council, and the Lord Chancellor Parker secretary of Presentations in Chancery. He died December 6, 1718, and was buried in Westminster Abbey. See Hant's edition of *The Fair Penitent* and *Jane Shore* (1907).

Rowing. The oarsman sits with his face to the stern of the boat, his feet planted flush against his 'stretcher' or footboard, and the handle of his oar in his hands, the loom of the oar resting in the rowlock, the 'button' being inside the thowl-pin. He should sit upright, with a rigid back, and do his work mainly with his back and legs, using his arms as couplings between his body and the oar-handle, and only bending them towards the finish of his stroke. To row a stroke, swing the body forward from the hips straight towards the toes; extend the arms rigidly, brace the shoulders, and keep the head up. The hands should be holding the oar-handle about $3\frac{1}{2}$ inches apart. The grasp should be with fingers and not fist—i.e. the lower knuckles of the hand should be very slightly bent, almost straight, the hold being retained by the upper joints of the fingers and by the thumb. This mode of holding the oar gives freer play to the wrist-joints for the 'feather,' of which more anon. The body being thus extended, and the legs opened at the knees to allow the body free swing forward, and the hands thus grasping the oar-handle, then the stroke is begun by raising the hands enough to allow the blade of the oar to sink into the water square. (It is most important that the blade should be square to the plane of the surface of the water; otherwise, as soon as the stroke commences, the blade fails to preserve its own plane, and sinks too deep, or springs out of water, according as the face of it is inclined at an obtuse or acute angle to the water.) When the oar has been thus lowered into the water, by raising the hands over the stretcher, the stroke should commence—sharply, by bracing the muscles of back, loins, shoulders, and legs, and throwing the body backwards, swinging from the hips, the feet firmly pressing against the stretcher, the arms rigid; so that the weight of the body is eased as much as possible off the seat, and is transferred to the oar-handle and the stretcher. When the body has reached the perpendicular in the swing back, the arms should begin to come in. The action of bringing them in should be from the shoulders, the elbow-joints gradually bending, but the forearm remaining as near as possible parallel

to the water. The 'biceps' should not be exerted, else the forearms bend upwards, the hands rise, and the blade buries. The body should not 'wait' for the arms and hands to overtake it: it should be still swinging back till the hands overtake it.

When the hands reach the breast-bone they should be sharply dropped about two inches: this raises the oar out of the water. After this drop of hands they should be turned sharply from the wrists till the knuckles touch the body. This turn produces the 'feather.' If the turn is made too soon, before the hands have reached the chest, the action is faulty, and produces what is called 'feather under water,' by turning the oar edgewise in the water instead of after the oar has left the water. So soon as the drop and turn of wrists has ended and 'feather' has been performed, the 'recovery' should commence. The body should instantly, and without 'hang' or delay, commence to swing forward again like a pendulum. The hands should at the same instant be shot out and the arms extended, reaching their extension by the time that the body has once more attained the perpendicular in its forward swing. The swing should continue forward till full reach has been attained for a new stroke; then once more the hands should be raised, the oar lowered into the water, and a new stroke rowed. In rowing behind another oarsman the eyes should catch the back in front of the oarsman, who should take time and swing from it—keeping 'eyes in the boat.' The oarsman at first finds it difficult to 'govern' his blade—i.e. to keep it in the right plane and at the correct elevation or depression, according to whether he is rowing the stroke or is 'recovering.' In time his wrists become more apt, and time their action to the ever-varying positions of the body. The more he attends to a correct grasp of his oar-handle the easier will be the play of his wrists, and the greater facility will he find in regulating the plane of his blade. It has been said before that the blade should be 'square' to the water throughout the stroke. So it appears to the oarsman; but in well-constructed boats the 'thowl' is slightly inclined in the direction in which the oarsman is looking; this inclination gives the oar-blade a correspondingly slight inclination forward, making it describe a trifle less than a rectangle with the water, and so obviates any tendency to row 'deep.' It will suffice if the beginner thinks of keeping his blade 'square,' and the small deviation from the square, reducing the angle that is effected by the slope of the thowl for his benefit, will then be produced naturally by the mechanism of his work. If this inclination of the thowl is made too great the oar has a tendency to fly out of the water.

To stop the way of a boat she should be 'held.' This is done by laying the blade flat, and thus slightly sinking the edge which lies towards the direction in which the boat is travelling. This causes the blade to bury at an acute angle to the plane of the water. This checks the way until it is reduced enough to allow the oarsman to turn the blade square, reverse way, and to 'back' water. If he tries to back water with any pace on, before he has first 'held' the boat, the resistance to his blade not only risks fracture, but is likely to be beyond his strength, to lay him flat on his back, and to make him 'catch a crab.' In backing water the process of the stroke, described above, should be reversed, so far as circumstances will allow—i.e. the oarsman has no stretcher to press against, and is 'pushing' with his weight instead of 'pulling.' In most 'tab' boats, and in all racing boats, straps are laid across the stretcher, to hold the feet at the instep, and so to facilitate recovery. The strap should only be used as an adjunct to recovery, not as the sole

means: the loins should play their part in swinging the body forwards; and the arms, by being rapidly shot out, should aid the action of the loins. If a tyro is found to rely too much on his strap, a mentor may with advantage remove the strap until proper use of the loins has been effected.

Sculling.—In sculling each hand holds one scull, instead of there being two hands on one oar as in 'rowing.' The principles of action of body, legs, and arms are the same as in rowing, except that the body, when sculling, may with advantage be swung farther back at each stroke than in rowing. The grip of a scull should be on the same principle, as regards holding in fingers and not in fist. The thumb should not clasp under the handle, but cup the butt of the scull with the top joint. In rowing this would be wrong; but in sculling it is found to secure the better hold, and to give freer play to the wrists for feathering. It is important that both hands should work together, both blades entering and quitting the water together, and both wrists feathering simultaneously. If one hand is later than the other the course of the boat is distorted at each stroke.

BOAT-RACING.—Virgil, in *Æneid*, iv., describes a boat-race between four Trojan galleys; and the word 'regatta' is of Italian origin. But modern boat-racing may be said to be an Anglo-Saxon sport. Since 1895 America, Canada, Belgium, Germany, and Australia have invaded Henley regatta with considerable success, and Belgium and Australia have displayed examples of cultivated styles which many British clubs might wisely study as regards elbow finish and clean feather. Twice this century have Ghent eights won the Grand Challenge; and Sydney, Australia, scored in their only essay, 1912 (though Leander beat them at the Olympic Stockholm regatta later on). The body swing of the best British eights is longer and more effective than that of the visitors aforesaid; but in finish of the stroke, and thence in accuracy in quitting the water, those same visitors can teach us much. British 'finish' of the stroke has become slovenly since 1900. Canadians put up many a good fight, but have not yet had the luck to win. American Cornell and Pennsylvania University eights have reached final heats in the Grand, but failed to win outright.

Eton and Westminster schools practised boat-racing in the early part of the 19th century; thence the pastime seems to have spread to the universities. One of the earliest races was between Westminster boys and the 'Temple' crew, in six oars, the boys winning. As early as 1815 college 'bumping' races in eight oars had begun at Oxford. In those days only three or four colleges manned eights. Cambridge adopted a similar sport at much the same date, or a year or so later. In 1829 the first Oxford and Cambridge match was rowed—Hambleton Lock to Henley Bridge. The next was in 1836, Westminster to Putney; after that at intervals till 1856, since which date these matches have been annual. Each university has won about the same number of matches. Also, five times have the U.B.C.'s been drawn together in the same heat for the 'Grand Challenge' at Henley, of which Oxford won 3 and Cambridge 2 encounters; and once Oxford beat Cambridge in an encounter for the 'Gold Cup' at the now extinct Thames regatta of the 'forties.' 'Outriggers' were first used by the two university crews in 1846. Sliding seats were first used by them in 1873. 'Keelless' eights were first used by them in 1857. In 1845 the Putney to Mortlake course was first adopted for these matches. Outriggers are a contrivance for artificially extending the gunwales of a boat, so as to give the required leverage for the oar in the rowlock, while the rest of the hull is narrowed to

offer less resistance to the water. The earliest application of the principle was with wooden outriggers on the Tyne before 1836. Iron outriggers were first used by H. Clasper for a Tyne firm in a Thames regatta in 1844.

Professional Racing.—The earliest recorded professional champion sculling race was in 1831, when one Campbell, Thames waterman, beat one Williams for the championship of the Thames from Westminster to Putney. In 1847 the Putney to Mortlake course was first adopted for these watermen's matches. In 1859 the title first left the Thames, and was won by R. Chambers of the Tyne. About 1860 professional oarsmen were far more numerous than now; and regattas were got up for them, on and off, including four-oar and pair-oar racing as well as sculls. After the 'seventies' these meetings became extinct. In the earlier decades four oars from Tyne and Clyde used to oppose Thames oarsmen. In the present time professionals almost exclusively limit themselves to sculling matches. In sculling, the professional class is far ahead of the amateur, by reason of more leisure for practice. Strength doubtless tells in sculling, but accuracy of blades (for equal and simultaneous immersion and emergence) is the crux; and amateurs have not time to study to obtain this. Besides, most of them are also oarsmen, and work at an oar tends to destroy equilibrium of hands on sculls. In oarsmanship—eights and fours—best amateurs have been, on the other hand, superior to watermen since about 1865. Probably three or four amateur eights could annually be seen which could smother the best watermen's eight of the year (if such a crew were trained and practised).

Decadence of watermen's regattas, coupled with wilful misuse of the true principles of sliding seats, have much to do with deterioration of British professional sculling. From 1876, when E. Trickett, of Australia, beat the then gray-haired J. H. Sadler of Britain, colonials continued to hold the title of world's champion, until, in 1912, at last Ernest Barry brought the title back to Britain, beating R. Arnst (New Zealand) on the Thames course. Barry remained unbeaten until 1919, when he suffered defeat at the hands of A. Felton of Australia, but in 1920 he regained the title by defeating Felton on the Parramatta River, New South Wales. Barry thereafter retired. His style was a renaissance of all that is best in sculling—as to slide, combined correctly with swing and level arm work.

'Watermen' on the Thames are a licensed body; but their quondam calling as carriers from river stairs has died out, superseded by rail and road carriage.

Amateur Sculling Championship.—This is symbolised by the 'Wingfield Sculls,' established in 1830. The trophy now carries with it the amateur championship of England. The holder has to meet the best of all challengers once a year, on a date fixed by a committee of old champions, about July, or to abandon in favour of the best challenger.

Regattas.—Henley regatta was founded 1839. In 1886 the course was changed as to some 300 yards of its length, to avoid a corner which gave unfair advantages. It is now a four-days meeting, and comes off early in July each year. The prizes are 'Grand Challenge,' for best eight oars; 'Stewards' Cup,' for best four oars; 'Ladies' Plate,' for college and school eights; 'Thames Cup,' for second-class eights; 'Wyfold Cup,' for second-class fours; 'Visitors,' for college and school fours; 'Silver Goblets,' for any pair of oarsmen; and 'Diamond Sculls,' for single scullers. By first- and second-class eights and fours are meant the classes which usually compete at the races referred to—e.g. no one who rows for 'Grand Challenge' may

row for 'Thames Cup' the same year; nor if he rows for 'Stewards' fours may he row in a 'Wyfold' crew; the better eights and fours usually elect to do battle for the 'Grand' and 'Stewards,' and the weaker reserve themselves for the lesser races. There are other regattas of less importance—e.g. 'Metropolitan,' on the Thames tideway, Kingston-on-Thames, Walton-on-Thames, Moulsey, Reading, &c.; and provincial regattas at Tewkesbury, Bridgnorth, Worcester, Tyne, Durham, Burton-on-Trent, Bedford, &c.

The best regattas are held under the rules of the 'Amateur Rowing Association,' a sort of jockey club of oarsmanship, the object of which is to promote rowing and to put a stop to performances inconsistent with amateur status—e.g. rowing for money prizes. The Amateur Rowing Association publishes a code of regatta rules. All clubs which are affiliated to the Amateur Rowing Association adopt this code. Oarsmen who row at regattas where this code is not in force may become thereby ineligible to row afterwards at regattas where it holds good.

Bumping Races.—In 'bumping' races at the universities the various boats start in line, 120 feet apart, by signal of cannon. The order of starting depends on order of precedence in the last previous race, whether the same year or the year before. If a boat is touched from behind in the race, both boats row into the bank, and the 'bumped' boat loses a place and changes order next time with the boat that so 'bumped' it. The head boat of the river at Oxford holds a challenge cup given in 1862 by the late Mr G. Morrison.

Time Races.—At Oxford and Cambridge, owing to the narrowness and curvatures of their respective rivers, other races, such as for four oars or sculls, are rowed as 'time' races. The boats start two at a time, 80 yards apart, their respective winning-posts are the like distance apart, and their respective arrivals at their goals are announced by pistol shots.

Level Racing Rules, &c.—In regattas and matches boats start abreast, and in modern times to ensure equal starting the rudder of each competitor is held from a starting-boat, one for each racing crew, moored in line. 'Fouling' is not allowed; each boat has to keep its own water; the umpire is sole judge of the course and of fouling, and usually follows the race in a launch. All boats abide by their accidents—e.g. of broken gear or upsets.

Sliding Seats.—The use of sliding seats began in 1871 in England. Americans had previously used but thought little of the novelties. A Tyne crew, captained by F. Taylor, matched against another Tyne crew, used such seats in a match, November 1871, and won. Next year four Henley crews adopted them with marked success, and the London Rowing Club used them in a winning match v. Atalanta Rowing Club, of New York. In 1873 they became universally adopted. Leading amateur clubs prohibit use of slides by their beginners, till swing on fixed seats has been first mastered, else there is a tendency to sacrifice swing to slide. Slide and swing should begin, continue, and end contemporaneously; the legs should extend gradually as the body swings back, and the sliding seat should on no account touch the back stop until the moment when the oar reaches the chest.

Faults in Rowing.—A 'coach' or tutor of a crew endeavours to cure faults by admonition, so as to get his crew into 'form' and style. Uniformity of oars and of action of bodies has much to do with pace in a racing boat, though, of course, strength is also an important factor. Still a strong oar who mars uniformity among his comrades often does more harm than good, and is well replaced by a lighter and neater oarsman. Among salient

faults may be specified 'rowing out of time,' by letting the oar enter or leave the water too soon or too late; 'rowing light'—i.e. not covering the blade; 'rowing deep'—i.e. burying the shank as well as the blade of the oar; 'feathering under water'; 'sliding too soon' or too suddenly. Among 'faults of swing' are 'hanging' with the body before recovery, or when forward before dropping the oar in; delay in shooting out the hands; 'bending the arms' too soon; bending the back in the middle of the stroke instead of swinging from hips; hunching the shoulders; 'screwing'—i.e. not swinging straight in a line with the keel; 'meeting the oar'—i.e. swinging to meet the oar-handle instead of rowing it well home; 'rowing short'—i.e. not swinging to full reach forward.

Stroke and 'No. 7.'—A 'stroke' is selected to set a good style to the men who are to copy him. Hence style more than rough strength is of importance for this post. A stroke should be lively in swing; sharp in catching hold of the first part of the stroke; long in reach; even in swing; even in time, like a pendulum; a good judge of the pace of stroke which he is rowing; capable of 'spurring'—i.e. of quickening the pace of stroke when extra speed is needed, and this without getting short in reach. Thirty strokes a minute is a fair practice stroke. In racing for a mile or mile-and-half course as many as forty-four a minute can be rowed long by good crews. (Over a four mile course thirty-seven a minute, well rowed at full length of reach, is about as much as can be done, excepting a final 'spurt.' 'No. 7' is second to none in importance in an eight oar. He couples stroke to the crew. A weak No. 7 takes many points of merit off a crew, and cripples the work of good but rough men behind him.

Steering.—Four oars are now rowed without coxswains, except in junior or second-class races. One of the oarsmen steers with levers attached to his stretcher and connected with the rudder by wires. In an eight, a coxswain is an important factor; he should have nerve and judgment, and be capable of reminding his crew of faults, when, as in a race, no 'coach' or mentor can attend them. The main art in steering is to keep the boat in a straight course by gentle touch and adjustment of the rudder lines, not by hard pulls, which tend to spoil equilibrium, and to bring the boat round too sharply. In going round a curve the bows should not be expected to point in the direction required. They must of necessity point outwards, because the boat lies as a tangent to a curve.

Rowing Clubs.—Among leading amateur rowing clubs, besides the universities, may be mentioned the Leander, the London Rowing Club, Thames Rowing Club, Kingston, Molesey; these usually supply the competitors at Henley, together with the universities. There are good provincial clubs at Durham, Worcester, Bridgnorth, Bedford, Huntingdon, Burton, &c. Among schools Eton, Radley, Westminster, Shrewsbury, Cheltenham, Bedford 'Grammar' and Bedford 'Modern' supply good oarsmen—Eton especially. Of university crews, nearly one-half are made up on the average of old Etonians.

Training.—'Condition' promotes endurance in a contest, whether of horse or man. Hence training is an important item in preparation for a boat-race. Hard work trains; regulated diet keeps the oarsman up to this hard work, and puts on extra muscle to replace fat which hard work has sweated off. Five weeks is a minimum time for full training where oarsmen have been out of work for some time; a shorter period may suffice if they have not been inactive for long. Professionals usually train for three months before a match. The usual rules are early rising—say 7 A.M.—a

short morning walk, bath, breakfast, morning row (if studies or business hours admit of it), luncheon or midday dinner, afternoon or evening row (according to season of year), late dinner or supper, a short post-prandial stroll, a cup of gruel or chocolate, and bed for nine hours. After each row the body should be well washed and rubbed down. As to diet. For breakfast: fish, eggs, watercress or lettuce; and two cups of tea; stale bread or toast. For luncheon: cold meat and some green food; or broiled meat and vegetables. Dinner: fish; joints of beef or mutton; vegetables—any greens, asparagus, spinach, a potato or two, &c.; now and then a modicum of poultry as an extra course; stewed fruit; rice or plain farinaceous pudding. Drink: at luncheon or dinner, ale, or light wine. A pint at each meal usually suffices; in sultry weather a little more fluid may be allowed, in which case it is best to let the extra supply be water only. Oranges or strawberries are allowed for dessert, and a glass of port. Pork and veal are tabooed, as being indigestible in the large quantities which hungry men consume. Such is modern training. In earlier decades less liberality was allowed. Steaks, chops, and plain joints formed the staple supplies, and the hobby was to have them 'underdone,' almost to semi-rariness. This system often produces disorder of blood, resulting in boils, the effect of too much animal food without sufficient green meat. Professionals still adhere to old creeds of training more tenaciously than do modern amateurs.

Boats, Oars, and Pace of Races.—The boats used for racing have been gradually evolved from the old pleasure craft. The ship in which Oxford won the first Oxford and Cambridge Boat Race is still preserved by the O.U.B.C. She is simply an elongated fixed seat, rigged gig, and is 'clinker-built,' i.e. built of narrow planks, each of which overlaps the next. After the introduction of outriggers, racing-boats were made much narrower and longer, but the greatest step in the evolution of racing craft was the introduction of the keelless boat. All modern racing-boats are keelless, i.e. the timber which takes the place of the keel (called the 'kelson'), and runs the whole length of the boat, is inside the outer covering or skin. A racing-boat is built upside down. First the timbers which take the place of the gunwale (now called the inwale) are placed in position on the bench. On this inwale are placed, at fixed intervals, the ribs fixing it to the kelson, which is then placed in position. At this stage the boat somewhat resembles a skeleton. The skin of thin cedar is then superimposed and attached to the ribs with copper nails. Before being thus fitted the cedar planks are cut exactly to the required size. They are moistened on one side and heated on the other so as to make them curve, and are fixed in position before they have time to regain their normal shape. By this process the hull of the boat, when completed, is absolutely smooth and without excrescence of any kind. The hull is then turned over, and the seats, stretchers, sax-boards (running along the top of the side), and outriggers fixed. A complete racing eight is a beautifully finished piece of cabinet work, and costs approximately £110 to £120.

In spite of many arguments and discussions as to the correct lines for the longitudinal and transverse sections of a racing-boat, there has been no very great change since 1875. An eight is pointed at bow and stern, is about 60 feet long, has its greatest beam (about 23 inches) at No. 4's seat; it gets very gradually narrower from that point to 'stroke's' seat, and then tapers off to a point at the stern. The leverage of the oars, measured from the centre of the seat to the rowlock, is 31 inches. The slide comes level with the rowlock when the oarsman is

fully extended forward, and travels back about 16 inches. Racing oars range from 12 feet to 12 feet 4 inches in length; the button is 3 feet 8 inches from the handle, and the blades from 5½ inches to 6½ inches wide.

There have from time to time been improvements in the manufacture and fitting of racing-boats, and in the material and construction of oars, but they have not had any very marked effect on the time records of competing crews. Between Putney and Mortlake the sloping banks of the river have been gradually replaced by vertical concrete embankments, and the tide runs faster now than it formerly did. As a result, the times occupied by the university crews, both in practice and in the race itself, have improved; but at Henley Regatta the record time for the Grand Challenge Cup (6 min. 51 sec.) made in 1891 by Leander Club, and in 1897 by New College, Oxford, has not been beaten. Making all due allowances for conditions of weather and stream, it is believed that the fastest piece of eight-oared rowing ever accomplished was in the race between the United States (Naval College) and Great Britain (Leander Club) at the Olympic Regatta of 1920. The Americans won by four-fifths of a second, and their time over 2000 metres was 6 min. 5 sec. The race was rowed at Villeverde on the Antwerp-Brussels canal.

See *Rowing*, by R. P. P. Rowe and C. M. Pitman (Badminton Library, 1898); *The Complete Oarsman*, by R. C. Lehmann (1908); *Henley Royal Regatta*, by H. T. Steward (1903); *Henley Races*, by Sir Theodore Cook (1919); and *A Text-book of Oarsmanship*, by G. C. Bourne (1925).

Rowlandson, THOMAS, caricaturist, was born in the Old Jewry in July 1756. He was sent to Paris at fifteen, and there he studied art and gained a taste for the pleasures of the town. The over-indulgence of a wealthy French aunt first taught him improvidence, and the £7000 she left him he quickly gambled away, once continuing at the gaming-table, we are told, for thirty-six hours continuously. Yet he maintained his uprightness of character, hated debt, and when he had played the fool turned to his work as his resource. He travelled over England and Wales, often visited Plymouth, Portsmouth, Southampton, and especially Yarmouth, and, being a humorist to the marrow, enjoyed life to the full in his tavern, with his tankard and his pipe, and the company of friends like Moreland, Gillray, and Bunbury. He died April 22, 1827. Rowlandson took little pains over his work, yet his drawings never lack the essential elements of his strength, variety, and humour. He possessed rare dexterity of touch, fertility of imagination, and knowledge of the human figure, and, though he was not seldom vulgar, he was never feeble. He was a relentless hater of Napoleon to his fall, belittling his greatness by countless travesties; and though he took his part in many of the political contests of his day, he was never a mere party satirist. His strength lay in broadly human humour, as seen at its richest among the lower orders of the population, as in his famous Vauxhall drawing. Well known are his *Imitations of Modern Drawings* (1784-88), and his illustrations to *Dr Syntax's Three Tours*, *The Dance of Death*, *Johnny Newcome*, *Sterne's Sentimental Journey*, *Peter Pindar*, *The Bath Guide*, and *Munchausen's Travels*. See **CARICATURE**; and books by Grego (1880); and A. P. Oppé (1923).

Rowley, THOMAS, the pretended monk on whom Chatterton fathered the 'Rowley Romance'; see **CHATTERTON**.

Rowley, WILLIAM, an actor and playwright under James I., of whose life but little is known,

save that he was honoured by collaborating with such illustrious dramatists as Dekker, Middleton, Heywood, Webster, Massinger, and Ford, most probably for his skill in stage situation. Four plays published with his name are extant: *A New Wonder, a Woman never veest* (1632; and in Dodsley); *All's Lost by Lust* (1633; ed. Morris, 1907; Stork, 1910); *A Match at Midnight* (1633); and *A Shoemaker a Gentleman* (1638; ed. Stork).

Rowley Regis, a town of Staffordshire, 3 miles SE. of Dudley. Four parish churches in succession have occupied the same site (1199, 1840, 1904, 1923). There are collieries, ironworks, stone-quarries, potteries, implement-works, &c. Pop. (urban district) 40,000.

Rowton Heath, a battle of the Great Rebellion, fought under the walls of Chester, 24th September 1645. After the crushing disaster of Naseby the king fled to Wales, and next formed the desperate project to march northwards to Montrose. The city of Chester was then being besieged by Sir William Brereton, but the king succeeded in finding an entrance, and charged Sir Marmaduke Langdale to raise the siege. The parliamentarians had just been reinforced by Poyntz's Yorkshire Horse when Sir Marmaduke attacked them. He was utterly defeated, with a loss of 300 killed and 1000 prisoners, and the disaster, added to Philiphaugh, stripped the king of his last hope.

Roxburgh, WILLIAM (1759-1815), botanist, born at Underwood, Ayrshire, was appointed director of the Calcutta Botanical Gardens in 1793. His books, *Plants of the Coast of Coromandel* and *Flora Indica*, made him a recognised authority on Indian botany. The family Roxburghiaceæ was named after him by Sir Joseph Banks.

Roxburgh Club. See BOOK-CLUB.

Roxburghiaceæ. See STEMONACEÆ.

Roxburghshire, a Scottish Border county, bounded by Berwickshire, Northumberland and Cumberland, Dumfriesshire, Selkirkshire, and Midlothian. Its greatest length is 42 miles; its greatest breadth 30 miles; and its area 670 sq. m., or 428,494 acres. In the north the Tweed winds 25 miles eastward, receiving in this course the Leader and the Teviot, which latter runs 37 miles north-eastward from above Hawick to Kelso, and itself receives the Ale, Slitrig, Rule, Jed, &c. Thus the whole county, often called Teviotdale, drains to the German Ocean, with the exception only of Liddesdale, or Castleton parish, in the extreme south, whose 106 sq. m. belong to the basin of the Solway Firth. The Cheviots (q.v.) extend along the south-eastern boundary, their highest point here Auchopocairn (2382 feet); in the interior rise Ruberslaw (1392) and the triple Eildons (1385). Much of the low ground is of fair fertility, and great improvements have been made in agriculture; but rather less than two-thirds of the entire area is in cultivation, and the raising of crops is of much less importance than the grazing of sheep. Roxburgh, which gave the county its name, has been quite superseded by its neighbour Kelso (q.v.); and Jedburgh, the county town, is very much smaller than Hawick; other places are Melrose, Denholm, St Boswells, Yetholm, &c. Chief seats are Floors Castle, Mount Teviot, Minto House, and Abbotsford; and the dukes of Buccleuch and Roxburgh are much the largest proprietors. The antiquities include hill-forts; the Catrail; Dere Street; the Roman station at Newstead; the castles or peel-towers of Hermitage, Branksholm, Harden, Ferniehirst, Smailholm, &c.; and the noble monastic ruins of Melrose, Jedburgh, and Kelso. Besides many more worthies, five poets—James Thomson, Jean Elliot, Leyden, Aird, Pringle—were natives; but, although not his birthplace, Roxburghshire is

pre-eminently the land of Scott. It witnessed many a fray, but no battle greater than Ancrum Moor (q.v.). The county returned one member to parliament till 1918; since then one in conjunction with Selkirkshire. Pop (1801) 33,721; (1831) 43,663; (1861) 54,119; (1891) 53,741; (1921) 44,989.

See Jeffrey's *History of Roxburghshire* (1857-64); Sir G. Douglas, *Roxburgh, Selkirk, and Peebles* (1899); Sir James Murray, *Dialect of the Southern Counties of Scotland*; G. Watson, *Roxburghshire Word-book* (1923); W. S. Crockett, *Berwickshire and Roxburghshire* (1926); and BORDERS, BALLAD, HAWICK, TWEED, MELROSE, &c.

Roxbury, was annexed in 1867 to Boston (q.v.).

Roy, WILLIAM, the first of British geodesists, was born 4th May 1726, at Miltonhead, in Carluke parish, Lanarkshire, his father being factor and gardener to the Hamiltons of Hallerraig. He was educated at the parish school and Lanark grammar-school, and in 1747 is found acting as deputy-quartermaster in the Royal Engineers corps, engaged on the survey of Scotland. His name first figures in the *Army List* in 1757, and he gradually rose to be lieutenant-colonel (1764), colonel (1777), and major-general (1781). In 1784 he measured a base line (see ORDNANCE SURVEY) on Hounslow Heath of 27,404½ feet, or about 5½ miles, which, though the first measurement of the kind in Britain pretending to accuracy, was executed with such care that, on remeasurement after Roy's death, the difference between the two results was found to be only 2½ inches. For this splendid labour Roy received the Royal Society's Copley medal. Ill-health necessitated his removal to Lisbon in the winter of 1789; but he returned to London, and died there suddenly, 30th June 1790. In 1767 Roy was elected a Fellow of the Royal Society, to whose *Transactions* he contributed, in 1777, 'Experiments made in Britain to obtain a Rule for Measuring Heights with the Barometer.' He had also during survey-work in Scotland (1764) paid particular attention to the camps and other Roman remains in that country, and his *Military Antiquities of the Romans in Britain* was published in 1793 by the Society of Antiquaries. Roy was also surveyor-general of the coasts of Great Britain.

See two articles in the *Proc. Soc. Antiquaries Scot.* (i. p. 147, 1855; and ix. p. 562, 1873).

Royal Academy. In 1745 Hogarth and other painters, with the view of making their works known, presented certain of them to the Foundling Hospital. The public having been greatly attracted, they, in 1760, opened a free exhibition in the rooms of the Society of Arts; and, in the following year, a series of exhibitions was begun in Spring Gardens, and its promoters, styled 'The Incorporated Society of Artists of Great Britain,' received a royal charter in 1765. Disputes having arisen, twenty-nine members of this society (not—according to Redgrave—twenty-two only, as stated by Sandby) memorialised George III. to establish an academy for the encouragement of the arts of design, and the plan they submitted having been approved, the 'Royal Academy of Arts in London' was founded, 10th December 1768. The instrument of foundation provided for forty academicians, from whom the president and other officials, including professors of fine art in its various branches, should be elected; and annual exhibitions were stipulated for, their proceeds to be devoted to the aid of indigent artists and to the support of the Academy. In 1769 a class of twenty associates (to have no share in the government of the body, a restriction since modified) was created, and also a class of six associate-engravers, on the same footing, excepting that they were ineligible for election as academicians, a restriction now withdrawn. In 1771 George III. assigned rooms to the

academy in Somerset House, and during twelve years (1768-80) he contributed £5116 to its funds from the privy purse; after 1780 the help became unnecessary. In 1837 it removed to quarters in the National Gallery, and in 1867 obtained a lease of Old Burlington House. As tersely stated by Redgrave, 'the strength of the new institution consisted in its combining, under a well-framed code of laws, the most esteemed artists of the day, empowered to manage their own affairs.' The thirty-nine named in the instrument, include Reynolds, Gainsborough, Wilson, and ten foreigners; Sir Joshua was elected the first president. See Sandby, *History of the Royal Academy* (1862); Hodgson and Eaton, *The Royal Academy* (1905); A. Graves, *The Royal Academy* (a dictionary, 6 vols. 1904-6); and for the Chantrey Fund, CHANTREY.

The Royal Hibernian Academy, founded by charter in 1823, consists of twenty-five academicians and eight associates. Its first president, Francis Johnston, presented ground and erected buildings thereon for the use of the body. The Academy suffered badly in the rebellion of 1916.

The Scottish Academy, the successor of such exhibiting bodies as the society of 'Associated Artists' and the Royal Institution, was founded in 1826, under the presidency of George Watson, consisting of thirty academicians and sixteen associates (the latter increased in 1830 to twenty). In 1838 it received a charter, entitling it to the style of 'The Royal Scottish Academy of Painting, Sculpture, and Architecture'; and in 1891 a supplementary charter was granted, admitting associates to a share in the management of the body, and removing any limit to their numbers (but providing that only twenty shall participate in the pension fund), and granting extended powers for dealing with non-resident and non-exhibiting members. See Sir G. Harvey's *Notes of the Early History of the Royal Scottish Academy* (2d ed. 1873).

Royal Academy of Music, the name first given in England to an association for performing operas, mainly those of Handel, founded by the king and the principal nobility and gentry of the country, which survived for but a few years. The well-known educational institute now bearing the name was founded in 1822 by Lord Burghersh (1784-1859, afterwards eleventh Earl of Westmorland, and not less distinguished as a musician than as soldier and diplomatist), who saw with regret the great disadvantages under which natives of Great Britain suffered as compared with those of foreign countries in respect of musical education. The institution, which received a charter in 1830, was designed to give concerts as well as to provide musical education; and it has instructed many of the leading instrumentalists and vocalists of both sexes. Since its reconstitution in 1866 the most distinguished principals have been Sir George Macfarren (1876-87), Sir A. C. Mackenzie (1888-1924), and John McEwen. The Royal Academy of Music is distinct from the Royal College of Music (see CONSERVATOIRES), though allied with it for promoting musical education throughout the country by means of an 'Associated Board.' The Royal College of Organists dates from 1864. It received a royal charter in 1893, and was accommodated in its present buildings (Kensington Gore) in 1904.

Royal Assent. See PARLIAMENT; and for royal prerogative, &c., see SOVEREIGN, WARRANT, SUPREMACY, COMMISSIONS, CHARTER, BOUNTY, HOUSEHOLD, HUMANE SOCIETY, HERALDRY, CIVIL LIST, SOCIETIES.

Royal Family. By the law of England royal rank is conceded to the wife or husband, children or other descendants, and collateral relatives of the

sovereign. For the position and rights of a Queen-consort or Queen-dowager, see the article QUEEN. The husband of a reigning queen does not acquire any share in her prerogative rights, but it is usual to grant him special precedence; King Philip and William III. were associated in title and power with their wives by act of parliament. Of the sovereign's children the eldest son is, of course, heir-apparent; he is born Duke of Cornwall, and he is always created Prince of Wales (q.v.). The Prince and Princess of Wales and the Princess Royal (the eldest daughter of the sovereign) are within the protection of the statute of Edward III. relating to Treason (q.v.). An heir-presumptive to the throne has no special rank or precedence as such. The younger children of the sovereign take rank after the heir-apparent; by a statute of 1540 a place is assigned to them at the side of the cloth of estate in the parliament chamber; it is customary to confer peerages on all the younger sons. On a reference by George II. to the House of Lords it was held that Edward, Duke of York, second son of the Prince of Wales, was entitled to a place among the king's children. Members of the royal family enjoy considerable privileges; they pay no tolls or duties, and they are exempted from succession duty and some other taxes.

In order to protect the succession to the crown against the dangers which might arise from unsuitable alliances, the following special rules are applied to members of the royal family: (1) by the Royal Marriage Act of 1772 it is enacted that no descendant of George II. (other than the issue of princesses married into foreign families) may marry without the consent of the sovereign; any marriage contracted without such consent is void. But any such descendant, if above the age of twenty-five, may, after twelve months' notice to the Privy-council, contract marriage without such consent, unless both Houses of Parliament declare their disapproval. All persons who solemnise or are present at a marriage contrary to the act are liable to the penalties of Perjury (q.v.). The act was passed in consequence of the marriage of the Duke of Gloucester with the widow of Lord Waldegrave and of the Duke of Cumberland with the widow of Colonel Horton. In 1793 the Duke of Sussex was married at Rome to Lady Augusta Murray; the marriage was declared void by the Prerogative Court, and the claims of Sir Augustus d'Este, eldest son of the marriage, were rejected by the House of Lords in 1844. (2) The grandchildren of the sovereign (not being the issue of princesses married to foreigners and residing abroad) are under the control of the sovereign, who may order the place of their abode, without regard to the wishes of their parents. The law was so laid down by a majority of the judges in the case of the children of Frederick, Prince of Wales, in 1737. The policy of these rules has been much questioned, and the conduct of George IV. in regard to his marriage with Mrs Fitzherbert (q.v.) in 1785 affords a strong argument against the existing law. See also CIVIL LIST.

Royal Fern (*Osmunda*), the most striking of British ferns; it grows in damp places, and used to be fairly common in districts of a very moist climate in Scotland and Ireland, but is disappearing before collectors. It has two kinds of leaves, sterile and fertile; the sterile are bipinnate; the fertile, covered with spore-cases, have the appearance of a panicked inflorescence, due to the absorption of the central tissues—hence the name Flowering Fern. The genus is allied to another, *Todea*, which has only one kind of leaf, and the two are included in the Osmundaceæ. There are only a very few species. The spores give rise at once to the prothallus without the intervention

of a protonema; and the prothalli tend to be unisexual—i.e. to have the male and female



Royal Fern (*Osmunda regalis*):
a, leaflet of barren frond; b, portion of fertile frond.

organs on separate plants; or the male organs appear on the prothallus before the female.

Royal George. See WRECKS.

Royal Institution, founded in 1799 by Count Rumford, Sir Joseph Banks, and others, received a royal charter in 1800, and had for its objects the facilitating of mechanical inventions, the promotion of their use, and the teaching of science and its applications by means of lectures and experiments. It was reconstituted in 1810. Among its lecturers have been many of the most eminent English men of science. It maintains professors of natural philosophy, chemistry, and physiology, and has laboratories (including since 1896 the Davy-Faraday research laboratory presented by Dr Ludwig Mond).

Royal Military Asylum, commonly called the 'Duke of York's School,' an institution for educating the sons—generally orphans—of British soldiers, was established at Chelsea in 1801-3 by the Duke of York, but transferred in 1909 to Guston, near Dover. The boys have a completely military organisation, with scarlet uniform, band, &c. A similar institution is the Queen Victoria School at Dunblane. As a result of their training a large proportion of the pupils ultimately volunteer into the army; and the military bands are largely recruited from these schools. See MILITARY SCHOOLS, BAND.

Royal Society. The origin of this society may be traced back to those stirring years of civil strife that brought in the Commonwealth. Clubs for political, theological, and sectarian purposes were then numerous and active; and in the year 1645 'divers worthy persons, inquisitive into natural philosophy, and other parts of human learning, did, by agreements, meet weekly in London on a certain day, to treat and discourse of such affairs.' Among these worthy persons were certain medical men, Dr Wilkins, afterwards Bishop of Chester; Foster, professor of astronomy in Gresham College; Wallis, the mathematician; and others, including Haak, a learned German from the Palatinate; and out of their meetings arose the now world-famous Royal Society. Wallis records that the subjects discoursed of were 'the circulation of the blood; the valves in the veins; the venæ lacteæ; the lymphatic vessels; the Copernican

hypothesis; the nature of comets and new stars; the satellites of Jupiter; the oval shape of Saturn; the spots in the sun, and its turning on its own axis; the inequalities and selenography of the moon; the several phases of Venus and Mercury; the improvement of telescopes, and grinding of glasses for that purpose; the weight of air; the possibility or impossibility of vacuities, and nature's abhorrence thereof; the Torricellian experiment in quicksilver; the descent of heavy bodies, and the degrees of acceleration therein; and divers other things of like nature.' In 1662 the persevering 'philosophers' (as students of the mathematical and natural sciences were then usually called) were, through the 'grace and favour' of Charles II., incorporated by charter, in which they were described as the Royal Society of London for the Promotion of Natural Knowledge. The king gave them also a mace, and subsequently granted two other charters conferring additional powers and privileges. They are inscribed in a handsome volume known as the Charter Book, which, containing, as it does, the sign-manual of the founder, of other royal personages, and of nearly every Fellow elected into the society, presents a collection of autographs unequalled in the world.

Through many difficulties the young society pursued its way. Its meetings were interrupted by the plague and the great fire; but in March 1664-65 it had published the first number of the *Philosophical Transactions*, and thus commenced a record of its labours and researches, and at the same time a history of science of the highest value. Besides this, the society has published since 1800 an octavo serial entitled *Proceedings*. The *Catalogue of Scientific Papers* contains the titles of scientific papers published in all parts of the world from 1800 to 1900. In 1901 its place was taken by the *International Catalogue of Scientific Literature*, the publishing of which is in the hands of the Royal Society. The society's publications are not restricted to the Fellows, but are sold to the general public. By increase of numbers—including scientific men on the Continent, who were elected as foreign members—the society widened its sphere of usefulness. It promoted the publication of Newton's *Principia* and optical works; it lent instruments to Greenwich Observatory in its early days, and its Fellows were appointed visitors of that establishment by Queen Anne—a function which they still exercise; it aided travellers and scientific investigators; advised the government on scientific subjects; Cook's celebrated voyage to observe the transit of Venus was undertaken at its instance; and since the voyage of the *Endeavour* many scientific expeditions have been equipped under the advice of the Royal Society. In 1710 the society removed to a house which it bought in Crane Court, Fleet Street. In 1780, by order of George III., quarters were assigned to it in the then new palatial building, Somerset House. In 1857, at the request of the government, it migrated westward to Burlington House, a wing of which it now occupies.

Various bequests and gifts (including £100,000 from Sir Alfred Yarrow) enabled the society in 1922 and 1923 to establish a number of research professorships in order that men of ability of the highest type should be able to give their whole time to research. The society sends two representatives to the Meteorological Committee, and otherwise controls certain departments of meteorological research, while, from its inception in 1902, the National Physical Laboratory has been under its scientific control. In fulfilment of trusts the society awards annually, in recognition of scientific work and discoveries, several medals, including the Copley medal and two Royal medals; the Rumford medal every two years for researches in

light or heat; the Darwin medal for biological research; and the Davy medal for chemical investigations. Some of the most illustrious names in the annals of science appear on the roll of presidents of the Royal Society. See the *Record of the Royal Society* (3d ed. 1912) and the society's *Year-book*; and for the two dining clubs (amalgamated in 1901), the *Annals of the Royal Society Club* (ed. Sir A. Geikie, 1917), and *Annals of the Philosophical Club of the Royal Society* (ed. T. G. Bonney, 1919).

The ROYAL SOCIETY OF EDINBURGH, which took the place of the Philosophical Society of that city, was incorporated by royal charter in 1783. It owed its origin to Principal Robertson the historian, who successfully laboured to found in Edinburgh a society on the model of the Berlin Academy, for the investigation and discussion of subjects in every branch of science, erudition, and taste. In obtaining the royal charter the Principal was aided by the influence of Henry, Duke of Buccleuch, who zealously co-operated in the foundation of the society. The society was formally constituted at a meeting held in the College Library on the 23d June 1783, where the subsequent meetings were held till 1810, when the society purchased a house in George Street. In 1826 the society removed to apartments, leased from government, in the Royal Institution in Princes Street, removing again in 1909 to George Street. The original list of members included the names of most of the literati of Scotland—such as David Hume, Dugald Stewart, Henry Mackenzie, Adam Smith, Thomas Reid, Joseph Home, Sir James Hall, Joseph Black, James Hutton, and James Watt. The first president was Henry, Duke of Buccleuch; and amongst his successors have been Sir Walter Scott, the Duke of Argyll, Sir David Brewster, Lord Kelvin, Sir William Turner, Professor James Geikie, Dr John Horne, and Sir Alfred Ewing.

The papers read are published in the society's *Transactions*, and in its *Proceedings*. It has an extensive library consisting mainly of scientific serials of all countries. There are some valuable prizes, which are bestowed on the authors of the best communications on scientific and other subjects. These are the Keith Prize, founded by Alexander Keith of Dunnottar; the M'Dougall Brisbane Prize, by Sir Thomas M. Brisbane; the Neill Prize, by Dr Patrick Neill; the Gunning Victoria Jubilee Prize, by Dr R. H. Gunning; the James Scott Prize, and the Bruce Memorial Prize. See the history of the society in Neill's index to the *Transactions*.

Royalty, originally the seigniorage paid to the crown for a manor of which the king is lord, or a tax paid to the king for lands or to a superior as representing the crown; but most familiar nowadays in two derived senses of modified signification. Royalty is the term for the sum paid on minerals removed from a mine, not necessarily to the crown, but to the landlord, on the theory that the landlord owns the soil to the centre of the earth, and accordingly all the minerals found beneath his land (see MINING). This burden is by many regarded as a grievance, and its abolition advocated. Another sense of the word is the sum paid to the holder of a patent, by percentage for each article manufactured under the patent, or for the use of patent articles hired out by the patentee (see PATENT). Another is the sum paid from time to time by a publisher to an author, calculated on the number of copies sold (see BOOK-TRADE, COPYRIGHT).

Royan, a small seaport of France (dep. Charante-Inférieure), stands on the north side of the estuary of the Gironde, 60 miles NW. of Bordeaux. It is one of the most frequented seaside places on the Atlantic coast of France. Pop. 10,000.

Roy Bareilly. See RAI BAREILL.

Royden, AGNES MAUDE, preacher, was born in 1876, the youngest daughter of Sir Thomas Royden, first baronet of Frankby Hall, Birkenhead. Educated at Cheltenham Ladies' College and Lady Margaret Hall, Oxford, she thereupon allied herself closely with the women's movement. She lectured in English literature to the Oxford University Extension Delegacy, and edited the *Common Cause* till 1914. In 1917 she became assistant preacher at the City Temple, and in 1920 began services at Kensington.

Royer-Collard, PIERRE PAUL, a French statesman, was born 21st June 1763, at Sompuis (dept. Marne). On the outbreak of the Revolution he was elected a member of the municipality of Paris, and from 1790 to 1792 acted as joint-secretary. Having incurred the enmity of the Jacobins, he lived in hiding at Sompuis during the Reign of Terror. Three years afterwards (1797) chosen to the Council of the Five Hundred, he took an active part in the work of that assembly, until the 18th Fructidor. In 1811 he was appointed professor of Philosophy in Paris, and exercised an immense influence on the philosophy of France. Rejecting the purely sensuous system of Condillac, he proceeded eclectically, giving special prominence to the principles of the Scottish Philosophy (q.v.) of Reid and Stewart. Strongly 'spiritualist' as opposed to materialism, he originated the 'Doctrinaire' school, of which Jouffroy and Cousin were the chief representatives. He was appointed president of the Commission of Public Instruction in 1815, but resigned that post in 1820; in 1815 also he returned to political life as deputy for the department of Marne. The French Academy opened its doors to him in 1827; and in 1828 he was named president of the Chamber of Representatives, and in that capacity presented the address of the 221 deputies (March 1830) withdrawing their support from the government, which the king refused to hear read. Next day the Chamber was prorogued. From 1842 Royer-Collard completely withdrew from public life; he died, 4th September 1845, at his country seat of Châteauneuf, near St Aignan (Loir-et-Cher). His salon was latterly the resort of such men as Cousin, Guizot, De Broglie, Casimir Périer, Villemain, De Rémusat, and others. He never was a writer, and he became a philosopher only by accident: his true interest in life was politics, his real eminence as a political orator after the ancient pattern, rather than that of the modern parliamentary debater. His idea of the monarchy was utopian; the famous *charte* was found impracticable as the sheet-anchor of liberty; even his best speeches, triumphs of dialectic as they often were, fell short of the effect that seemed secure, whether because ever in human things facts overturn the conclusions of reason, or because reason does not reach the profound depths in which are generated the opinions of men.

See biographies by Philippe (1857), De Barante (new ed. 1878), and Spuller (1895); R. de Nesmes Desmonets, *Les Destinées politiques de Royer-Collard* (1908); Schérer's *Études sur la Litt. Contemp.*, vol. i., and Faguet, *Politiques et Monarchistes du XIX^e Siècle* (1891).

Royston, an urban district of Hertfordshire, 20 miles north of Hertford. There is an ancient church (1250-80), and in the middle ages the Austinian canons had a priory here. In 1742 a cavern was discovered under one of the streets. It is said to date back to before Roman times and to have served later as a sepulchre, a hermitage, and an oratory. Pop. 4000.

Royton, a town of Lancashire, 2 miles NNW. of Oldham, with large cotton-factories; pop. 17,000.

Rsheff, or **RJEV**, a Russian river port on the Volga, lies 135 miles NW. of Moscow; pop. 25,000.

Ruabon, a town of Denbighshire, $4\frac{1}{2}$ miles SSW. of Wrexham, with collieries and brickworks; pop. 3600.

Ruanda. See **URUNDI**.

Rubasse, a mineral prized for ornamental uses, is rock-crystal, limpid or slightly amethystine, filled internally with minute brown spangles of specular iron, which reflect a bright red, equal to that of the most brilliant ruby. An artificial rubasse is made by heating very pure rock-crystal red hot and plunging it into a coloured liquid.

Rubber. See **INDIA-RUBBER**.

Rubble, a common kind of masonry, in which the stones are irregular in size and shape. Walls faced with ashlar are generally packed with rubble at the back. Rubble is of various kinds, according to the amount of dressing given to the stones. Common rubble is built with stones left almost as they come from the quarry. Hammer-dressed rubble is so called when the stones are squared with the mason's hammer; coursed rubble, when the stones are squared and equal in height, &c.

Rubefacients are external agents employed in medicine for the purpose of stimulating, and consequently reddening, the part to which they are applied. All agents which, after a certain period, act as Blisters (q.v.) may be made to act as rubefacients if their time of action is shortened. The mildest rubefacients are hot poultices, cloths soaked in very hot water, moderately stimulating liniments—as, for example, soap-liniment, with various proportions of liniment of ammonia, or chloroform, &c. Spanish fly, in the form of *Emplastrum Calefaciens*, or warm plaster, in which the active ingredient is blunted by the free admixture of soap-plaster, resin-plaster, &c., is a good form of this class of agents. Capsicum or Cayenne pepper, in the form of an ointment, is an excellent rubefacient; it is much used in the West Indies, but is seldom employed in this country. Mustard, in the form of *Cataplasma Sinapis*, or mustard poultice, and oil of turpentine are perhaps the best of the ordinary rubefacients. The former is applied to the chest, with much advantage, in many cases of pulmonary and cardiac disease, such as bronchitis, pneumonia, &c., and to the surface of the abdomen in various affections of the abdominal viscera. Mustard is also used by mixing with hot baths for the feet in cases of catarrh, or in general baths as a stimulant to the whole skin. The best method of employing turpentine is to sprinkle it freely on three or four folds of clean flannel, wrung out of boiling water. The sprinkled surface of this pad is placed upon the skin, and a warm dry towel is laid over the flannel. Two or three such applications will produce a powerful rubefacient effect. Turpentine thus applied is serviceable in all the cases mentioned in the above remarks on mustard, as well as in sore throat, chronic rheumatism, neuralgia, &c.

Rubella, or **GERMAN MEASLES**. See **MEASLES**.

Rubens, **PETER PAUL**, the most celebrated painter of the Flemish school, was born on the 28th of June 1577 at Siegen, in Westphalia, where his father, John Rubens, an eminent lawyer, was living in disgrace, in consequence of his intrigue with Anne of Saxony, second wife of William the Silent. In 1578 his parents settled in Cologne; and upon the death of her husband in the year 1587, his mother returned to her native city of Antwerp, where the boy was educated in the Jesuits' college. He served for a short time as a page in the household of Margaret de Ligne, widow of the Count of Lanaing, and was intended for the pro-

fession of law; but he was animated by a strong desire to become a painter, and at the age of thirteen he began the study of art, first, for a brief period, under Tobias van Haecht, a skilful landscape-painter; then for four years under Adam van Noort, a painter of religious subjects, distinguished for his excellent colouring; until finally, in his nineteenth year, he passed into the studio of Othon van Veen, court-painter to the Archduke Albert, governor of the Netherlands.

In 1599 he was admitted a master of the Brotherhood of St Luke in Antwerp; and in the following year he started for Italy, making his way to Venice, where he studied the works of Titian and Veronese. He next entered the service of Vincenzo Gonzaga, the magnificent and luxurious Duke of Mantua, as gentleman of the chamber and court-painter; and in 1605 was despatched on a mission to Philip III. of Spain, thus beginning the career of a diplomatist, for which his keen intellect, his polished urbanity, and his linguistic attainments so admirably qualified him. While at Madrid he executed portraits of many of the Spanish nobility, as well as several historical subjects. On his return from Spain he travelled in Italy, copying celebrated works for the Duke of Mantua; and to this period is referable the sketch, now in the National Gallery, London, from one of the subjects of Mantegna's 'Triumph of Julius Caesar.' In 1608, while in Genoa, he received news of his mother's illness, and returned home, but too late to see her alive. Settling in Antwerp, he was appointed in 1609 court-painter to the Archduke Albert and his wife Isabella, and soon afterwards married his first wife, Isabella Brant, whom his pencil has often portrayed, and who appears, seated hand in hand with himself, in the famous full-length group at Munich.

The painter was now rapidly approaching his full artistic maturity, and his 'Descent from the Cross,' in the cathedral of Antwerp, begun in 1611 and completed in 1614, and usually regarded as his masterpiece, is a work in which both his earlier and later manner may be traced. It is a triptych, showing on the interior of its wings The Visitation and The Presentation in the Temple, and on their exterior subjects of St Christopher and a Hermit bearing a lantern.

In 1620 Rubens was invited to France by Marie de' Medici, the queen-mother, who was then engaged in decorating the palace of the Luxembourg in Paris; and he undertook for her twenty-one large subjects commemorating her marriage to Henry IV., works, completed with the aid of assistants in 1625, which are now in the Louvre, most of the sketches by the master's own hand being at Munich. In 1628 he was despatched by the Infanta Isabella upon a diplomatic mission to Philip IV. of Spain. He remained for nine months in Madrid, and there he made the acquaintance of Velasquez, and executed some forty works, including five portraits of the Spanish monarch. In 1629 he was appointed envoy to Charles I. of England, to treat for peace; and, while he conducted a delicate negotiation with perfect tact and success, his brush was not idle, for he painted the 'Peace and War,' now in the National Gallery, London, and the portrait of the king and his queen as St George and Cleolinde, a work now at Windsor, and also made sketches for the Apotheosis of James I. for the Banqueting-hall at Whitehall, completing the pictures on his return to Antwerp. In acknowledgment of his services he was knighted by Charles I.; and he received a similar honour from Philip IV.

In 1630 Rubens married his second wife, Helena Fourment, a beautiful girl of sixteen; in 1635 he designed the decorations which celebrated the

entry of the Cardinal Infant Ferdinand into Antwerp as governor of the Netherlands; and, having with much difficulty completed a picture of 'The Crucifixion of St Peter' for the church dedicated to that saint in Cologne, he died at Antwerp on the 30th of May 1640, and was interred with great pomp in the church of St Jacques, his body being deposited, two years afterwards, in a chapel specially built there for its reception.

Not only was Rubens great as a subject-painter, but he was equally distinguished as a portraitist, an animal-painter, and a landscapist. The main characteristics of his productions are their power, spirit, and vivacity, their sense of energy, of exuberant life. As Reynolds has truly said, 'Rubens was perhaps the greatest master in the mechanical part of the art; the best workman with his tools that ever used a pencil; and he was great alike in handling and as a colourist. It is, however, mainly on technical grounds that he claims supremacy, for his works are wanting in the dignity, quietude, refinement, and in the profound imagination which distinguish the greatest Italian painters. He was a most prolific artist; his works number in all several thousands, of which Smith in his *Catalogue* has described over thirteen hundred; and about twelve hundred prints have been executed after his paintings and designs, frequently under his personal supervision by such of the best contemporary engravers as Pontius, Vosterman, Soutman, and the Bolswerts. Many of his finest works are still at Antwerp; but his art may probably be most adequately studied in the Pinakothek at Munich, which contains nearly a hundred examples of his brush, several of them ranking with his noblest efforts. Among the most distinguished of his many pupils were Van Dyck, Van Diepenbeck, Jordaens, and Snyders.

See *Lettres Inédites de P. P. Rubens*, publiées par Emile Gachet (Brussels, 1840); *Life by De Waagen in Raumer's Historisches Taschenbuch* (Berlin, 1833; trans. Noel, 1840); W. Noel Sainsbury, *Original Unpublished Papers Illustrative of the Life of Rubens* (1859); A. Michiels, *Rubens et l'École d'Anvers* (Paris, 1877); the volume by Kett (1880); that by Ruelens; the *Life by Michel* (trans. 1899); and books by Hope Rea (1906), Rosenberg (1905), Dillon (1909), Rooses and Ruelens, *Codex Diplomaticus Rubenianus* (1887 et seq.); and the monumental quarto of Max Rooses (1903; trans. 1904).

Rube'ola. See MEASLES.

Rübezahl. See RIESENBERGIRGE.

Rubiaceæ, a family of dicotyledonous plants, in which, according to many botanists, the Cinchonaceæ are included as a sub-family; but which, as restricted by others, consists entirely of herbaceous plants, with whorled leaves, angular stems, and numerous very small flowers; the calyx superior, with four, five, or six lobes, or almost wanting; the corolla wheel-shaped, or tubular, regular, inserted into the calyx, and with the same number of divisions as the calyx; the stamens equal in number with the lobes of the corolla; two styles; the fruit a dry pericarp with two cells, and one seed in each cell. The wider limits include well over 4000 species, chiefly tropical. To this family belong Madder (q.v.), Bedstraw (q.v.), and Woodruff (q.v.).

Rubianus. See CROTUS RUBIANUS.

Rubicon, a stream of Central Italy, falling into the Adriatic a little north of Ariminum, has obtained a proverbial celebrity from the well-known story of its passage by Cæsar, in the middle of January, 49 B.C. It formed the southern boundary of his province, so that by crossing it he virtually declared war against the Republic. Cæsar himself makes no mention of its passage; Suetonius, Plutarch, and Lucan tell how he hesitated awhile

on the bank and then crossed with the words, *Jacta est alea* ('the die is cast'). Hence the modern phrase 'crossing the Rubicon' is derived (with its applications to games of cards, &c.). A papal bull of 1756 identified the Rubicon with the modern Luso, but a comparison of distances shows that it must rather have been the Fiumicino or Rugone.

Rubidium (sym. Rb; atom. number, 37; atom. wt. 85.45) is one of the alkali metals. Its salts exist in very minute quantities in numerous mineral waters, and in these rubidium salts, along with cesium salts, were detected by Bunsen and Kirchhoff by means of spectrum analysis. The mineral lepidolite is the best material to prepare rubidium compounds from. The metal is, like cesium, silver-white. It melts at 38.5° C., but is still soft at -10° C. Its sp. gr. is 1.52. Like cesium, it takes fire spontaneously in the air, and it decomposes water at the ordinary temperature, in the latter respect resembling all the other alkali metals. The salts of rubidium resemble generally those of potassium. The name rubidium is derived from *rubidus*, 'dark red,' in allusion to the colour imparted to a flame by the salts of the metal.

Rubinstein, ANTON, pianist and composer, was born of Jewish parents near Jassy in Moldavia in 1829, and received an early education in music. Liszt heard him play as an infant prodigy in Paris in 1841, and recognised his genius at once. After some further touring and some serious study in Berlin and Vienna, Rubinstein taught music in St Petersburg from 1848 to 1854. From 1862 to 1867 he was the director of the conservatoire, of which he had been one of the founders, and in 1887 he was induced to resume the directorship. Otherwise his life was spent in brilliant concert tours all over Europe. He visited England in 1842 and in 1857, and had an enthusiastic reception in the United States in 1872. As a pianist he held the highest rank, with a supreme mastery of technique. Opinions differed about his fidelity to a composer's intentions, but his playing was always characterised by deep emotional feeling and powers of expression. Rubinstein was also a prolific composer, but few of his works have survived, except in the smaller forms. His works include several operas, of which *The Demon* and *The Maccabees* are the best, five symphonies, the 'Ocean' and the 'Dramatic' being the best known, various cantatas, concertos, songs, and pieces of chamber music. His style, influenced by Schubert and Mendelssohn, tends to be diffuse without being specially distinctive, and it is very unlikely that his works will ever again come into favour. He died in 1894.

His brother, NICHOLAS RUBINSTEIN (1835-81), also an excellent pianist, founded the conservatoire at Moscow.

See *Autobiography of Anton Rubinstein*, trans. from the Russian by Aline Delano (1891), and studies and biographies by M'Arthur (1889), Zabel (Leipzig, 1892), and Cuthbert Cronk (1900).

Ruble. See ROUBLE.

Rubrics (Lat. *rubrica*, from *ruber*, 'red'), in classic use, meant the titles or headings of chapters in law-books, and is derived from the red colour of the ink in which these titles were written, in order to distinguish them from the text. In mediæval and modern use the name is applied to the directions in the service-books of the church as to the ordering of the prayers and the performance of the ceremonies that accompany them. The first printed missals have few rubrics, and the printing of both the words and ceremonies of the mass in full dates only from 1485. The same name, together with the usage itself, is retained in the Book of Common Prayer; and in all cases, even where the direction has ceased to be printed in red ink, the name

rubric is still retained. Where red ink is not employed the rubric is distinguished from the text by italics or some other variety of print.

Rubruquis, WILLIAM DE, a mediæval traveller, was born, it is pretty certain, at Rubrouck (8 miles N.E. of St Omer, in northern France), and not at Ruysbroeck, near Brussels, early in the 13th century. He entered the Franciscan order, and was sent by Louis IX. of France into central Asia for the purpose of opening up communications with Sartak, the son of the Mongol prince, Batû Khan, a supposed Christian. Friar William travelled (1253) by way of Constantinople across the Black Sea and the Crimea to the Volga. Sartak referred him to his father, Batû, and that prince sent him forward to the Mongol emperor, Manga Khan, whom he found on 27th December, about 10 days' journey south of Karakorum in Mongolia. With that sovereign he remained until July 1254, then returned to the Volga, penetrated the defiles of the Caucasus, proceeded through Armenia, Persia, and Asia Minor, to Syria, and arrived at Tripoli in August 1255. King Louis had meanwhile returned to France, and Friar William wrote him the account of his journey which has come down to us. It has been called the greatest geographical masterpiece of the Middle Ages by virtue of its truthfulness and freedom from invented marvels. Of the later history of Rubruquis the only fact known is that he was living in 1293, when Marco Polo was returning from the East.

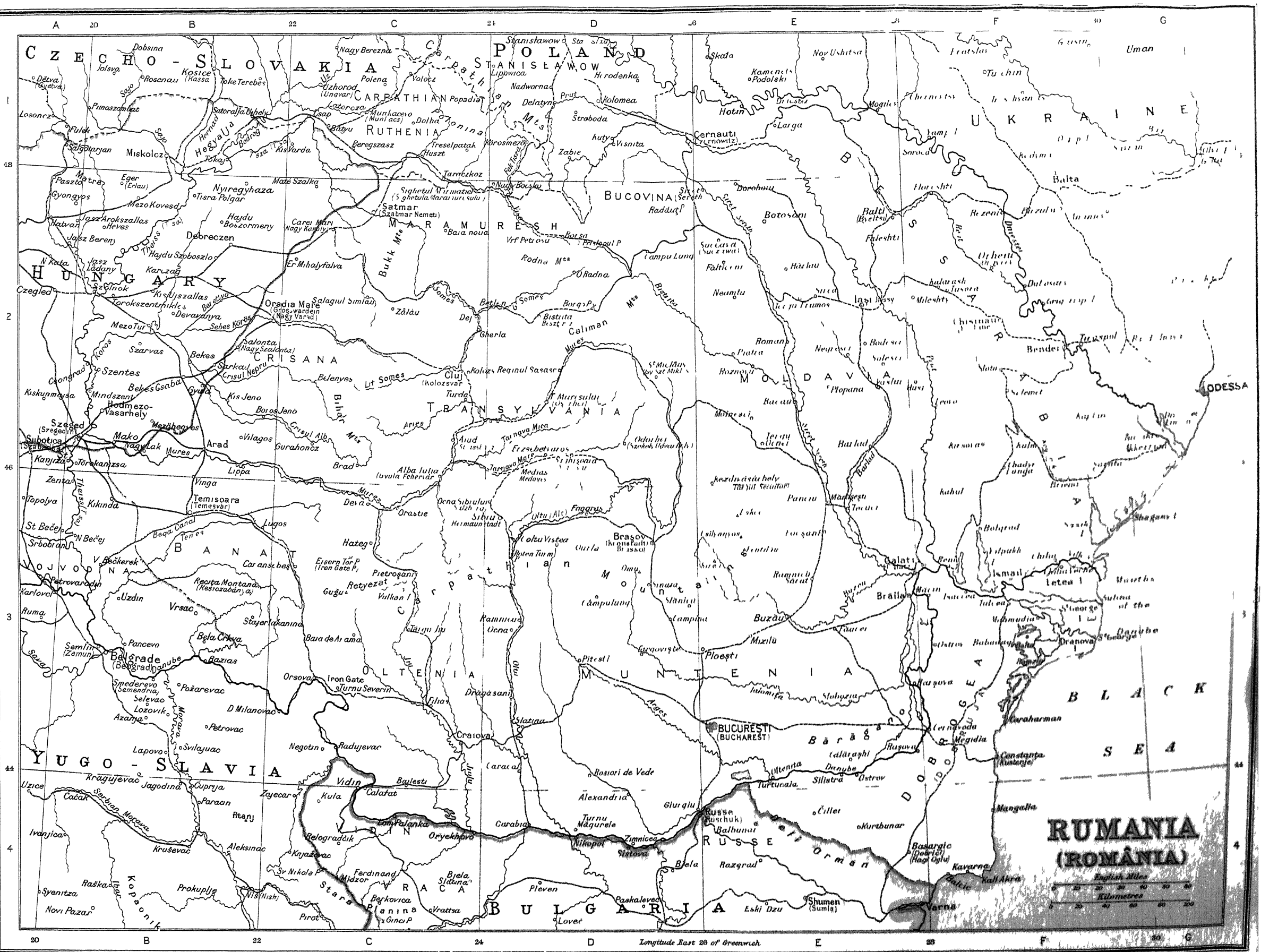
Rubus, a genus of plants of the family Rosaceæ, distinguished by a 5-lobed calyx without epicalyx, and the fruit formed by an aggregation of small drupes adhering to each other upon a long *torus*. The fruit is eatable in all, or almost all, the species. The genus is a large one, comprising some 300 species, widely distributed over nearly every part of the globe. Among the most important species are *R. Chamæmoris*, the Cloudberry (q.v.); *R. Idæus*, the Raspberry; *R. cæsius*, the Dewberry; *R. arcticus*, characterised by Linnaeus as the prince of wild berries; *R. fruticosus*, the Common Bramble (q.v.); and *R. saxatilis*, the Stone Bramble. Of the Common Bramble, a number of varieties having very large luscious fruit have been introduced into Britain from North America with the view of cultivating them for their fruit. They are much appreciated in Canada and in the United States. The Loganberry is a hybrid between Blackberry and Raspberry. The ornamental species frequently planted in British gardens are *R. odoratus*, the Virginian Raspberry; *R. laciniatus*, with large flowers and elegant leaves; and *R. biflorus*, whose snow-white bark contrasts strikingly with the dark-green leaves.

Ruby, a gem much prized, is a pure transparent, red-coloured Corundum (q.v.), just as Sapphire (q.v.) is a blue variety of the same mineral. It is inferior in hardness to the diamond only among gems. Although usually red, yet violet, pink, and purple rubies are met with, but the most highly esteemed are those which have the colour of pigeon's blood. The finest true oriental rubies are more highly prized than diamonds of similar size and quality; those over a carat in weight are worth on an average £30 per carat, and no stone increases so much in value in proportion to increase in size. But perfect specimens, as regards colour, transparency, and freedom from flaws, are much less common than good diamonds. Gems of this character seldom exceed 8 or 10 carats; but Gustavus III. of Sweden presented one to the Empress Catharine, which was of the size of a pigeon's egg. The throne of the Great Mogul, according to Tavernier, was adorned with 108 rubies of from 100 to 200 carats each. One possessed by the king of Ceylon was,

according to Marco Polo, a span in length, as thick as a man's arm, and without a flaw; Kublai Khan offered for it the value of a city, but the king would not part with it. The Burmese government sent two rubies to London in 1875, one of which, reduced by recutting to 32 $\frac{1}{2}$ carats, was sold for £10,000; the other, of 38 $\frac{1}{2}$ carats, was sold for £20,000. The specific gravity of the ruby (3.900 to 4.2833) exceeds that of all other gems. When rubbed it becomes electrical, and remains so for some time. The finest rubies—those having the colour of pigeon's blood—come from Upper Burma, near Mogok, north of Mandalay (see BURMA). Dark-red rubies, sometimes with a brownish tint, are found in Siam, and purplish rubies in Ceylon. Rubies are also met with in the mountain-region of Yunnan in China, in Afghanistan, and in the basin of the Oxus. The true or oriental ruby, as above described, occurs in crystalline limestone in Burma, and in alluvial deposits which have been derived from the denudation of granitoid igneous and schistose rocks. Ruby-bearing gravels and sands occur sparingly in Europe, as in Auvergne, Bohemia, the Urals, &c. Small rubies have also been detected in such rocks as basalt, as in Victoria and New South Wales; and fine rubies have been reported to be found in New Guinea. Many of the so-called rubies of jewellers are not true or oriental rubies, but varieties of Spinel (q.v.), a mineral composed chiefly of alumina and magnesia, inferior in hardness and of less specific gravity than the oriental ruby, and crystallising in the cubical system. Oriental rubies belong to the hexagonal system, and, unlike the spinel, are always dichroic. Spinel rubies are found in the form of crystals or rounded pebbles in alluvial deposits and in the beds of rivers in Ceylon, Siam, Pegu, Badakshan, and other eastern countries, having been derived like the true ruby from crystalline igneous and schistose rocks. They occur also in crystalline limestone and in serpentine. Small rounded spinel-rubies occur in the sands of mountain-streams in Wicklow; and large crystals have been found in various parts of North America, but rarely, if ever, fit for the purposes of the jeweller. Spinel is also found in Australia. *Spinel-ruby* is the name given by jewellers to a stone of a deep carmine-red; a rose-red stone is distinguished as *Balas-ruby*; red with a decided tinge of orange is *Vermeil* or *Vermeille*; yellow or orange-red is *Rubicelle*; violet is *Almandine ruby*. There are also transparent spinels, which when large and fine are treated as jewels. All these, however, are merely variously-tinted varieties of one and the same mineral—spinel—which is allied to Corundum (q.v.), being composed mainly of alumina, with a smaller proportion of magnesia.

Synthetic rubies are made from precipitated alumina by fusion in an inverted blowpipe flame, the characteristic colour being obtained by adding 2 to 3 per cent. of chromium alum to the ammonium alum from which the alumina is precipitated. The artificial rubies can be distinguished from natural stones, as a rule, by the presence of air-bubbles and curved streaks not found in the latter.

Rückert, FRIEDRICH, German poet, was born at Schweinfurt, 16th May 1788, and educated there and at Würzburg. For some years he led a wandering life, studying philology and poetry, and cultivating the muses. During this period of his life he helped Arndt and Theodor Körner to fan the flame of German patriotism by his *Deutsche Gedichte* (1814), especially by the *Geharnischte Sonette* included in this volume. From 1826 to 1841 he filled the chair of Oriental Languages at Erlangen; but the greater part of his summers were passed at the country seat of his wife's parents, Neuses near Coburg. After learning



Persian, Arabic, and Turkish, incited thereto by Hammer-Purgstall at Vienna (1818), Rückert recast in German verse, with great skill, several of the famous books of the East, as *Die Verwandlungen des Abu Seid* of Hariri (1826), *Nal und Damajanti* from the *Mahabharata* (1828), *Rostem und Sohrab* from Firdausi's *Shah-Namah* (1838), *Amrilkais* (1843), *Hamasa* (1846), a collection of Arabic folk-songs, and others. His most popular books are the collection of lyrics entitled *Liebesfrühling* (1844) and the reflective poems gathered together as *Die Weisheit des Bruhmanen* (1836-39). In 1841 Frederick-William IV. invited him to Berlin, making him professor of Oriental Languages; but the poet preferred his idyllic life at Neuses, and went back there in 1848. There he died on 31st January 1866. Rückert wrote with fatal ease; he tried nearly all forms of poetical composition, and produced too much. Nevertheless he penned several charming little lyrics, which may be read in the selected *Gedichte* (1841). Two qualities distinguish his work in general—a marvellous command of language and rhyme, and the gift of giving poetic expression to philosophic thought. The former sometimes led him into mannerisms of form and unpleasing *coups de force*; the latter often betrays him into throwing a poetic glamour over dull, pedantic, and unimportant ideas. His posthumously published work includes German adaptations of Theocritus, Aristophanes, Kálidása's *Sakuntala* (1867), Sádi's *Bostán* (1882), and a good deal of original poetry.

Rudbeckia, a North American genus of Compositæ, of the Sunflower sub-family.

Rudd. See RED-EYE.

Rudder. See STEERING.

Rudder-fish, a name loosely applied to at least three different kinds of fish, of which the Pilot-fish (q.v.) is one.

Ruddiman, THOMAS, Latin grammarian, was born near Banff in 1674, and in 1690 gained a bursary at King's College, Aberdeen, taking his M.A. four years later. In 1695 he became parish schoolmaster of Laurencekirk, and here in 1699 accidentally made the acquaintance of the celebrated physician and Latinist, Dr Archibald Pitcairne, who was so impressed with his learning and sagacity that he got him appointed assistant-keeper of the Advocates' Library, Edinburgh. His new office gave him ample opportunity for prosecuting his favourite studies, but the remuneration was so small (£8, 6s. 8d. *per annum*) that, in 1707, he started business as a book auctioneer. In that year he edited Florence Wilson's Latin *Dialogue on the Tranquillity of the Mind*, to which he prefixed a life of the author; in 1709 Arthur Johnston's *Poetical Paraphrase of the Song of Solomon and Cantica*—both also in Latin. In 1714 appeared his well-known *Rudiments of the Latin Tongue*; in 1715 his great edition of Buchanan's works. He now exchanged the calling of a book auctioneer for the more congenial one of printer; and in 1728 he was appointed printer to the university, in 1730 principal keeper of the Advocates' Library. In 1725-32 he published his great *Grammaticæ Latine Institutiones*, on which his philological reputation mainly rests; in 1739 he completed Anderson's magnificent *Diplomata et Numismata Scotiæ*, writing the learned Latin introduction and appendices. Controversy as to the respective merit of the Latin verse of Johnston and Buchanan, and as to the hereditary right of the kings of Scotland to the crown, consumed a great part of his time, but did not so preoccupy his thoughts as to prevent him from publishing in 1751 an edition of Livy, still known as the 'immaculate,' from its entire exemption from errors of the press.

Ruddiman died in Edinburgh 19th January 1757. He was in politics, like his friend Pitcairne, an ardent Jacobite, and in private life a most upright and estimable man. Besides the publications already noted, and much else, he edited Gawin Douglas's translation of the *Æneid* (folio, 1710), and appended a very valuable glossary which became the basis of Jameson's Dictionary and so of Scottish lexicography. He also founded the *Caledonian Mercury* newspaper. See his Life by George Chalmers (1794).

Rüdesheim, a town of Prussia, on the right bank of the Rhine, opposite Bingen, at the foot of the Niederwald (q.v.), and 16 miles W. of Mainz. Round Rüdesheim is grown one of the most esteemed of the Rhine-wines, the Rüdesheimer.

Rudolf, or RUDOLPH, German king and founder of the late imperial dynasty of Austria, was born in Limburg castle in the Breisgau, on 1st May 1218. He became a warm partisan of Frederick II., distinguished himself in arms, and spent much of the early years of his manhood in quarrels with the bishops of Basel and Strasburg. His possessions were greatly increased by inheritance and by his marriage, until he was the most powerful prince in Swabia. In 1273 the electors chose him to be German king; as never having been crowned by the pope, he was not entitled to be called kaiser or emperor. His accession was opposed by none; the pope's consent was secured at the price of certain rights already parted with by Rudolf's predecessors. Ottocar of Bohemia, however, refused to tender his allegiance. He was put under the ban of the empire in 1276, but, submitting on Rudolf's approach with an army, was invested with Bohemia. Having soon afterwards taken the field against his suzerain, he was defeated and slain in 1278 on the Marchfeld beside the Danube. Rudolf spent the greater part of his life that remained in suppressing the castles of the robber knights and putting an end to their lawless practices. He died at Spire, 15th July 1291, and was buried in the cathedral there. His son Albert, to whom (and his brother Rudolf) Austria, Styria, and Carniola had been given in 1278, succeeded him as German king. Rudolf was a pattern knight, tall in person, upright, pious, valiant, and energetic. See Lives by Schönhuth (1844), Kopp (1845), and Hirn (1874); Lorenz, *Deutsche Geschichte in 13. und 14. Jahrhundert* (1863-67); and a work by Kaltenbrunner (Prague, 1890).

Rudolf II., eldest son of the Emperor Maximilian II., was born at Vienna on 18th July 1552, and educated at the Spanish court by the Jesuits. He was made king of Hungary in 1572, king of Bohemia, with the title King of the Romans, in 1575, and on the death of his father in 1576 succeeded to the imperial crown. Gloomy, taciturn, bigoted, indolent both in body and mind, he put himself in the hands of the Jesuits and low favourites, and left the empire to govern itself. His attention was given to his curiosities, his stable, his alchemical and magical studies; nevertheless his taste for astrology and the occult sciences, and his desire to discover the philosopher's stone, made him extend his patronage to Kepler and Tycho Brahé. The astronomical calculations begun by Tycho, and continued by Kepler, known as *The Rudolphine Tables*, derive their name from this emperor. Meanwhile the Protestants were bitterly persecuted by the Jesuits throughout the empire; the Turks invaded Hungary and defeated the archduke Maximilian (1596); Transylvania and Hungary rose in revolt; and at last Rudolf's brother Matthias wrested from him the crowns of Hungary and Bohemia, and the states of Austria

and Moravia. Less than a year after losing the crown of Bohemia he died, unmarried, on 20th January 1612, and was succeeded by Matthias. See works by Gindely (1865) and Von Bezold (1885).

Rudolf, LAKE, a lake in Kenya, Sudan, and Abyssinia, near the edge of the Kaffa or South Ethiopian highlands, is long and narrow, stretching 160 miles N.E. and S.W. by 40 broad, with an area of 3000 sq. m., at a height of 1300 feet above the sea. It is crossed by 4° N. lat. and 35° E. long. It has no visible outlet, and its waters are very brackish. It was discovered by L. von Höhnel and Count Teleki in 1888. See von Höhnel's *Discovery of Lakes Rudolf and Stephanie* (Eng. trans. 1894).

Rudolstadt, a town of Thuringia, lies in a hill-girt valley, on the left bank of the Saale, 18 miles S. of Weimar. There are two castles, a library, picture-gallery, &c., and factories for porcelain, chemicals, and wool. Pop. 16,000.

Rudra is, in Vedic mythology, a collective name of the gods of the tempest, or Maruts. In later and Puranic mythology Rudra ('the terrible') is a name of Siva, and the Rudras are his offspring.

Rue (*Ruta*), a genus of Rutaceæ, half-shrubby plants, natives of the south of Europe, the north of Africa, the Canary Isles, and the temperate parts of Asia. Common Rue, or Garden Rue (*R. graveolens*), grows in sunny stony places in the countries near the Mediterranean. It has greenish-yellow flowers, the first of which that open have ten stamens, the others eight only (they are of unequal length, and each one is bent inwards in turn to touch the pistil, and when the pollen is shed it bends back again), and glaucous evergreen leaves with small oblong leaflets, the terminal leaflets obovate. It is not a native of Britain, but is frequently cultivated in gardens. It was formerly called *Herb of Grace* (see *Hamlet*, act iv. scene 5), because it was used for sprinkling the people with

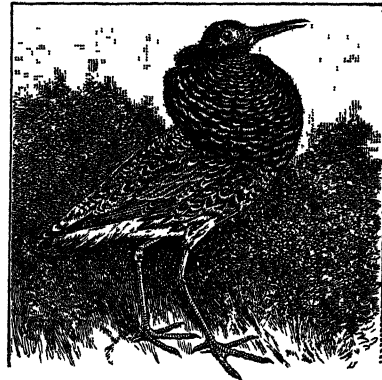


Common Rue (*Ruta graveolens*).

holy water. It was in great repute among the ancients, having been hung about the neck as an amulet against witchcraft in the time of Aristotle. The smell of fresh rue is very offensive to many. — *Meadow rue* (*Thalictrum*) belongs to the Ranunculaceæ.

Ruff (*Machætes pugnax*), a bird, the sole representative of the genus, belonging to the Sandpiper (q.v.) sub-family of the Snipe family (Scolopacidae). In the British Isles it is now little more

than a visitor in its spring and autumn migrations, owing to the draining of its marshy breeding-places and the practice of capturing it in spring when game is out of season. It is more common on the east than on the west coast of England. The same is true of the east coast of Scotland, where it is found from Berwick to the Orkneys and Shetlands, but it has been recorded from the Outer Hebrides. As a straggler it is found on the Faroes and Iceland, in Canada, in some of the eastern United States, and it has been found once in Barbadoes and once on the Upper Orinoco. It breeds over the greater part of northern Europe; it is found as a migrant over the rest of Europe, the southern shores of the Mediterranean, and the east and west coasts of Africa as far as the Cape; in Asia it extends from Siberia to Japan, Burma, and India. The male bird, the *Ruff*, is about a foot long. In spring it sheds the feathers of the face; curled tufts of feathers appear on the sides of the head; and an erectile ruff is developed which lasts for a couple of months. This ruff, as well as the feathers on the back, shows every variation of colour in different birds; but each bird annually regains its own peculiar colour. After moulting the neck and upper breast are of a buff colour; the under parts dull white; the feathers of the upper parts are dark brown with buff margins; and the primary wing-feathers are dusky brown. The female, the *Reeve*, is about one-fourth smaller in size, and shows very much the same colours as the moulted male. In habit these birds are polygamous; the males fight for possession of the females, and in battle the ruff serves for defence. The nest is made among the coarse grass of a dry tussock in a moist swampy place. The eggs, four in number,



Ruff (*Machætes pugnax*).

are grayish green marked with reddish brown. The food consists of insects and their larvæ, worms, seeds, rice, and other vegetable substances. When captured and being fattened for the table, the birds are fed on boiled wheat, bread and milk, and bruised hemp-seed.

Ruffe, or **POPE** (*Acerina cernua*), a small freshwater fish of the Perch family (Percidæ), abundant in the lakes, slow rivers, and ditches of many parts of the middle of Europe and of England. It is five or six inches in length, of an olive-green colour mottled with brown, and has only one dorsal fin. The flesh of the ruffe—also spelt ruff—is highly esteemed for the table.

Rufiji, or **LUFUJI**, a river of Tanganyika Territory, which rising far in the interior enters the sea through a delta opposite the island of Mafia. Shoals and bars at the mouth prevent the access of large ships; but the river is navigable by smaller

boats throughout great part of its course. The valley is extremely fertile.

Rugby, a town in Warwickshire, near the river Avon, 82 miles NW. of London, 12 miles E. of Coventry, is an important junction of the L.M.S. Railway. Although known in Doomsday as Rochberie (later Rokeby), most of the town is modern, and it is chiefly known by its famous school. In March 1645 the town was occupied by Oliver Cromwell. In 1923 a government wireless station was erected here to provide a means of radio communication throughout the British empire. The high-frequency valve generators have a maximum output of 500 amperes, into an aerial supported on 12 masts, each 820 feet in height. The industries are principally concerned with electrical engineering; there is a large cattle market. It is a well-known hunting centre. Pop. of urban district (1901) 16,830; (1911) 21,758; (1921) 25,088.

The school was founded in 1567 by Lawrence Sheriff, a native, who made a fortune as a grocer and dealer in spices, but the original buildings have long since disappeared. Mainly fed at first by boys from the midlands, its reputation gradually increased under such men as Dr Henry Holyoake and Dr Thomas James, but its national fame came under Dr Thomas Arnold, who, in raising the school, raised the dignity of his whole profession. After Arnold came successively Archibald Campbell Tait (1842-50), afterwards Archbishop of Canterbury; Dean Goulburn (1850-58); Dr Temple (1858-69), afterwards Archbishop of Canterbury; Dr T. W. Jex-Blake (1874-87); Dr John Percival (1887-95), afterwards Bishop of Hereford; Dr H. A. James; Dr David, afterwards Bishop of Liverpool; and W. W. Vaughan (1921). From Rugby went the first head-master to Marlborough, Wellington, Clifton, Haileybury, and other schools. Illustrious Rugbeians include Dean Stanley, who wrote the biography of his famous head-master; Thomas Hughes, who immortalised the school in his *Tom Brown's School-days*; Dean Vaughan; Dr Samuel Butler; 15th Earl of Derby; Viscounts Cross and Goschen; Lord Davey (Lord of Appeal); Roundell Palmer (Lord Chancellor); Sir Richard Temple; Judge Bowen; Professor Henry Sidgwick; Judge Farwell; Walter Savage Landor; Arthur Henry Clough, the poet; Matthew Arnold; H. W. Fox, a missionary to India, to whose memory a fund was raised to support one Indian missionary (a 'Fox Sermon' is preached annually); Sir Henry Wilmot, V.C.; W. C. Macready, the actor; M. H. Bloxam, author of *Gothic Architecture*, who left his collections of antiquities and books to the school; Charles Apperley (better known as 'Ninrod'); C. L. Dodgson, the author of *Alice's Adventures in Wonderland*; F. C. Selous, the hunter; H. O. Arnold-Forster, Dr Arnold's grandson; Rupert Brooke, poet; Sir Austen Chamberlain; Sir Charles Nicholson, Bt., architect; P. F. Warner, the famous cricketer; Baron Stuart of Wortley; Baron Kilbracken; Sir E. Maunde Thompson; and Judge Tobin. The Memorial Chapel, completed in 1923 to designs by Sir C. Nicholson, is to the memory of 682 old boys who fell in the Great War (1914-18), whose names are inscribed on the walls. More than £50,000 was raised for this memorial and for a fund to provide for the education of the sons of the fallen Rugbeians. Rugby football (see FOOTBALL) was originated here in 1823 by William Webb Ellis.

See, besides Stanley's *Life of Arnold and Hughes's Tom Brown's School-days*, *Rugby School Registers, 1675-1904* (3 vols.); Bloxam and Smith's *Rugby: its School and Neighbourhood* (1889); W. H. D. Rouse's *History of Rugby School* (1898), which has a full bibliography; Bradby's *Rugby* (1900); W. Eadon's *Guide to Rugby School* (pamphlet, 1923); and W. N. Wilson's *Rugby School Memorial Chapel* (1923).

Rugby, TENNESSEE. See HUGHES (THOMAS).

Rugeley, a market-town of Staffordshire, on the Trent, 10 miles ESE. of Stafford. It has good public buildings (1879), a grammar-school, iron-works, and neighbouring collieries. Pop. 4600.

Rügen, an island of Prussia, lies in the Baltic, off the coast of Hither Pomerania. Greatest length, 33 miles; greatest breadth, 25 miles; area, 374 sq. m. It is separated from the mainland by a strait about a mile in width. The island, which is deeply indented by the sea, terminates at the north-eastern extremity in the precipitous cliff called the *Stubbenkammer* (400 feet). Erratic boulders are common all over the island. Numerous barrows exist. Hertha Lake was once believed to be the place where, according to Tacitus, the Germanic goddess Nerthus was worshipped. The soil is productive, and yields good wheat; cattle are reared; and fishing is carried on. The scenery, everywhere pleasing, is frequently romantic, and, together with the facilities for sea-bathing, attracts numerous visitors. Chief town, Bergen, in the middle of the island. Rügen was occupied originally by Germanic tribes, then by Slavs, was conquered by the Danes in 1168, was thereafter ruled by native princes under Danish suzerainty, passed to a branch of the ruling family of Pomerania in 1325, in 1478 was incorporated with Pomerania (q.v.), and shared its destinies.

Ruhmkorff, HEINRICH DANIEL, electrician, born at Hanover in 1803, in 1839 settled in Paris, and died there 21st December 1877. His Induction Coil, exhibited in 1855, is described and figured at INDUCTION.

Ruhnken, DAVID, classical philologist, was born 2d January 1723 at Stolpe, in Pomerania, received his education at Königsberg, at Wittenberg University, and at Leyden under Hemsterhuis, who taught him Greek. Ruhnken's first works were to prepare a new edition of Plato, to collect the scholia on that author, and publish an edition of Timæus' *Lexicon Vocum Platoniarum* (Leyden, 1754; a much improved edition, 1789). In 1755 he went to Paris, and spent a whole year there examining the MSS. of the Royal Library and of the Library of St Germain. Hemsterhuis then got him appointed assistant to himself (1757) at Leyden. In 1761 he succeeded Oudendorp in the chair of Eloquence and History. In 1774 he succeeded Gronovius as librarian to the university, which he enriched with a multitude of valuable books and MSS. He died 14th May 1798. One of the best scholars and critics of the 18th century, Ruhnken possessed fine taste and sagacity, vast learning, and a remarkably lucid and graceful Latin style. His principal literary works embraced *Epistolæ Criticæ* (1749-51), an edition of Rutilius Lupus (1768), of Velleius Paterculus (1779), of Muretus (1789), &c. His pupil Wytenbach wrote his *Life* (Leyden, 1799).

Ruhr, a right-hand affluent of the Rhine, rises in Westphalia, near the south-west frontier of Waldeck, flows generally west, and, after a course of 144 miles, joins the Rhine at Ruhrort. The Ruhr basin, a very important mining and manufacturing district, played an important part in the revolution. In accordance with M. Poincaré's policy of putting pressure upon Germany, a great part of it was occupied by French and Belgians in 1923-25.

Ruhrort, a great Rhine port, at the influx of the Ruhr, is now part of Duisburg (q.v.).

Ruisdael. See RUYSDAEL.

Rule, St. See REGULUS.

Rule of Faith, not the sum of the Christian faith as laid down in Creeds (q.v.) and Confessions

(q.v.); but, in polemical theology, the sources whence the doctrines of the faith are to be authoritatively derived—the Scriptures, the tradition of the Church, the teaching of the fathers, &c. See ROMAN CATHOLIC CHURCH, REFORMATION, CHILLINGWORTH, NEWMAN, &c.

Rule of the Road. This phrase includes the regulations to be observed in the movements of conveyances either on land or at sea. *On Land:* In Britain drivers, riders, and cyclists keep the side of the road next their left hand when meeting, and that next their right when overtaking and passing other horses or vehicles. The person neglecting this rule is liable for any damage that may happen through such neglect. A man riding against a horse, or a conveyance driving against another that is standing still, is answerable for any damage that may ensue. On the Continent and in America drivers and riders keep to the right. *At Sea:* If two steamers are meeting end on or nearly end on, both alter their courses to starboard—i.e. both turn to their right hand. If two steamers are crossing each other, the one which has the other on the starboard (right hand) side keeps out of the way. A steamer must keep out of the way of a sailing ship. A steamer shall slacken speed or stop and reverse if necessary. If two sailing ships are approaching each other, whether meeting or crossing, one running free keeps out of the way of one close-hauled; one close-hauled on the port tack keeps out of the way of one close-hauled on the starboard tack; one with the wind free on the port side keeps out of the way of one with the wind free on the starboard side; where both have the wind free on the same side the one to windward keeps out of the way of the one to leeward; and a ship with the wind aft keeps out of the way of the other ship. Notwithstanding the above rules, a ship, whether a sailing ship or steamship, overtaking any other must keep out of the way of the overtaken ship. Where one ship is to keep out of the way, the other must keep her course. Regard, however, is to be paid to all dangers of navigation, and to any special circumstances which may render a departure from the rules necessary to avoid immediate danger. For lights, see **SIGNALLING**.

Rullion Green. See **PENTLAND HILLS**.

Rum, a mountainous island of Inverness-shire, belonging to the group of the Inner Hebrides, 15 miles N. by W. of Ardnurchan Point. It is $\frac{1}{2}$ miles long, 8 miles broad, and 42 sq. m. in area, only 300 acres being arable, and the rest deer-forest and moorland. The surface presents a mass of high sharp-peaked mountains, rising in Halival and Haiskeval to the height of 2368 and 2659 feet.

Rum, a kind of spirit made by fermenting and distilling the 'sweets' that accrue in making sugar from cane-juice. The scummings from the sugar-pans give the best rum that any particular plantation can produce; scummings and molasses the next quality; and molasses the lowest. Before fermentation water is added, till the 'sett' or wort is of the strength of about 12 per cent. of sugar; and every ten gallons yields one gallon of rum, or rather more. The flavour of rum depends mainly on soil and climate, and is not good where canes grow rankly. Pine-apples and guavas are at times thrown into the still, but on the great scale no attempt is made to influence flavour artificially. The finest-flavoured rums are produced by the old-fashioned small stills. The modern stills, which produce a strong spirit at one operation, are unfavourable to flavour. The colour of rum is imparted after distillation by adding caramel.

RUM SHRUB, a liqueur in which the alcoholic base is rum, and the other materials are sugar,

lime or lemon juice, and the rind of these fruits added to give flavour.

Rumania (*România*), a kingdom in the south-east of Europe, situated between 20° and 30° E. long. and 43½° and 48½° N. lat. Its general boundaries are on the east the river Dniester and the Black Sea, on the south the river Danube (except for the Dobrudja, a province on the extreme south-east), but on the north and west natural physical boundaries have given way to an ill-defined line extending from Hotin on the Dniester west to Mako (the meeting-place of Rumania, Hungary, and Yugo-Slavia) and then south to Bazias on the Danube. The kingdom is compact, the frontier being 1783 miles in length. As a result of the Great War the area of Rumania was more than doubled (see *History*).

Country.	Area, square miles.	Estimated Population	Chief Towns.
Wallachia } Old	29,960	5,224,000	Bucharest.
Moldavia } Rumania.	14,710	2,537,000	Jassy.
Dobrudja }	8,819	725,000	Constantza.
Bessarabia.....	17,146	2,957,000	Chisinau.
Bukovina.....	4,080	820,000	Cernauti.
Transylvania.....	22,312	2,860,000	Cluj.
Crisana.....	8,088	1,153,000	Oradea Mare.
Maramuresh.....	6,258	593,000	Sighetula.
Banat.....	11,009	950,000	Timisoara.
	122,282	17,500,000	

Of this total population about 13,200,000 are Rumanians, 1½ million are Magyars, a million are Jews, three-quarters of a million are Germans (Saxons), and the remainder are mostly Russians, Ruthenians, Bulgarians, and Turks, while there are also a considerable number of Gypsies. At the end of the 19th century there were about 5½ million Rumanians in the old kingdom, with some 4½ million living in the adjoining countries. The capital and seat of government is Bucharest (Rum. *București*) with some 600,000 inhabitants. Other towns are Chisinau (Russ. *Kishinev*, 200,000), Cluj (Germ. *Klausenburg*, 105,000), Czernowitz (Rum. *Cernauti*, 90,000), Temesara (90,000), Oradea Mare (90,000), Jassy (Rum. *Iasi*, 76,000), Galatz (Rum. *Galati*, 75,000), and Arad (75,000). Curtea d'Argesh, the mediæval capital of Wallachia, now a village, is famous for its 13th-century cathedral, built of a grayish-white limestone resembling alabaster, in the Byzantine order of architecture, with a profusion of Moorish or Arabesque ornamentation. Sinaia, on the river Prahova on the lower slopes of the Carpathians, is the fashionable summer-resort for the court and society.

There are separate articles on the **BANAT**, **BESSARABIA**, **BUKOVINA**, **DOBRUDJA**, **TRANSYLVANIA**, &c.

Physical Aspects.—In the south and east the Wallachian plain extends into Bessarabia and the Dobrudja (Rum. *Dobrogea*), and continues into the Ukraine. The main chain of the Carpathians, entering the centre of the kingdom in the north, eventually curves west, encircling the Transylvanian plateau. The Carpathians are characterised by no outstanding peaks, but rather by rolling uplands, hardly any of the hills exceeding 8000 feet. Rumania is plentifully supplied with rivers, those on the north-west of the Carpathian water-shed, including the Maros, flowing mostly into the Theiss (Rum. *Tisa*), and those on the south-east, including the Pruth and the Olti, direct into the Danube. The Dniester and the Danube both act as frontiers for part of their courses, but the embouchures of the latter are wholly in Rumanian territory. There are three

zones of country: the Carpathians, which are covered with forests and rich mountain pasture, and have an annual rainfall of over 35 inches; the hill-region, consisting of the Transylvanian slopes and the western part of Moldavia, well adapted for every kind of agricultural industry; and the Southern Steppes, hot and arid, with an annual rainfall of less than 15 inches. The Balta region round about the mouths of the Danube is, however, extremely marshy, being flooded to the extent of some 2 million acres for five months every summer. Here there is a profusion of wild-duck and other marsh-fowl, with otters, beavers, hedgehogs, &c., and various brightly-coloured butterflies and other insects. In the higher lands stags, bears, wild boars, wolves, grouse, eagles are numerous, but the chamois is rare. The sylvan scenery of the Carpathians is very lovely, and either there or in the plains are to be found the oak, elm, beech, and less frequently the maple, sycamore, mountain-ash, lime, horse-chestnut, and acacia.

Occupations.—About four-fifths of the total population are peasants engaged in agricultural pursuits, the system of peasant proprietary being very remarkable. Before 1865 the whole of the land of the country was practically held by the boyars or inferior nobles (who were frequently absentees), or by the state, the peasants merely owning small patches of land contiguous to their huts, which were, and in some cases still are, semi-subterranean. The peasantry had been robbed of their land during long ages of feudal oppression and foreign conquest, but when the government became democratic it was determined to restore a portion of the land (about one-third) to its original owners at very moderate prices to be fixed by the state. Under Prince Couza the process began about 1865, the government advancing the purchase-money and creating a loan for the purpose. The greater portion of the debt was paid off by the peasant proprietors by 1881, but large ownership still preponderated. Nearly one-half of the whole country remained in the hands of little over five thousand owners, while many of the peasant holdings were too small to admit of the most advantageous and economical farming. The second restoration process began in 1918, when all lands (except forests, vineyards, and orchards) that were inalienable or that belonged to foreigners, absentees, corporations, institutions, and to the crown were expropriated. Further, private owners were called upon to supply between them 5 million acres of cultivated land, according to a sliding scale, which left no former owner with more than 1250 acres or with less than 250 acres. Altogether about 7 million acres changed hands, the peasant being given a minimum of 12½ acres. In compensation the landlords were given 5 per cent. bonds, amounting to 50 per cent. of the value of the holding in 1914. Eventually the government took over 35 per cent. of the debt, leaving the remainder to be payable by the peasants in fifty years' time. Owing to various economic causes, chiefly the enormous depreciation of the currency, this valuation has been very unfair on many landlords. Now the peasants possess 85 per cent. of the whole area, one of the highest proportions existing in any country.

Production and Industry.—The industries of Rumania suffered severely on account of the Great War. The German occupation, the threat of Bolshevism (which delayed the demobilisation of the army), the disorganisation of the railways, all the changes of the Agrarians Reforms, the great expense (for the peasants) of agricultural machinery, and the lack of capital have all hindered the proper development of the exceptionally rich agricultural and mineral resources. The chief agricultural crops

—maize, wheat, oats, and barley—are cultivated over an area of some 24 million acres, the total harvest averaging 10 million metric tons, of which one-half is maize and one-quarter wheat. Normally, after the United States of America and Russia, Rumania is the greatest grain-producing country in the world. Tobacco is grown extensively, and there are about 600,000 acres of vineyards, besides orchards of plums, peaches, apples, pears, &c. The best agricultural districts are found in Wallachia, Moldavia, and Bessarabia, while there is excellent pasture for cattle, sheep, goats, and pigs in Transylvania. Horse-breeding is also important. The forests in Greater Rumania cover some 17 million acres, and the total water-power resources have been estimated at 1½ million h.p., but the timber trade so far has not been very extensive, and only a very small proportion of the hydraulic resources has been exploited at all.

The chief mining industry is that of petroleum, the production of which has increased from 250,000 metric tons in 1900 to 1,783,000 in 1914 and 2,313,000 in 1925, most of the petroleum wells being in the region round Ploëști in Wallachia. Lignite is produced to the extent of 2½ million tons annually, and there are salt-mines near Ocna in Moldavia, with an annual output of ½ million tons. Transylvania is said to possess the richest gold-mines in Europe, and other minerals, including iron and copper, are present in the soil. All mines (except stone quarries), springs, and natural sources of energy, such as water-power, are now under the control of the state (see *History*), but a vast amount of capital is required for their development.

Manufactures include breweries, paper-mills and wool-factories, while the state subsidises the petroleum-refineries, sugar-factories, and the flour and saw mills. The fisheries, especially of carp and sturgeon, are of considerable importance.

Commerce.—For the years immediately preceding the Great War, the imports averaged annually 22 million sterling in value, and the exports 26 million sterling, but after the war this standard was only regained in 1924, in spite of the annexation of so much territory. The chief imports are now cotton manufactures (about ⅓ of the total), metal and woollen manufactures and machinery; the chief exports are cereals and flour (about ⅓ of the total), mineral oils, wood manufactures, livestock and vegetables. Most of the trade is done with the countries of central Europe. Rumanian exports to Great Britain average annually 2½ million sterling in value (mainly for barley, maize, and petroleum) and the imports from Great Britain 4 million sterling (mainly for cotton piece goods, and iron, wrought and unwrought).

The principal ports are Brăila, Galatz, and Constantza (Rum. *Constanța*), but petroleum is also exported from Giurgiu on the Danube. Rumania is represented on the International Danube Navigation Commission (see *DANUBE*), which has its seat at Galatz. The total railway mileage amounts to 7246 miles, of which 2707 are in the Old Kingdom, but several projects of new lines, chiefly in Transylvania are under consideration, as the war made imperative a thorough reorganisation of the whole railway system.

Defence.—Military service is compulsory for all Rumanians from the ages of 21 to 50. The term of service for the infantry is two years in the active army and eighteen years in the regular army reserve, and for other ranks three and seventeen years respectively. Thereafter, all pass into the militia for nine years. The peace footing of the army, divided into seven army corps, is 11,400 officers and 135,000 other ranks. There is a small fleet stationed in the Black Sea.

Religion and Education.—Freedom of worship is supposed to be assured to all sects, but persecution of Unitarians, Baptists, and others has nevertheless continued; the state religion is that of the Orthodox Church. In 1925 a Patriarchate of Rumania was created, and there are other four archbishops and a number of bishops. There are also an archbishop and three bishops of the Greek Catholic Church, and Roman Catholic, Lutheran, Reformed, and Unitarian bishops. Of the total population, there are about 10 million belonging to the Orthodox Church, 1½ million Greek Catholics, 1½ million Roman Catholics, 1½ million Protestants, 800,000 Jews, as well as Mahomedans and others.

Education is free and compulsory 'wherever there are schools,' but about half the population over seven years of age can neither read nor write. Rumania has four universities, at Bucharest (1864), at Jassy (1860), at Cluj or Klausenburg (1919), and at Cernauti (1920).

Constitution.—The revised constitution of 1923 allows for a king, who nominates the ministers, and has the right of vetoing the legislation proposed by the two chambers of Parliament. The Senate or Upper House is for the most part elective, but there are a few life members chosen for merit and position. Senators must be over forty years of age and deputies over twenty-five. The term of office is five years, all male Rumanian tax-payers over twenty-one having the franchise.

History and Political Relations.—The early Greek historians mention a Thracian tribe, the Getæ, from whom were descended the Dacians, a brave race who occupied the northern side of the Ister or Danube, and flourished as a free people down to about the end of the first century of our era. Before that time the Dacians had come into conflict with both Greeks and Romans, but in the year 101 A.D. the Emperor Trajan undertook the first of two expeditions against their king, Decebalus, which terminated in the complete subjugation of the country. Historians are now generally agreed that the modern Rumanians are descended from the Roman colonists established by Trajan for the defence of this frontier. Pressed by the barbarian races who eventually compassed the downfall of the Roman empire, Dacia was evacuated by the Romans in the reign of Aurelian (about 274 A.D.), and for about a thousand years the banks of the Danube served as halting-places for various wandering tribes, amongst whom the most conspicuous were the Goths; the Huns under Attila; the Lombards under Alboin; the Bulgari, who afterwards settled on the plains south of the Danube and founded Bulgaria; the Ungri, a savage race who settled in Hungary; and the Wallachs, from whom Wallachia has derived its name. For a considerable period both banks of the Danube formed part of the powerful Slavonic-Bulgarian state, which, however, was crushed by the Byzantine Empire in 1018, after Hungary had already conquered Transylvania. Later the Rumanians of the south formed an independent state, finally overwhelmed by a Tatar invasion about the year 1250 A.D. After that there gradually arose out of a number of smaller states an independent realm in Wallachia, with its traditions of heroes and chiefs, Mircea the Old, Michael the Brave (d. 1601), whose memory is perpetuated by a beautiful equestrian statue at Bucharest, and others; whilst the neighbouring state of Moldavia had also its heroes in Stephen the Great (d. 1504), &c. These rulers for a long time resisted the Musulman advance, but were eventually reduced to vassalage by the victorious Turks, and were compelled to sign what are known as the 'Capitulations,' and to pay an annual tribute to the sultan. The first treaty with Wallachia

known by that name was signed as far back as 1393; but that with Moldavia, which country was supported by the king of Poland, followed as late as 1513.

Although Wallachia and Moldavia thus became states tributary to the Porte, they retained sufficient independence to be in a sense autonomous; but in the course of time their princes, or voivodes as they were called, where Turkish nominees, whose tenure of office may be judged by the fact that in the course of ninety years (from 1723 to 1812) the government of Wallachia passed through the hands of no less than forty of those rulers. They were mostly Greeks, known as Phanariotes or Fanariots (q.v.), who during their brief tenure of power practised the most scandalous extortions upon the people in order to enrich themselves and remit the annual tribute to Constantinople. The great majority of those Fanariot voivodes either were assassinated or were disgraced through the intrigues of their rivals at the Sublime Porte; and some of them did not scruple to appeal during their brief tenure of power for the support of Russia, which country was constantly at war with their suzerain.

The Muscovites began to make inroads into the Danubian principalities as early as the year 1709, under Peter the Great, and continued to invade them at intervals, especially in the reign of the Empress Anne in 1755 and in that of Catharine IV. in 1768. In the first instance the Tsar Peter was invited to enter the states by the voivodes Brancovano of Wallachia and Cantemir of Moldavia, who desired to secure their independence under his protection; but no such inducement was afterwards requisite; and although the Russian invasions and occupations were always undertaken on the pretext of liberating the Christians from the Musulman yoke, the real object has been to advance step by step to Constantinople and to secure possession of the whole Balkan peninsula. At different times the Russians exercised absolute sway in the principalities, notably from 1789 to 1792 and from 1806 to 1812, when the princes under their protection were called Hospodars (q.v.), a Slavonic word. In 1848 they helped to suppress the national rising there, as they did in Hungary, but in 1853, before the Crimean war, their power began to wane. At the termination of that war they were compelled by the allied powers to cede Bessarabia to the principalities.

In the year 1858 both principalities, united under the name of Rumania, elected Prince Couza (born at Galatz, 1820), under whose rule the important Agrarian Reforms of 1865 (see *Occupations*) were carried out, but in 1866 he was deposed on account of extortions and gross immorality, and was succeeded by Prince Charles of Hohenzollern. This revolution was mainly led by two able statesmen, Bratiano and Rosetti, who may be said to have been jointly the counterpart of the Italian Cavour, and who for many years enjoyed great popularity as the chief ministers of state. On the outbreak of the Russo-Turkish war in 1877 the Rumanians espoused the Russian cause. Prince Charles was actually appointed commander-in-chief of the allied armies, the Russian Cesaewitch serving under him, and the Rumanians helped very materially to bring the war to a triumphant close. The conquerors, however, deprived their allies of part of their territory, Bessarabia, giving them in exchange the Dobrudja, which they exacted from the Porte—an exchange subsequently confirmed by the Berlin Conference (June 1878), when Rumania was recognised as a completely independent power. The effect of that exchange was, however, unfortunate for Russia in two respects. It caused a permanent estrangement between the Rumanians and their guardian allies, and the Dobrudja served

as a barrier against Russian aggression in Bulgaria. Indeed, throughout her history, Rumania has acted as a buffer state between Austrian and Russian interests in the Balkans. In 1881 Prince Charles, whose qualities as a statesman and soldier were invaluable in organising the country, was invested with the kingly dignity with the acquiescence of the European Powers.

A financial crisis 1899-1901, caused by undue extravagance, was surmounted with foreign loans, chiefly from Germany, and after the disturbances among the peasants in 1907, the government granted them fresh facilities for obtaining credit. Rumania took no part in the first Balkan war (1912), but declared war on Bulgaria the next year, and after a bloodless campaign annexed part of the Dobrudja. The accession in October 1914 of King Ferdinand, Italy's declaration of war in 1915, and the victorious Russian offensives in Galicia led Rumania to enter the Great War on the side of the Allies in August 1916, but by December both the petroleum region and the capital Bucharest were occupied by the Central Powers. A second Rumanian offensive in 1917 met with inevitable failure after the collapse of Russia, and an armistice was concluded in December, but in April, November, and December 1918 respectively, Bessarabia, Bukovina, and Transylvania, were annexed, and the ancient empire of Michael the Brave was revived. A Bolshevik invasion of Rumania in 1919, organised by Bela Kun (see KUN), ended in the Rumanians occupying Budapest, and in 1922 the 'Little Entente' was concluded between Rumania, Yugoslavia, and Czechoslovakia. Since the war legislation has chiefly concerned itself with agrarian reforms (see *Occupations* above), with the unification of the new kingdom, and with the promoting of state control of certain industries, including the mines. The financial policy of the brothers Bratiano, though designed to prevent the foreign exploitation of the national resources, went perhaps too far in discouraging the inflow of foreign capital. Ferdinand, who died in 1927, was succeeded by his grandson Michael, whose father renounced the succession in 1925.

Language and Literature.—Rumanian (or Walachian) is one of the Romance Languages (q.v.), a daughter of the Latin; but, though the language is unmistakably Romance in type and in grammatical construction, the vocabulary is mixed, the number of Latin roots being variously estimated at more or less than half of the total, the next greatest element being Slavonic words, with the addition of some hundreds of Turkish, Greek, Albanian, and, in recent times, French words. Most Rumanians speak what is practically the same language—the Daco-Rumanian—throughout the kingdom. The Macedo-Rumanian (see KUTZO-VLACHS), south of the Danube and amongst the Balkans and Pindus, is largely modified by Greek; and the Istro-Rumanian, spoken by 2000 or 3000 in Istria and Croatia, has been much Slavonised.

The Rumanian language has been almost entirely kept alive by the common people, except for a brief period in the 17th century; the state, the church, and the aristocracy used Slavonic from the 6th to the 17th centuries, Greek under the Fanariot régime of the 18th century, and French during part of the 19th century. The first Rumanian book, a psalter, was printed in 1577, but the chronicles of the 17th century are the earliest specimens of national literature. Only about the middle of the 19th century can Rumanian literature be said to have flourished. France, both in politics and in art, gave an enormous impetus to Rumanian national life, classic authors of different countries, especially England, being retranslated from the French. Few countries have greater wealth of folk-lore and folk-song than Rumania, but no printed records

existed till the collection made in 1866 by Alexandri (q.v.), himself one of the most notable of native Rumanian poets. Contemporary with him were Bolintineanu and Alexandrescu. This renaissance of letters began with the foundation by the critic Maiorescu of the Yunimea Society in Jassy. Other writers are the novelist Dora d'Istria (see GHICA), the essayist Jon Ghika (q.v.), the poet Eminescu, the dramatist Caragiale, the novelists Sadoveanu and Voinesti, the poet Cerna, the historians Xenopol and Iorga, and the essayist Marcu Beza.

See various standard works by N. Iorga, including his *History of Roumania: Land, People, Civilisation* (Eng. trans. 1926), and by A. D. Xenopol, including his *Histoire des Roumains* (1894) and *Les Roumains* (1909), also the vol. of memoirs of King Charles I., *Aus dem Leben König Karls von Rumänien* (1894-1900). In English, see Samuelson, *Roumania, Past and Present* (1882); Strati-lesco, *From Carpathian to Pindus* (1906); M. Beza, *Rumanian People and Literature* (1920); V. Clark, *Greater Rumania* (1922); E. O. Hoppé, *In Gipsy Camp and Royal Palace* (1924); J. L. Evans, *The Agrarian Revolution in Rumania* (1924). In French, the history of F. Damé (1900); Stourdza, *La Terre et la Race roumaine* (1904); studies by Gubernatis (1898), Căteley (1908), Pittard (1919), and Gillard (1922); N. Xenopol, *La Richesse de Roumania* (1916); and various economic works by Colescu (1903-13). In German, studies by Bergner (1897), Krauss (1916), Dungen (1916), Schmalz (1921), and Capitani (1926), and the histories of the literature by Gaster (1901), and Alexisi (1906).

Rumex. See DOCK, SORREL, POLYGONACEÆ.

Rumford, COUNT. Benjamin Thompson, a man of many talents, was born of an old colonial stock at Woburn, in Massachusetts, on 26th March 1753. His youth was spent as an assistant in a goods store at Salem and at Boston, and as a school teacher. But having married a rich widow, he was made major in a New Hampshire regiment, and, through his royalist opinions, incurred the hostility of the colonists to such an extent that he found it best to cross the ocean to England (1775). In London he gave valuable information to the government as to the state of America, and was rewarded with an appointment in the Colonial Office. From his boyhood he had had a passion for physical investigations; in England he experimented largely with gunpowder, and was elected a Fellow of the Royal Society (1779). In 1782 he was back in America, with a lieutenant-colonel's commission in the king's army. After peace was concluded he was knighted, and entered the service of the Elector of Bavaria. In this new sphere he showed great reforming energy: he thoroughly reformed the army, drained the marshes round Mannheim, established in Munich a cannon-foundry and a military academy, cleared the country of the swarms of beggars and planned a poor-law system, spread widely the cultivation of the potato, disseminated a knowledge of cheap and good dishes (especially the Rumford soup) and foods, devised an economical fireplace, kitchen, and oven (the Rumford roaster), improved the breeds of horses and cattle in Bavaria, and laid out the English Garden in Munich. For these services he was rewarded by election to membership of the Academies of Science in Munich, Mannheim, and Berlin, by being put at the head of the War Department of Bavaria, and by being made a count of the Holy Roman Empire—he chose the title of Rumford, the former name of the town of Concord in New Hampshire. During the course of a visit to England in 1796 he endowed the two Rumford medals of the Royal Society of London, and he also endowed two similar medals of the American Academy of Science and Art, all four for researches in light and heat. Three years later was founded on his initiative the Royal Institution (q.v.) for diffusing the knowledge

of mechanical inventions. Going back to Munich in the same year, he found it threatened by the opposing French and Austrian armies. The Elector fled, leaving Count Rumford president of the Council of Regency, generalissimo of the forces, and head of the police. In 1799 he retired from the service of the Elector. His remaining years were principally occupied with physical investigations, especially in heat, which he clearly recognised to be some form of motion, besides showing that a definite quantity of heat could be produced by a definite amount of mechanical work. In 1804 he married the widow of Lavoisier, the celebrated chemist, and soon after settled at Anteuil, near Paris, where he died on 21st August 1814. See the Memoir by Ellis prefixed to his *Complete Works* (5 vols. London, 1876), and the Life by Bauernfeind (Munich, 1889).

Rumi, JALÂL-UDDIN. See PERSIA (*Literature*).

Ruminants, a name applied to those even-toed or Artiodactyl Ungulates which 'chew the cud.' These are (a) the Tragulidæ, often called musk-deer; (b) the Cotylophora, including antelopes, sheep, goats, oxen, giraffes, deer; (c) the Camelidæ, or camels and llamas. Their characteristics and the process of rumination are described in the article ARTIODACTYLA, with which those on DIGESTION and on CATTLE should be compared.

Rumphius, Latinised name of GEORG EBERHARD RUMPH (1637-1702), who, born at Hanau, became Dutch under-stadhouder at Amboyna. He was author of *Herbarium amboinense* and *Plinius indicus*, and a distinguished conchologist. His drawings of shells are marvellously accurate.

Rump Parliament. See LONG PARLIAMENT, CROMWELL.

Runcorn, a thriving manufacturing town and canal and river port of Cheshire, on the left bank of the tidal Mersey, 12 miles ESE. of Liverpool and 28 WSW. of Manchester. It is connected with Widnes on the Lancashire side of the river by a high railway viaduct (1864-69), and a transporter bridge (1902) which carries road traffic on a suspended platform. An ancient place, where a castle was founded by the Princess Ethelfreda in 916, and a priory in 1133, it yet dates all its prosperity from the construction of the Bridgewater Canal (1762-72), which at Runcorn descends to the Mersey by a succession of locks. More canal-boats plied to and from Runcorn than any other place in the kingdom even before the opening of the Manchester Ship-canal (1887-94; see MANCHESTER and CANALS); and there are besides spacious docks with considerable shipping. Sole-leather and chemicals are the chief products. Other industries are boat-building and iron-founding. Pop. (1851) 8049; (1871) 12,443; (1901) 16,491; (1921) 18,393.

Runeberg, JOHAN LUDVIG, the greatest poet who has written in Swedish, was born in Finland, at Jacobstad, on the Gulf of Bothnia, on 5th February 1804. His father, a retired sea-captain, gave him a good education; though from the time he entered (1822) the university of Åbo he supported himself. In 1830, after three years of private coaching, Runeberg was given a secretaryship in the university (removed to Helsingfors in 1827) and was named reader in eloquence (Latin literature), and in the following year added to these offices that of teacher in the lyceum. In these years he published his first books—in 1830 a volume of *Lyric Poems* and in 1831 a narrative poem, *The Grave in Perrho*, for which the Swedish Academy gave him its minor gold medal. Other books followed in quick succession, as a beautiful epic idyll, *The Elk-hunters* (1832), one of his finest pieces of work; a second volume of *Poems* (1833), contain-

ing amongst other things a second epic idyll, *Hanna*, which is almost equal to *The Elk-hunters* in beauty and finish of style; and a third, *Christmas Eve*. All three are written in hexameters, which Runeberg manages with admirable effect; like other poems of the same class, they deal with the rural life of the interior of Finland, *Hanna* with the joys and sorrows of the quiet parsonage, *The Elk-hunters* with the peasantry and country-folk, and *Christmas Eve* with the manor-house and its dependents. Runeberg describes the fresh, unconventional manners and the old-world, patriarchal style of living of these people with great wealth of picturesque detail, with excellent taste, with tender sympathy, with grace and simplicity and beauty of form. The atmosphere that envelops his poetry was the immediate creation of his own wholesome, healthy, manly temperament and genius; one sterling ingredient is a quaint natural humour, deep-seated and pure in quality. Runeberg's poetry is moreover the written embodiment of the deepest feelings and sentiments of the dual people of Finland, of the Finns no less than of the descendants of the Swedish immigrants, and with his name all Finlanders associate their passionate devotion to their country.

From 1832 Runeberg added to his already numerous duties those of editor of the bi-weekly *Helsingfors Morning News*. But, with all these irons in the fire, he had too much work and too little pay, and there was little prospect of a good permanent position in the university; so in 1837 he applied for, and obtained, the post of reader of Roman Literature in the college of Borgå, where he spent the rest of his life, and died 6th May 1877. During these last years he wrote an epic of Russian life, *Nadeschda* (1841); a third volume of *Poems* (1843); an epic of old Norse times, *King Fjalar* (1844); *Ensign Stål's Stories* (2 vols. 1848 and 1860); a slight but merry little comedy, *Can't* (1862); a fine tragedy in the old Greek spirit, *The Kings in Salamis* (1863); and some short *Prose Writings* (1854). *King Fjalar*, artistically, his greatest achievement, if not the greatest achievement in Swedish literature; but its fame has been eclipsed by Ensign Stål's glowing stories of Finland's heroic struggle against the giant Russia in 1808-9. The opening poem of the series, 'Our land, our land,' has been fittingly chosen as the national song of Finland. In 1857, after four years' labour, Runeberg edited for the Lutheran Church of Finland a *Psalm-book*, in which were included above sixty pieces from his own pen. He also excelled as a translator of folk-songs from Serbian, German, and other languages. There is only one single poem in all his longer works that lacks the finished simplicity, beauty, and classic restraint which are so characteristic of him; that is a cycle entitled *Nights of Jealousy*, written in early youth.

See J. E. Strömberg's biography (4 parts, Helsingfors, 1880-96); and Söderhjelm's (1904-96); Nyblom's preface to Runeberg's *Samlade Skrifter* (6 vols. Stockholm, 1873-74); and monographs (in Swedish) by Dietrichson and Rancken (Stockholm, 1864), Cygnäus (Helsingfors, 1873), and Vasenius (Helsingfors, 1890); a Life (in German) by Peschier (Stuttgart, 1881); and the preface to Eigenbrodt's excellent German translation of Runeberg's epic poems (2 vols. Halle, 1891). English readers will find a useful account of Runeberg's life, with specimens of his poems translated, in Gosse's *Northern Studies* (1879); a fairly faithful translation of his lyric poems, with a biographical notice, in Magnússon and Palmer's *Runeberg's Lyrical Songs* (1878).

Runes (literally 'secrets,' 'mysteries,' 'whispers'), the letters of the oldest alphabet of the Germanic peoples, especially the Scandinavians and the English. In Sweden, Denmark, and Norway

thousands of inscriptions have been found. In England they are commonest in the north. They are rare in Germany. The Goths knew them before they became Christian, and Wulfila adopted some for his Gothic alphabet. In like manner the English retained the letters wyn and þorn (q.v.) when they took over the Irish alphabet.

The runic alphabet is called the Futhorc, from the first six letters *f, u, th, o, r, c*. The form, number, and value of the rune-staves changed considerably during the many centuries they were in use, and those of different countries exhibit considerable differences. They may, however, be arranged in three main divisions: (1) those of the earliest inscriptions (perhaps 3d or 4th century to 6th century) in a language not yet differentiated; (2) the Anglian runes, used in Northumbria from the 7th to the 9th century; (3) the later Scandinavian runes, used in Sweden and Norway in the 7th and following centuries. These futhorcs are shown in the table. The oldest is of twenty-four runes,

Names.	Values.	Prim.	Angl.	Scan.
feoh	f	𐌺	𐌿	𐌶
ur	u	𐌹	𐌺	𐌺
thorn	th	𐌸	𐌸	𐌸
os	a, o	𐌲	𐌲	𐌲
rad	r	𐌹	𐌹	𐌹
cen	c, k	𐌺	𐌺	𐌺
gifu	g	𐌶	𐌶	
wyn	w	𐌶	𐌶	
hægl	h	𐌺	𐌺	*
nyd	n	𐌺	𐌺	𐌺
is	i	𐌺	𐌺	𐌺
ger	j	𐌺	𐌺	
eoh	i, h	𐌺	𐌺	
peorth	p	𐌺	𐌺	
eolh	z	𐌺	𐌺	
sigel	s	𐌺	𐌺	𐌺
tir	t	𐌺	𐌺	𐌺
beore	b, b	𐌺	𐌺	𐌺
eh	e	𐌺	𐌺	
man	m	𐌺	𐌺	𐌺
lagu	l	𐌺	𐌺	𐌺
ing	ng	𐌺	𐌺	
dæg	d	𐌺	𐌺	
ethel	o, æ	𐌺	𐌺	

divided into three families or octaves. In the Anglian futhorc some new runes (not shown above) were obtained by differentiation, and the phonetic values underwent considerable changes. The Anglian runes are from 25 to 40 in number. The later Scandinavian futhorc, in which the greater number of runic inscriptions were written, had dwindled down to 16 runes. The names of the runes are given above in their Old English forms (*feoh*, 'wealth'; *ur*, 'auroids'; *thorn*, 'thorn,' &c.). There have been preserved verses in Old English, Norwegian, and Icelandic, descanting upon the significance of these names.

The origin of the runic writing has been a matter of prolonged controversy. Isaac Taylor held that it was derived from a northern Greek alphabet of about the 6th century, B.C.; Wimmer from the Latin alphabet; Von Friesen from both Greek and Latin. The forms of the runes were considerably modified by the fact that they were cut with a

knife on wooden slabs; consequently horizontal strokes, which would follow the grain of the wood, are necessarily avoided, and all the strokes are either vertical or slanting. This accords with the famous passage in the Old English poem *The Husband's Message*. Naturally the inscriptions that survive are mostly on more durable materials—stone and metal.

There are several interesting runic inscriptions in Britain, among which may be mentioned that on the Ruthwell (q.v.) Cross in Dumfriesshire, and that on the Bewcastle (q.v.) Cross in Cumberland, a fac-simile of which is given here. It is a memorial of Aelfrid, son of Oswiu, king of Northumbria, and dates from the 7th century. Several crosses in the Isle of Man are carved with the old Irish interlaced ornament, and are in the form of the old Irish cross. As they have also runic inscriptions, this style of Irish ornament has wrongly acquired the name of runic knot-work, and the Irish form of cross is often called the runic cross. These names originated at a time when archaeological knowledge was less advanced than it is now, and should be rejected.

Fac-similes of the chief runic inscriptions have been conveniently collected by Dr G. Stephens of Copenhagen in his *Handbook of Runic Monuments* (1884), which is an abridgment of his larger work on the *Old Northern Runic Monuments* (4 vols. 1866-1901). See Isaac Taylor, *The Alphabet* (1883), and *Greeks and Goths: a Study on the Runes* (1879); the works of Dr Wimmer, Dr Bugge, and Von Friesen; and *Runic and Heroic Poems of the Old Teutonic Peoples* (ed. Bruce Dickins, 1915).

Runn of Cutch. See CUTCH.

Runner, in Botany, is a long, slender branch proceeding from a lateral bud of a herbaceous plant with very short axis, or, in popular language, without stem. It extends along the ground, and produces buds as it proceeds, which often take root and form new plants. Strawberries afford a familiar example. Another is found in *Potentilla anserina*. Runners are common in the genus *Ranunculus*.

Runners. See BEAN.

Runnimeade, a long stretch of green meadow, lying along the right bank of the Thames, 1 mile above Staines and 36 miles by river WSW. of London. Here, or on Charta Island, a little way off the shore, Magna Carta (q.v.) was agreed to by King John, 15th June 1215.

Running. See ATHLETIC SPORTS.

Runrig Lands, or, as they are variously called, runridge or rundale lands, formerly frequent in Ireland and Scotland, are survivals of the simple form of open-field husbandry by a village community. Under this system the arable portion of the area of land occupied by a group of families, forming a township or village community, was periodically distributed among the families of the community, the share allotted to each family consisting of discontinuous rigs or strips of the open field; the pasture-land was held in common (see LAND LAWS). With the increasing tendency towards the recognition of separate proprietary rights, redistribution became more and more rare, and then ceased altogether. In the result, while the pasture-land continued to be held in common, the arable land came to be parcelled out



in severalty among individual proprietors, forming a congeries of small detached and interspersed estates. It was also formerly a common practice in Scotland, when an estate had to be divided among heir-portioners or adjudgers, to parcel it out by 'kavels,' or, in other words, in the form of runrig, the alternate ridges being allotted to separate proprietors. The obstruction to agricultural improvement resulting from the land being thus dispersed in small parcels intermixed with each other led in Scotland, in the end of the 17th century, to the introduction of a process of compulsory apportionment of such lands. By Statute 1695, chap. 23, it was provided that 'wherever lands of different heritors be runrig,' application may be made to the judge ordinary, or justices of the peace, 'to the effect that these lands may be divided according to their respective interests.' By this process, which is really a process of excambion or exchange, the land is apportioned so that each of the proprietors thereafter has his holding in one or more compact blocks which can be enclosed. This remedy, however, does not apply to burgh acres or to parcels of land exceeding four acres in extent. The Small Landholders (Scotland) Act, 1911, sect. 24 (6), gives to the Land Court, on application by the parties interested, wide discretionary powers to apportion land held runrig among the holders thereof.

Rupee, a silver coin current in India, of the value of 2s. English (see INDIA). A lac (or lakh) of rupees is 100,000 (at the old value of 2s. = £10,000), and a crore is 10,000,000. Coins are struck in silver of the value of 1, 2, $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ rupee. The first rupee was struck by Sher Shah, the Afghan emperor of Delhi (1540-45), and was adopted by Akbar and his successors; but in the decline of the Mohammedan empire every petty chief coined his own rupee, varying in weight and value, though usually bearing the name and titles of the reigning emperor. The rupee is the official money of account in the island of Mauritius.

Rupert, PRINCE, third son of the Elector Palatine Frederick V. and Elizabeth, daughter of James I. of England, was born at Prague on 18th December 1619, his parents having the month before been crowned king and queen of Bohemia. He studied at Leyden, and became well grounded in mathematics and religion ('indeed, made Jesuit-proof'), as well as in French, Spanish, and Italian, and above all the art of war. After a year and a half at the English court, where it was proposed to make a bishop of him or viceroy of Madagascar, he served in 1637-38, during the Thirty Years' War, against the Imperialists, until at Lemgo he was taken prisoner, and confined for nearly three years at Linz. In 1642 he returned to England, in time to be present at the raising of the king's standard at Nottingham; and for the next three years the 'Mad Cavalier' was the life and soul of the royalist cause, winning many a battle by his resistless charges, to lose it as often by a too headlong pursuit. He had fought at Worcester, Edgehill, Brentford, Chalgrove, Newbury, Bolton, Marston Moor, Newbury again, and Naseby, when in August 1645 his surrender of Bristol after a three weeks' siege so irritated Charles, who the year before had created him Duke of Cumberland and generalissimo, that he curtly dismissed him, and sent him his passport to quit the kingdom. A court-martial, however, completely cleared him, and he resumed his duties, only to surrender at Oxford to Fairfax in the following June. He now took service with France, but in 1648 accepted the command of that portion of the English fleet which had espoused the king's cause. As admiral or corsair, Prince Rupert acquitted himself with all

his old daring and somewhat more caution; and for three years he kept his ships afloat, escaping at last the blockade in which for nearly a twelve-month he was held at Kinsale on the Irish coast by Blake. But in 1651 the latter attacked his squadron, and burned or sunk most of his vessels. With the remnant the prince escaped to the West Indies, where, along with his brother Maurice, till the loss of the latter in a hurricane (1652), he led a buccaneering life, maintaining himself as before by the seizure of English and other merchantmen. In 1653 he was back in France, where and in Germany he chiefly resided till the Restoration. Thereafter he served with distinction under the Duke of York, and, in concert with the Duke of Albemarle, in naval operations against the Dutch; and he died at his house in Spring Gardens, 29th November 1682, in the enjoyment of various offices and dignities, being a privy-councillor, governor of Windsor, an F.R.S., &c. He left a natural daughter, Ruperta, born to him in 1673 by Margaret Hughes, actress. His last ten years had been spent in retirement in the pursuit of chemical, physical, and mechanical researches, for which he evinced considerable aptitude. Though he was not the inventor of mezzotint (see ENGRAVING), Prince Rupert no doubt improved the processes of the art, which he described to the Royal Society in 1662, after executing several interesting engravings on the new principle. Among his discoveries were an improved gunpowder, the composition known as 'Prince's metal,' and perhaps the 'Prince Rupert's Drops,' or curious glass bubbles described under Annealing (q.v.).

See Eliot Warburton's *Memoirs of Prince Rupert and the Cavaliers* (3 vols. 1849); Lord Ronald Gower's *Rupert of the Rhine* (1890); Eva Scott, *Rupert, Prince, Palatine* (1899); Mrs Erskine, *A Royal Cavalier* (1910).

Rupert's Land. See HUDSON'S BAY COMPANY.

Rupia is a somewhat severe form of skin disease. It is characterised by flattish, distinct *bullæ* or blebs, containing a serous, purulent, or sanious fluid, which become changed into thick scabs. Several varieties of this disease have been established by dermatologists. In its simplest form the blebs are not preceded by any inflammatory symptoms, are about an inch in diameter, and contain a fluid which is originally thin and transparent, but soon thickens, becomes purulent, and dries into brown, ragged scabs, which are elevated in the centre. The scabs are easily separated, and leave ulcerated surfaces, on which several successive scabs usually form before healing ensues. In a more severe form, known as *Rupia prominens*, the scab projects so much in the centre as to resemble a limpet-shell in form.

Rupia is a chronic disease, and is usually limited to the limbs, the loins, and the nates. It is not contagious, and generally attacks persons debilitated by old age, intemperance, bad living, or previous diseases, especially smallpox, scarlatina, and syphilis. The general treatment consists mainly in the administration of tonics, the mineral acids, ale, wine, animal food, &c.; and there is no doubt that certain cases, especially those caused by syphilis, which will not yield to tonics, rapidly improve when treated with iodide of potassium. The local treatment consists in puncturing the blebs as soon as they arise, in removing the scabs by poulticing, and in applying a slightly stimulating application—such as a solution of nitrate of silver—to the subjacent ulcers. The disease is frequently tedious and obstinate, but the patient almost always ultimately recovers.

Ruppin. NEU, a town of Prussia, on a lake (Ruppiner See), which communicates with the

Elbe, 48 miles by rail NW. of Berlin. It was built by Frederick William II. after a fire in 1787, and is a handsome town with a 13th century abbey church. Pop. 17,000.

Rupture. See HERNIA.

Rural Dean. See DEAN.

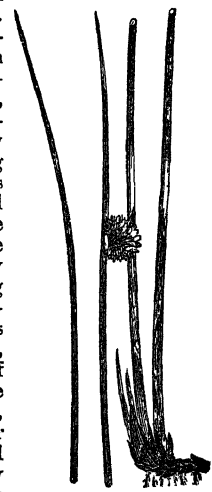
Rurik, the founder of the Russian monarchy. See NORTHMEN, and RUSSIA.

Rurki, a town in the United Provinces of India, 22 miles E. of Saharanpur, with an engineering college and meteorological observatory. Pop. 16,700.

Rush, BENJAMIN, an American physician, was born in what is now the twenty-third ward of Philadelphia, December 24, 1745, graduated at Princeton in 1760, studied medicine in Philadelphia, Edinburgh, London, and Paris, and in 1769 was made professor of Chemistry in the Philadelphia Medical College. Elected a member of the Continental Congress, he signed the Declaration of Independence (1776). In April 1777 he was appointed Surgeon-general, and in July Physician-general, of the Continental army. His duties did not prevent him from writing a series of letters against the articles of confederation of 1776. In 1778 he resigned his post in the army, because he could not prevent frauds upon soldiers in the hospital stores, and returned to his professorship. He was a founder of the Philadelphia dispensary, the first in the United States, and of the College of Physicians, was active in the establishment of public schools, was a member of the state conventions which ratified the Federal constitution and formed the state constitution. He next became professor of the Theory and Practice of Medicine at Philadelphia, to which chair he added those of the Institutes and Practice of Medicine and Clinical Practice (1791), and of the Practice of Physic (1797); and during the epidemic of 1793 he was as successful as devoted in the treatment of yellow fever. Virulently attacked, owing to his methods of practice, by William Cobbett, who published a newspaper in Philadelphia, he prosecuted him for libel, and recovered \$5000 damages. In 1799 Rush was appointed treasurer of the United States Mint, which post he held till his death, 19th April 1813. He was called 'the Sydenham of America,' and his medical works brought him honours from several European sovereigns. The chief of them were *Medical Inquiries and Observations* (5 vols. 1789-93), *Essays* (1798), and *Diseases of the Mind* (1821; 5th ed. 1835).—His son, RICHARD (1780-1859), a lawyer and statesman, was minister to England in 1817-25, where he negotiated the important Fisheries and North-eastern Boundary Treaties, and was Secretary of the Treasury from 1825 to 1829. In 1828 he was an unsuccessful candidate for the vice-presidency of the United States; and in 1836-38 he secured for his country the whole of the legacy which James Smithson had left to found the Smithsonian Institution.

Rush (*Juncus*), a genus of plants of the family Juncaceæ, having a glume-like (not coloured) perianth, smooth filaments, and a many-seeded, generally three-celled capsule. The species are numerous, mostly natives of wet or marshy places in the colder parts of the world; some are found in tropical regions. Some are absolutely destitute of leaves, but have barren scapes (flower-stems) resembling leaves; some have leafy stems, the leaves rounded or somewhat compressed, and usually jointed internally; some have plane or grooved leaves on the stems; some have very narrow leaves, all from the root. The name Rush perhaps properly belongs to those species which have no

proper leaves; the round stems of which, bearing or not bearing small lateral heads of flowers, are popularly known as *Rushes*. The Soft Rush (*J. effusus*) is cultivated in Japan for making mats. The Common Rush (*J. conglomeratus*) and the Soft Rush are largely used for the bottoms of chairs and for mats, and in ruder times, when carpets were little known, they were much used for covering the floors of rooms; to this many allusions will be found in old writers. As they were seldom entirely renewed, the insanitary consequences may be imagined. The strewing of churches grew into a religious ceremony, and has been revived in modern times, as at Grasmere. The stems of the true rushes contain a large pith or soft central substance, which used to be used for wicks to small candles, called rushlights. There are twenty or twenty-four British species of rush, some of which are very rare, some found only on the highest mountains, but some are among the most common of plants. They are often very troublesome weeds to the farmer. Thorough drainage is the best means of getting rid of them. Lime, dry ashes, &c. are also useful.



Common Rush (*Juncus conglomeratus*).

Rush-nut (*Cyperus esculentus*). See CYPERUS.

Rushworth, JOHN, whose *Historical Collections of Private Passages of State, Weighty Matters of Law, Remarkable Proceedings in Five Parliaments*, is an important contribution to our knowledge of the Civil War, and the events that led to it, belonged to an ancient family in Northumberland, and was born there about 1607. He studied at Oxford, and settled in London as a barrister. He appears to have spent a great deal of his time for many years in attending the Star Chamber, the Court of Honour, the Exchequer Chamber, Parliament, &c., and in taking down shorthand notes of the proceedings. When the Long Parliament met in 1640 he was appointed assistant to Henry Elsyngne, clerk of the House of Commons. He sat in parliament as member for Berwick; was in 1645 secretary to Sir Thomas Fairfax, and in 1677 to the Lord Keeper of the Great Seal. In 1684 he was flung into the King's Bench for debt, and here he died, 12th May 1690. Rushworth's *Historical Collections* cover the period 1618-48, and were published in four instalments—in 1659, 1680, 1692, and 1701. The whole was republished in 1721 in 7 vols. Rushworth had the instinct of perpetuity, for he sets forth as the motive for his labour 'the impossibility for any man in after ages to ground a true History, by relying on the printed pamphlets of our days, which passed the press while it was without control.' The work has been blamed by royalist authors as unfair, and Carlyle often rails on its worthy author as a Dryasdust.

Ruskin, JOHN, the most eloquent and original of all writers upon art, and a strenuous preacher of righteousness, was born in London, 8th February 1819. He was an only child; his father (1785-1864), a wealthy wine-merchant, was an Edinburgh man settled in London. He was educated in his father's house, first in London and afterwards at Denmark-hill, till he went, as a gentleman commoner of Christ Church, to Oxford. There he gained the

Newdigate prize for English poetry—by a poem on *Salsette and Elephantia*—in 1839, and took his degree in 1842. He studied painting under Copley Fielding and Harding; but his masters in the art were, he says, Rubens and Rembrandt. The story of the earlier years of his life has been told by Ruskin himself very fully in his *Præterita*, one of the most charming autobiographies in the language. In 1843 appeared the first volume of his *Modern Painters*, the primary design of which (in reply to a criticism of Turner in *Blackwood's Magazine*) was to prove the superiority of modern landscape-painters, and more especially of Turner, to the Old Masters; but in the later volumes (the fifth and last was published in 1860) the work expanded into a vast discursive treatise on the principles of art, interspersed with artistic and symbolical descriptions of nature, more elaborate and imaginative than any writer, prose or poetic, had ever before attempted. *Modern Painters* was essentially revolutionary in its spirit and aim, many of the most distinguished landscape-painters, both of old and new schools, being summarily dealt with and condemned; and the work naturally excited the aversion and hostility of the conservatives in art. But the unequalled splendour of its style gave it a place in literature; the originality of its views, the lofty conception of the painter's art displayed in it, and the evident justness of much of the criticism, secured recognition. Disciples soon appeared; and the views of art enunciated by Ruskin gradually made way, and largely determined the course and character of later English art. The first volume was published in a much altered form in 1846. The last three volumes contained illustrations by the author. A revised and altered edition appeared in 1860-67; another in 1873; and an edition in six volumes, with some additional plates, an epilogue, and new index, in 1889. In 1849 appeared *The Seven Lamps of Architecture*; and in 1861-53 *The Stones of Venice*, both being efforts to introduce a new and loftier conception of the significance of domestic architecture. They were exquisitely illustrated by the author himself. About this time Pre-Raphaelitism (q.v.) began to develop itself as a distinctive phase of modern art, and Ruskin warmly espoused its cause in letters, pamphlets, and *Notes on the Academy Exhibition* (1855-60). He was the earliest literary advocate of this school, whose leading principle he defined as the resolve 'to paint things as they probably did look and happen, not as, by rules of art developed under Raphael, they might be supposed gracefully, deliciously, or sublimely to have happened.'

In 1854 he published four admirable and suggestive *Lectures on Architecture and Painting*; and in 1858 two *Lectures on the Political Economy of Art*. The *Notes on the Construction of Sheepfolds* (1851), dealing with the discipline of the church, illustrate his ingenuity in devising picturesque titles that suggest no notion of the subject treated. *The King of the Golden River*, a fairy story, was published in 1851; and in 1854 *The Two Paths*, lectures on art and its application to decoration and manufacture. The *Elements of Drawing* and the *Elements of Perspective* appeared in 1857 and 1859. The *Crown of Wild Olive* is a series of four essays on work, traffic, war, and the future of England; *Sesame and Lilies*, lectures on good literature. *The Queen of the Air* is a study of the Greek myths of cloud and storm; *Ethics of the Dust*, lectures on crystallisation; *Ariadne Florentina*, on wood and metal engraving; *Aratra Pentelici*, on the principles of sculpture. The *Laws of Fesolè* are the elements of painting and drawing; *Frondes Agrestes* are readings from 'Modern Painters'; *Giotto and His Works*, *Love's Meinie* (on Birds),

and *Deucalion* (on Geology) are other publications. *Munera Pulveris* contains the elements of political economy according to Ruskin; while *Unto this Last*—in Ruskin's opinion, the best of his works—attacks the current doctrines of the 'dismal science.' *Val d'Arno* contains lectures on the art of the 13th century in Pisa and Florence; later courses dealt with the modern art of England and English history (*Pleasures of England*). *Mornings in Florence* are studies of Christian art for English travellers; and *St Mark's Rest* is on the history of Venice. *The Eagle's Nest* discusses the relation of natural science to art; *Time and Tide* are letters to a working-man of Sunderland. *Arrows of the Chace* is a selection of his letters; *On the Old Road* is the title of a republication of his miscellaneous pamphlets, articles, and essays contributed to various reviews and magazines, containing famous utterances on Samuel Prout, the History of Christian Art, the Lord's Prayer, the 'Cestus of Aglaia,' &c. An early volume of poems, issued for private circulation, became a much sought after bibliographical treasure; in 1891 it was reprinted (in 2 vols.) with many additional pieces and illustrations from the author's drawings. *Fors Clavigera* appeared as a sort of periodical at irregular intervals for several years, in the form of letters to the workmen and labourers of Great Britain, on a great variety of topics (vols. i.-viii. with full index, 1887). *Proserpina*, published in the same way, gives studies of wayside flowers. *Hortus Inclusus* (1887) is a series of letters 'to the ladies of the Thwaite.' From 1869 till 1879 Ruskin was Slade professor of Art at Oxford; in 1871 he gave £5000 for the endowment of a master of drawing there; in 1883 he was re-elected professor, but resigned in the following year. Subsequently he founded a museum at Sheffield, where he bestowed part of his own priceless library and art treasures. In his later years he established himself at Brantwood, on Coniston Lake. There he died on the 20th of January 1900.

Ruskin was primarily a critic of art; but, as the titles of his works indicate, his teaching extended over a wide area. Art for him was closely and inseparably bound up with truth, with morals, with religion; and in most departments of political philosophy, in social and political economy, Ruskin was constant, in season and out of season, in lifting up his testimony against what he conceived to be low views, perverted ideals, coarse and vulgar complacencies. Like Carlyle, whose pupil he professed to be, he held the world in these later days to have gone on a wrong tack; in his views of nature and life he was, he said, 'alone in the midst of a modern crowd, which rejects them all,' and had to 'maintain himself against the contradiction of every one of his best friends.' Within the sphere of art criticism he declares that an important part of his lifework had been to teach 'the supremacy of five great painters, despised till he spoke of them—Turner, Tintoret, Luini, Botticelli, and Carpaccio.' His life-long contention with political economy is based on the belief that the science had been used to inculcate the unchecked and competitive pursuit of merely material wealth. He affirms broadly that his *Munera Pulveris* contains the first accurate analysis of the laws of political economy which had been published in England. What is usually called political economy is in reality nothing more than the investigation of some accidental phenomena of modern commercial operations, and has no connection with political economy as treated by the great thinkers of the past—such as Plato, Xenophon, Cicero, Bacon. True political economy regulates the acts and habits of a society or state, with reference to its maintenance, as domestic economy does those of a household. If

is neither an art nor a science, but a system of conduct and legislation, founded on the sciences, directing the arts, and impossible except under certain conditions of moral culture. By the maintenance of the state, which is the object of political economy, is to be understood the support of its population in healthy and happy life, and the increase of their numbers, so far as is consistent with their happiness. It is the 'multiplication of human life at the highest standard,' cherishing and developing the noblest type of manhood, alike in beauty, in intelligence, and in character. The wealth of which Ruskin takes cognisance is not mere exchangeable value, but intrinsic and effectual wealth, consisting of things contributing to the support of life in its fullest sense—as land, houses, furniture, instruments, food, medicine, clothing, books, works of art. The subject of political economy, therefore, embraces a large part of the sphere of private and public morals, and of political philosophy. It deals with the relation of master to servant, employer to workman, of the state to its subjects, with the province of sanitary and commercial legislation, and with the duty of the state in promoting education, suppressing luxury, regulating the hours and wages of labour. He is as confident as the most revolutionary reformer that the conditions of modern society must be completely changed and reconstructed; his ideals coincide in many points with those of some Socialists, though many of his aims would be regarded as distinctly reactionary. A 'violent illiberal' rather than a conservative, Ruskin regards reverence for natural beauty, truth, and godliness as the highest elements in life, and would give properly constituted authority extensive powers; usury of any kind is as indefensible as avarice or dishonesty. Till of late he was seldom treated as a serious political economist; but it has recently been admitted that he has actually pointed out some real weaknesses of the old abstract political economy as a scientific theory. He devoted a great part of his originally large fortune to founding the St George's Guild, which was intended to be a kind of primitive agricultural community, where the old-world virtues should be strenuously inculcated on young and old, and where ancient and homely methods might be cherished in defiance of all modern mechanical and manufacturing processes. He also strove to promote home industries in various places. Not more remarkable than the eloquence, power, and richness of his English style are the confidence and dogmatism of his assertions, the audacity of his paradoxes, the fearlessness of his denunciations; while his earnestness, conviction, and self-denying honesty of purpose are undisputed. His influence in creating a new interest in the beauty of nature and of art in England was profound; and although the world rejects his theories of social economy as perverse, paradoxical, and impracticable, he did much to vivify ideals of life, and ennoble our standards of conduct.

See E. T. Cook, *The Life of Ruskin* (2 vols. 1911); W. G. Collingwood, *The Life and Work of John Ruskin* (2 vols. 1893; new ed. 1900); monographs by Mrs. Meynell (1900) and Frederic Harrison (1902); French works on him by Bardoux (1900) and Sizeranne (1897; trans. 1900), and German by Charlotte Broicher (1904-8). A collected edition of the works (39 vols.) appeared in 1903-12, edited by Cook and Wedderburn, with a bibliography, and an index which is practically a concordance.

Ruskin College, a college established at Oxford in 1899 to provide education in social sciences for working-class students. It is supported by subscriptions from trade unions, co-operative societies, and other associations and individuals. New buildings were opened in 1913. The Central

Labour College was the result of the secession in 1909 of students and unions dissatisfied with its tendency and favouring a more definitely class-conscious point of view. The Central Labour College removed to London in 1911.

Russell, a great Whig house, whose origin has been traced back to Thor, through 'Olaf the sharp-eyed, king of Rerik,' Drogo, brother of Rollo, the first Duke of Normandy, and Hugh Bertrand, lord of Le Rozel, a follower of the Conqueror's. Anyhow, a John Russell was constable of Corfe Castle in Dorsetshire in 1221; and his descendants have had seats at Kingston Russell, near Dorchester; Cheney's, in Bucks, near Amersham; and Woburn Abbey, in Bedfordshire. Among them, besides William Lord Russell, Earl Russell, and Bertrand Russell (all noticed separately below), the following may be mentioned: Sir John Russell, Speaker of the House of Commons in 1424 and 1432; John, created in 1539 Baron Russell of Cheney's, and in 1550 Earl of Bedford, who got the abbey lands of Tavistock and Woburn; Sir William Russell, who in 1594 became Lord Deputy of Ireland, and in 1603 was created Baron Russell of Thornhaugh; Francis, fourth Earl (died 1641), the drainer of the Bedford Level; William, fifth Earl, created in 1694 Marquis of Tavistock and Duke of Bedford; Admiral Edward Russell (1651-1727), who, semi-Jacobite though he was, beat the French at La Hogue in 1692, and for his victory was made Earl of Orford; John, fourth Duke (1710-71), Lord-lieutenant of Ireland; his grandson, Lord William Russell (1767-1840), who was murdered by his valet Courvoisier; Odo (1829-84), brother of the ninth Duke, from 1871 ambassador to Germany, in 1881 made Baron Amptill; and George William Erskine (1853-1919), grandson of the sixth Duke, essayist and under-secretary.

See J. H. Wiffen's *Historical Memoirs of the House of Russell* (1833); and Froude's *Short Studies* (4th series, 1884).

WILLIAM RUSSELL, LORD RUSSELL, was born 29th September 1639, third son of the fifth Earl of Bedford by Lady Anne Carr, daughter of the poisoner Countess of Somerset; by the death of his brothers (one in infancy, the other in manhood) he, in 1678, succeeded to the courtesy title of Lord Russell. He was educated at Cambridge, and travelled on the Continent. At the Restoration he was elected M.P. for Tavistock, and was 'drawn by the court into some disorders' (debts and duelling), from which he was rescued by his marriage in 1669 with Lady Rachel Wriothesley (1636-1723), second daughter and co-heiress of the Earl of Southampton and widow of Lord Vaughan. He was a silent member till 1674, when he spoke against the doings of the Cabal, and thenceforth we find him an active adherent of the Country party. He dallied unwisely with France, but took no bribe; he shared honestly in the delusion of the Popish Plot; he presented the Duke of York as a recusant; and he carried the Exclusion Bill up to the House of Lords. The king and his brother resolved to be revenged on him and the other leaders of the Whig party; and he, Essex, and Sidney were arrested as participators in the Rye-house Plot. On 13th July 1683 he was arraigned of high-treason at the Old Bailey, and, infamous witnesses easily satisfying a packed jury, was found guilty. His father's proffer, through the Duchess of Portsmouth, of £100,000 for his life availed nothing, nor his own solemn disavowal of any idea against the king's life or any contrivance of altering the government; and on the 21st he was beheaded in Lincoln's Inn Fields. The pity of his judicial murder, the pathos of Burnet's story of his end, and the exquisite letters of his noble wife, who at his trial appeared in court as his secretary, have

secured him a place in history that else he had never attained to, for he was a man of virtues, not genius, a Christian hero rather than a statesman.

See his life by Lord John Russell (1819; 4th ed. 1853); the Letters of Lady Russell (1773; 14th ed. 1853); and the Lives of her by Miss Berry (1819), Lord John Russell (1820), and Guizot (Eng. trans. 1855).

JOHN RUSSELL, EARL RUSSELL, K.G., was born on 18th August 1792, in Hertford Street, Mayfair, London, the third son of the sixth Duke of Bedford. A sickly child, he was educated at Sunbury, at Westminster (1803-4), and then at Woodnesborough vicarage, near Sandwich, until, in 1809, after a nine months' visit with Lord and Lady Holland to Spain and Portugal, he entered the university of Edinburgh. He lived there three years with Professor Playfair, studying under Dugald Stewart and Dr Thomas Brown, first exercising his powers of debate at the meetings of the Speculative Society, and paying two more visits to the Peninsula. In July 1813, while still a minor, he was returned for the family borough of Tavistock, but, though he spoke in 1815 against the renewal of war with France, foreign travel and literature for some years engrossed him rather than politics. He made his first motion in favour of parliamentary reform in 1819, and continued to bring the subject almost annually before the House. He was also the strenuous advocate of the repeal of the Test and Corporation Acts, of Catholic Emancipation, and of other measures of civil and religious liberty. At the general election of 1830, caused by the death of George IV., the rallying cry of reform won many fresh seats for the Liberals; the 'Great Duke' was driven from office, and Earl Grey proceeded to form a ministry. Lord John became Paymaster of the Forces, without a seat in the cabinet; but he was one of the four members of the government entrusted with the task of framing the first Reform Bill, and on him devolved the great and memorable honour of proposing it. The fortunes of the measure belong to the history of the day; enough that on 4th June 1832 it received the royal assent, and the country was saved from the throes of revolution that at one time seemed imminent. In November 1834 Lord John left office with the Melbourne government, which had succeeded Grey's; in March 1835 he brought forward a motion in favour of applying the surplus revenues of the Irish Church to educational purposes; and the success of his motion caused the downfall of Peel and the return of Melbourne to power.

As Home Secretary and leader of the Lower House Lord John now attained the zenith of his career, four measures with which his name is associated being the Municipal Reform Act (1835), and the Tithes Commutation, Registration, and Marriage Acts (1836). In 1839 he exchanged the seals of the Home for those of the Colonial Office; in 1841 he proposed a fixed duty of 8s. per quarter on foreign corn and a reduction of the duties on sugar and timber. Defeated by the opposition, the Melbourne government appealed to the country without success, so once more made way for Peel. In this general election Lord John, who meanwhile had sat for Hunts, Bandon Bridge, Devon, and Stroud, boldly challenged the verdict of London on free trade by standing for the City. He was returned by the narrow majority of 9, and continued to represent the City until his elevation to the Upper House.

In November 1845 he wrote a letter from Edinburgh to his London constituents, announcing his conversion to the total and immediate repeal of the Corn Laws. This letter led to Peel's resignation; and Lord John on 11th December was commissioned by the Queen to form an administration.

He failed, however, owing to Lord Grey's antipathy to Palmerston, so Peel was forced back to office, and carried the repeal. On the very day on which the bill passed the Lords the Peel ministry was defeated in the Commons on a question of Irish coercion by a coalition of Whigs and Protectionists, whereupon a Whig ministry succeeded, with Lord John for prime-minister (1846). It succeeded to a difficult position. In Ireland there was the famine, followed by a foolish rebellion, whilst at home there was Chartism and the so-called 'Papal aggression,' which evoked from Lord John an indignant protest, first in the form of a letter to the Bishop of Durham, and next in the Ecclesiastical Titles Bill of 1851. In the winter of that year Lord Palmerston's approval of the French *coup d'état* without the Queen's or Lord John Russell's knowledge procured him his dismissal from the office of Foreign Secretary; within two months he 'gave Russell his tit-for-tat,' defeating him over a militia bill (February 1852). After a short-lived Derby government, Lord Aberdeen in December formed a coalition ministry of Whigs and Peelites, with Russell for Foreign Secretary and leader in the Commons.

His inopportune Reform Bill (1854), the Crimean mismanagement, his resignation (January 1855), and his bungling that same year at the Vienna Conference, all combined to render him thoroughly unpopular; and for four years he remained out of office. But in June 1859, in the second Palmerston administration, he became Foreign Secretary, which office he held six years, having meanwhile in 1861 been created Earl Russell. He did much for the cause of Italian unity; still, non-intervention was his leading principle—e.g. during the American civil war and the Sleswick-Holstein difficulty. On Palmerston's death in 1865 Earl Russell for the second time became prime-minister, but the defeat in the following June of his new Reform Bill left no alternative but resignation. He continued, however, busy with tongue and pen till his death, which took place at his residence, Pembroke Lodge, Richmond Park, on 28th May 1878.

The 'Lycurgus of the Lower House,' as Sydney Smith dubbed him, this 'little great man' was honest in all his convictions, in none more so than in his belief in himself. 'He knew he was right' gives the key to both his career and his character. Of his voluminous works, a score in number, including a tale and two tragedies, need only be mentioned his *Life of William Lord Russell* (1819), *Memoirs of the Affairs of Europe* (1824), *The Correspondence of John, fourth Duke of Bedford* (3 vols. 1842-46), and the *Memoirs of Fox and Moore*.

See his *Selections from Speeches and Despatches* (1870), his *Recollections and Suggestions* (1875), *Early Correspondence* (ed. Rollo Russell, 2 vols. 1913), *Later Correspondence* (ed. G. P. Gooch, 2 vols. 1925), and Spencer Walpole's *Life of Lord John Russell* (2 vols. 1899).

BERTRAND RUSSELL, F.R.S., mathematician and philosopher, and grandson of the foregoing, was born at Trelleck, 18th May 1872, and studied at Trinity College, Cambridge. He had already achieved fame as a brilliant philosophical and mathematical thinker and writer, when, on the outbreak of war, his no-conscription writings brought him fine imprisonment, and loss of a Cambridge lectureship. He visited Russia, where, a communist, he was disappointed in the Soviet experiment; and China, where he gave a course of lectures in Peking University. His books include *Philosophy of Leibniz* (1900), *Principles of Mathematics* (1903), *Philosophical Essays* (1910), *Principia Mathematica* (with Dr A. N. Whitehead, 1910), *Problems of Philosophy* (1911), *Principles of Social Reconstruction* (1917), *Mysticism and Logic*

(1918), *Mathematical Philosophy* (1919), *Practice and Theory of Bolshevism* (1920), *A B C of Atoms* (1923), *Prospects of Industrial Civilisation* (with his second wife, 1923), *Analysis of Mind* (1925), *A B C of Relativity* (1925), *On Education* (1926).

Russell, GEORGE WILLIAM, Irish writer under the pseudonym of 'A. E.', was born at Lurgan, Co. Armagh, in 1867. His collected poems were published in 1913; he has also published a prose drama *Deirdre* (1907), *The Candle of Vision* (in prose, 1918), *Interpreters* (1922), and various essays and works on Irish political matters. He is known besides as a painter, a promoter of Irish agriculture, one of the founders of the Irish Literary Theatre (1899), and an enthusiastic supporter of Irish nationalism. See the Study by D. Figgis, 'A. E.' (1916).

Russell, WILLIAM CLARK (1844-1911), a popular nautical novelist, was born in New York, son of the singer and song-composer, Henry Russell (1812-1900). Educated at Winchester and in France, he went to sea at thirteen for about eight years, then wrote for the Newcastle *Daily Chronicle* and the London *Daily Telegraph*, but from 1887 reserved his energies mainly for fiction.

Russell, SIR WILLIAM HOWARD (1821-1907), the first of 'special correspondents,' was born at Lilyvale in County Dublin, educated at Trinity College, Dublin, joined the staff of the *Times* in 1843, and was called to the bar in 1850. He went out to the Crimea at the beginning of the war, and there remained till the close, writing home those famous letters which opened the eyes of Englishmen to the shameful sufferings of the soldiers during the winter siege of 1854-55, and quickly brought about the fall of the Aberdeen ministry. He next witnessed the events of the Indian Mutiny, returning to England in 1858. He established the *Army and Navy Gazette* in 1860, and next year the opening of the civil war drew him to America, which he soon made too hot for him by a too truthful account of the Federal defeat at Bull Run. He accompanied the Austrians during the war with Prussia (1866), and the Prussians during the war with France (1870-71); visited Egypt and the East (1874) and India (1877), as private secretary to the Prince of Wales; and went with Wolseley to South Africa in 1879. Most of his letters were collected into volumes, which had great success in their day; three books that may be named are *The Adventures of Doctor Brady* (1868), a novel; *Hesperothen, or Notes from the West* (1882); and *A Visit to Chile and the Nitrate Fields of Tarapacá* (1890).

Russia, a federation of Soviet republics in eastern Europe and northern and western Asia, extending from the Black Sea to the Arctic Ocean, and from the Gulf of Finland to the North Pacific, bordering on Japan (in Sakhalin), China, Afghanistan, Persia, Turkey, Rumania, Poland, Latvia, Estonia, and Finland, and coming uncomfortably near the NW. frontier of India. This vast territory, which covers an area more than twice as large as Europe, and embraces one-sixth of the land-surface of the globe, has a population estimated at about 140,000,000, belonging to a great variety of kindreds, tribes, and tongues. In a slightly more restricted sense the name belongs also to the principal member of the federation, with about 93 per cent. of the total area. The other members are Ukraine, White Russia, Transcaucasia (itself a federation), Turkmenistan, and Uzbekistan. Within these many areas have been granted autonomy, some of them with the name of republic. The Russian dominions in America (Alaska) were sold to the United States in 1867 for \$7,200,000. The area

of European Russia was diminished in 1918 by the setting up of independent republics in Poland, Lithuania, Lettland, Estonia (see the articles on these), and by the union of Bessarabia (which Russia claims as Ukrainian) with Rumania in 1920, by the cession of Petchenga to Finland (which had severed its connection with Russia), by Polish conquests in White Russia and Ukraine.

Constituent States.	Area in sq. m.	Population.
Russia	7,597,638	96,746,300
White Russia	42,888	4,204,500
Ukraine	165,854	27,663,900
Transcaucasia	74,499	5,421,000
Turkmenistan	181,478	914,600
Uzbekistan	124,292	4,802,900
	8,168,744	139,753,900

The capital (since 1918) is Moscow.

In accordance with the principle of self-government of nationalities various regions have been erected into 'autonomous republics.' These are—in Russia proper: Bashkiristan, Tataristan, the Kirghiz or Cossack republic, Daghestan (Mountain republic), Crimea, Yakut republic, Karelia, Buriat and Mongol republic, German Volga republic; in Ukraine: the Moldavian republic, the Bulgarian republic; in Transcaucasia: Nakhitchevan, Abkhasia, Adjaria; in Uzbekistan: the Tajik republic. There are besides many regions with a minor share of autonomy.

The territory of the union, however different its separate parts as regards latitude and climate, is more homogeneous than it appears at first sight. It belongs to the great orographical division of Eurasia, which embodies both the plains of European Russia and the lowlands and plains that extend north of the two great plateaus of Asia—the high plateau of east Asia and the western plateau of Persia and Armenia (see ASIA). However, the Russians are rapidly passing the limits of the lowlands.

Seaboard, Islands.—Until the end of the 17th century Russia's seaboard was limited to the Arctic Ocean, and she had to wage a long series of wars before she secured a firm footing on the Baltic and the Black Sea. The latter, however, is an inland sea, the entrance to which still remains in the hands of a foreign power. The Arctic Ocean, which offers excellent fishing grounds in its western part, makes a deep indentation on the north coast of Russia—the White Sea (q.v.); but its gulfs, Kandalaksha, Onega, and Dwina, are ice-bound for nine months every year. Murmansk is open all the year. The only other port of any moment, Archangel, has now lost its former importance. Farther east, Tchesskaya and Petchora bays are surrounded by frozen deserts. The Kara Sea, between the crescent-shaped island group of Novaya Zemlya and the coast of Siberia, is navigable for a few weeks only every year (see SIBERIA). The islands of Kolguev, Vaigatch, Novaya Zemlya, and the islands of Siberia—Nicholas II. Land (renamed Lenin Land), New Siberia, Medvyezhi, Wrangel, and others—are uninhabited, save that a settlement has been attempted in Wrangel Island. As to the Behring Sea and the Sea of Okhotsk, which contain good fishing and hunting grounds, their coasts are most inhospitable. The same is true of that part of the Japanese Sea which belongs to Russia. Its only great gulf, Peter the Great's, has in Vladivostok one of the finest roadsteads in the world; but this gulf is separated from the interior by wide tracts of uninhabited marshes and forests. Of the Baltic Sea, only the head of the Gulf of Finland now touches Russian territory. Nevertheless, four out of the five chief outlets of Russia—Leningrad (St Petersburg), Revel, Libau, and Riga—are situated on the Baltic Sea. Libau is the only

one which has its roadsteads open nearly all the year round; and Leningrad is the only one that remains Russian. The chief Russian island of the Gulf of Finland is Kotlin, with the fortress of Kronstadt.

The Black Sea acquires more and more importance every year. The fertile steppes of its littoral are being rapidly settled, and the centre of gravity of Russia's population is gradually shifting south. The Black Sea suffers, however, from a lack of good ports. Its great gulf, the Sea of Azov (whose ports are Taganrog and Rostov), is very shallow; the fine ports of the Crimea are too remote from the mainland; and the seaboard of Northern Caucasia is separated from the interior by a high chain of mountains. Odessa is the chief port of this sea; and it has no rival in Russia except Leningrad. Nikolaiev is poorly equipped. Sebastopol is a naval station. Batum, the chief port of Transcaucasia, is of great importance for the export of petroleum.—The Caspian Sea, which receives the chief river of European Russia—the Volga—is an excellent medium of communication between the central Asian parts of the union and the Caucasus, as also for trade with Persia (to which the south coast belongs); but it has no outlet to the ocean, nor is there any probability of connecting it advantageously by canal with the Black Sea, because its level is 70 feet below the level of the ocean. The Caspian supplies Russia with considerable quantities of fish.

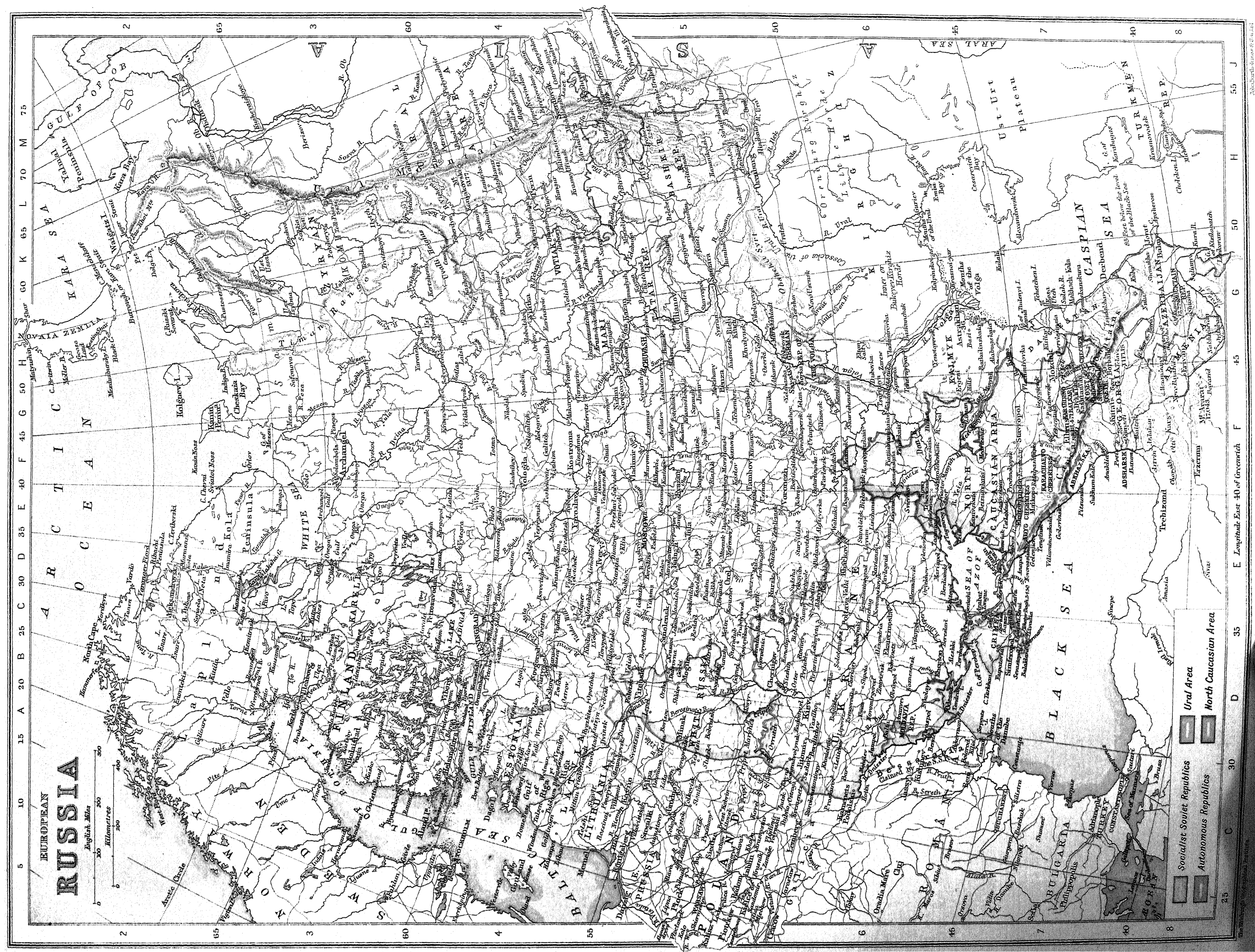
Orography.—The geographical features of the Caucasus, Siberia, and Turkestan being dealt with under those respective headings, the following remarks relate only to European Russia. The leading feature in its physical structure is a broad, flat swelling about 700 miles wide, with an average height of 800 feet, which crosses it from south-west to north-east and connects the elevated plains of middle Europe with the Urals. A belt of lowlands stretching from Poland to the White Sea fringes this central plateau on the north-west, separating it from the hilly tracts of Finland; while the plains of Bessarabia, Kherson, the Sea of Azov, and the lower Volga limit it on the south-east. The highest parts of the central plateau, hardly attaining 1000 to 1100 feet above the sea, lie along its north-western border—viz. the plateau of Minsk, the Valdai Hills, and the hilly tracts of the Sukhona and Vytchegda (upper Dwina). In middle Russia the same altitude is attained by the flat eminences of the plateau about Kursk and in the hills on the right bank of the Volga. In these places the country assumes a hilly aspect on account of the deep ravines which intersect it. The central plateau is, however, diversified by three depressions. One of these stretches south-east to north-west up the broad valley of the Dnieper and thence beyond the Polish frontier to the Vistula; another follows the Don and joins the valley of the Oka; and the third extends from the north shore of the Caspian along the left bank of the Volga to the bend it makes at Samara. During the Postglacial period an elongated gulf of the Caspian Sea extended in that direction up the valleys of the Volga and the Kama as far as 55° N. lat. A fourth depression, about Nijni-Novgorod, bears traces of a great lake which was filled up during the same epoch.

The Urals, which separate the lowlands of European Russia from those of Siberia, are not the narrow chain of mountains running north and south which they appear to be on many maps. In the south they consist of a series of parallel ridges running south-west to north-east, their summits reaching 5395 feet in Yaman-tau, 5245 in Iremel, and 3598 in Taganai. Farther north, up to the latitude of 61°, they must be considered as a continuation

of the central plateau, bordered by several low ridges (north-west to south-east) which become more distinctly apparent between the Denezhkin-kameñ (4841 feet) and the Töll-poss (5537 feet). They connect with a ridge that runs north-east into the Yalmal peninsula. And finally, in the extreme north, a low ridge, the Pai-kho, crosses over into the island of Vaigatch and the southern part of Novaya Zemlya. Thus the Urals exhibit the same great lines of upheaval—in a south-western and a north-eastern direction—which are characteristic features in the orographical structure of the great continent of Europe and Asia.

Rivers.—The chief rivers of Russia take their origin along the north-western border of the plateau, and some of them flow, broadly speaking, north-westwards, while the others, though describing great curves over the surface of the plateau, take a general direction towards the south-east. The Dwina, the Lovat (continued by the Volkhov and the Neva), and the two chief streams that reach the White Sea, the Onega and the North Dwina, are in the first case; while the Dnieper, the Don, and the Volga belong to the second category.—The tributaries of distant seas thus rising amidst the same marshes, on the same level of the plateau, and flowing in opposite directions, boats that have been brought up one river can easily be carried across a flat and marshy water-parting (*volok*) into the basin of another river and be floated towards another sea. The advantages that can be derived from such a disposition of the rivers are evident at a glance. At an early epoch of history it favoured the progress of the Russians from their cradle in Novgorod and Kiev towards the east; and later on it facilitated intercourse between distant parts of the territory upon which they had settled, and so maintained the unity of the separate parts. The whole making of Russia was closely dependent upon the courses of its rivers. Several of them have been improved for navigation and connected by canals, and many more could be, and certainly will be, improved. By means of three lines of canals and canalised rivers, which connect the upper tributaries of the Volga with the streams that flow into lakes Onega and Ladoga, the commercial mouth of the chief artery of Russia, the Volga, has been transferred from the Caspian to the Gulf of Finland—Leningrad being the chief port of the Volga basin. The upper Volga and the upper Kama are also connected by canals with the North Dwina, and the Dnieper with the Dwina (Düna), the Niemen, and the Vistula. Yet navigable rivers are unequally distributed over the territory; and the rivers of Russia, though exceeding in length those of western Europe, discharge a comparatively smaller volume of water. The rainfall all over Russia is small, and as part of it falls in the shape of snow, which is rapidly thawed in the spring, the rivers are flooded at that season and in early summer, and they grow shallow by the autumn. It has been estimated that one-third of the total volume of water discharged during the whole year by the rivers is carried during the spring and early summer floods. The amount of water discharged by the rivers also varies very much from year to year—a river which is navigable one year being often reduced next year to a small streamlet. During the winter navigation of course ceases.

Climate.—All over European Russia, with the exception of the south of the Crimea, and a narrow strip of land on the Black Sea, the climate is decidedly continental. A very cold winter, followed by a spring which sets in rapidly, and has therefore a charm hardly known to western Europe; a hot summer, the duration of which varies with the latitude; an autumn that is cooler than the



corresponding months of advanced spring; early frosts; and a small rainfall, chiefly during the summer and the autumn—such are the characteristics of the climate of Russia. The winter is cold everywhere. All over Russia the average temperature of January is below freezing-point. To find in Russia a winter as mild as at Königsberg (28° being the average of the three winter months) it is necessary to go as far south as Odessa. As for the southern Urals, they have a winter as cold as it is at Archangel. Even in south-west Russia the average temperature of March is a couple of degrees below freezing-point, while in the south-east it falls as low as 16° and 20°. All the rivers are frozen over in the first part of December, and they remain under ice for an average of from 100 days in the south to 150, and even 167, days in the north. At Astrakhan ice remains on the Volga for 90 days every year. On the other hand, in summer the temperature is so high all over Russia that it is only beyond the 60th degree of latitude that the average temperature of July is less than 62°. In middle Russia it rises to between 64° and 70°, and it reaches 78° at Astrakhan. The yearly temperature averages only 54° in the south and 32° in the north. The annual rainfall is very low as a rule. It averages from 14 inches in the east to 22 inches or more in the west. The moderating influence of the western winds is felt to some extent all over the country. But it decreases very rapidly as they make their way across the cold, dry plains. The strength of the wind, especially in winter, is greater as a rule, than in western Europe; by the end of winter blizzards often bury the railways under snow, and are very destructive to cattle.

Flora and Fauna.—With regard to its flora Russia may be subdivided into four regions. (a) The *tundras* of the Arctic littoral are devoid of tree vegetation. They are chiefly covered with mosses, lichens, and shrubs—the dwarf birch, the dwarf willow, and so forth, with the addition of a few herbaceous plants in the drier and more sheltered places, wherever sufficient humus has accumulated. (b) The *forest-region* covers the whole of northern and middle Russia from the *tundras* to the Steppes, and must be subdivided into two parts, the forest-region proper and the intermediate region of prairies dotted with forests. The forest-region has again two distinct parts—that of the coniferous forests, which cover nearly the whole of northern Russia beyond the upper and middle Volga, and the oak region. The forests of the latter class consist of various deciduous trees (birch, aspen, oak, &c., as well as the ash and the hornbeam farther south), and appear as islands in the midst of cornfields and rich meadows, adorned with a great variety of flowers. The flowering plants are those of middle Europe. The beech, so characteristic of the western European flora, does not extend farther than the frontiers of Poland (it reappears in the south-west and in the Crimea); and in the north-east the botanist finds an admixture of species of Siberian extraction. A line drawn from Kiev to the sources of the Ural would separate roughly the forest-region from an intermediate region—the *Ante-Steppe*—in which the forests and the Steppes struggle with alternating success for every square mile of land; and another line, almost parallel to the above, drawn from Ekaterinoslav to Uralsk, may be taken as the limit of (c) the *Steppes*. These are immense plains covered with grass, but devoid of forests, very much like the *prairies* of America and the *pushtas* of Hungary. A great variety of plants characteristic of the Steppes are found in this belt in addition to the species that occur in middle Russia; while towards the Caspian a great number

of species characteristic of the Aral-Caspian deserts penetrate into European Russia. Finally, (d) the flora of the Mediterranean region occupies a narrow strip along the southern coast of the Crimea. Many of its flowering plants are quite unknown in the continental part of Russia.—The fauna of European Russia is very much like that of middle Europe, the chief difference being the occurrence of a few species, now extinct elsewhere in Europe but still inhabiting Asia, and in the south-east there are several species characteristic of central Asia. Wolves and bears are common in the north. The reindeer is still met with in one or two regions; the wild boar is limited to one district; the elk, the lynx, the glutton, the beaver, once common, are now very scarce.

The Lake-region.—A depression, the surface of which is less than 300 feet above sea-level, stretches between the central plateau and the hills of Finland and Olonets, from the Gulf of Riga through the Baltic States and Russia to Lake Onega, and is continued over a low water-shed towards the lowlands of Archangel. It has but recently emerged from the Postglacial sea, and is dotted with marshes and numberless lakes, of which Peipus (on the Esthonian border), Ilmen, Ladoga, Onega, and Vodlo are among the largest. Low, flat ridges, partly carved out of the rocks by the ice-sheet, and partly of morainic origin, intersect the country; the soil is unfertile, and mostly too wet for the successful prosecution of either agriculture or cattle-breeding. The marshy forests are mostly thickets of thin firs, birches, aspens, &c., of poor aspect. Numberless rivers connect the lakes with one another, or with the Gulf of Finland.

The plains of the lower Dwina and Mezeñ, which fringe the White Sea and the Arctic Ocean, bear the same character, the vegetation being, of course, even poorer than in the lake-region; while the coasts of the ocean are fringed by a belt of treeless *tundras*. To the north-west of the lake-region lies the peninsula of Kola, a marshy tableland, inhabited by only a few Lapps. And in the far north-east, between the Timansky ridge and the Urals, there is an immense territory—the *Petchora region*—covered with *tundras* in the north, and with impenetrable forests in the south; it is thinly inhabited by a handful of Russians settled along the courses of the rivers, and by Samoyedes and Zyrian hunters in the forests.

The *central plateau* contains the most populous agricultural and industrial parts of European Russia. Its physical aspects vary, however, a good deal in the different parts.

White Russia.—The territory watered by the upper Dnieper and its tributaries is one of the poorest regions of Russia. Much of its area is covered with marshes; and the soil that is not under water consists chiefly of peat-bogs, hard boulder-clay, and sands. The depression between the Pripet and the Berezina called *Polesie* ('the woods'), also spoken of as the Rokitno swamp, is for hundreds of miles an almost uninterrupted marshy forest, flooded with water in the spring. White Russians are the predominant element in the population of the country, but the western part has been annexed by Poland.

Little Russia, or Ukraine.—Little Russia is one of the richest and most populous parts of Russia. The soil is mostly a rich black earth, and assumes farther south the aspect of fine grassy steppes, or prairies, yielding rich crops of wheat. The climate of this region is relatively mild, especially in Volhynia (of which the west is in Polish hands), and gardening is extensively carried on. Cattle-breeding and especially sheep-breeding are prosecuted on a grand scale on the prairies. In the north of the territory beet is much cultivated for sugar.

Kiev is one of the chief industrial centres of Russia, and woollen cloth mills have rapidly spread in Podolia. The population is chiefly Little Russian, with a considerable number of Moldavians in Podolia, where a Moldavian republic has been set up.

Middle Russia.—The provinces of Tver, Moscow, Vladimir, Smolensk, Orel, Tula, Kaluga, Kursk, Ryazan, Tamboff, Penza, part of Voronezh, southern Yaroslav, and Ulianov (Simbirsk) are comprised under the general name of Middle Russia. Except on its outskirts, this region presents everywhere the same aspects, wide undulating plains covered with cornfields and dotted with small deciduous forests. The soil is of very moderate fertility in the north, where it chiefly consists of boulder-clay; but towards the south it becomes very fertile in the black earth belt. The population is thoroughly Great Russian, with but a small admixture of White Russians and Little Russians in the west, and of Tatars and Finnish stocks, mostly russified, towards the east. They live in large villages, pursue agriculture in summer, and carry on a great variety of domestic trades in the winter. Moscow and the surrounding governments are the busiest industrial region of Russia.

Upper Volga and Kama.—Farther north-east the country is more elevated, but less effectively drained; and vast forests stretch from the upper Volga to the Urals. The governments of Kostroma, Vologda, and Vyatka, those parts of Nijni-Novgorod that lie on the left bank of the Volga, the Mari territory, and the Tatar republic, belong to this domain. Its population is thin. The villages and towns are separated by wide uninhabited tracts, and intercommunication is difficult, the Kama and its tributaries being the principal highways to middle Russia. The former government of Perm (which included the mining districts on the Asiatic slope of the Urals, and now forms part of the Ural Area of Siberia) and the northern part of the Bashkir republic are the chief centres for the iron industry.

The Middle Volga Country belongs to a great extent to the steppe-region of south Russia. The forests, which are still extensive in the Tatar republic and in the hilly tracts of the Urals, gradually thin away, till towards the south the territory becomes a wide prairie, which often suffers from want of rain. The dry, hot winds of central Asia make their influence felt. The population, mostly Great Russian, contains a large percentage of Turkish and Finnish race, and, in the German Volga republic, of Germans.

The Steppe-region occupies a belt more than 200 miles wide along the littoral of the Black Sea and the Sea of Azov, and extends eastwards through the region of the lower Volga and Ural till it meets the steppes of central Asia. As far as the eye can reach there are gently undulating plains, clothed with rich grass, and entirely destitute of trees; yet in the bottoms of the deep ravines, concealed by the undulations of the surface of the steppes, there grow a variety of trees and shrubs, as willows, wild cherries, wild apricots, and so forth. The whole is coated with a thick layer of fertile 'black earth.' For many centuries the Russians coveted these fertile grounds, but it was not until the 18th century that they actually took possession of them; they have since rapidly covered them with their villages. In order to people Bessarabia without depriving the Russian landowners of their serfs, several races of foreigners, as Moldavians, Wallachians (Vlachs), Serbs, Greeks, Germans, and even Scotsmen, were freely invited to settle there. Russia still claims Bessarabia though Rumania now holds it.

The same steppe-land extends into the peninsula

of the *Crimea*, but there the soil is no longer black earth, but a clay impregnated with salt. Its extreme dryness prevents it from being utilised for agriculture. A narrow ridge of mountains, the Yaila, reaching 4000 to 5100 feet in their highest summits, rises on the south-east coast of the Crimea. Its southern slope is the most beautiful corner of Russia, owing to its Mediterranean climate and Mediterranean flora. Farther east the *Caspian Steppes*, in respect both of their physical features and of their population, form an intermediate link between Europe and Asia. They only emerged from the sea in quite recent geological times, and their surface, perfectly flat, still lies below sea-level for a distance of more than 150 miles from the shores of the Caspian. The small streams which cross them mostly dry up through evaporation, and seldom reach the sea. The Volga and the Ural divide into numerous branches before entering the Caspian Sea, and afford the richest fishing grounds in the world. Numerous salt lakes, whence Russia gets her supply of salt, are scattered over the steppes. The population consists to a great extent of Tatars, Kirghizes, and Kalmucks. Cattle-breeding is the industry mostly followed; and fishing is a valuable source of income.

Ethnography.—The population of Russia embraces a great variety of nationalities; but the Russians, comprising the Velikorusses or Great Russians, the Malorusses or Little Russians, and the Byelorusses or White Russians, are by a long way the predominant people. None of the three is, of course, a pure race. The Great Russians, who invaded a territory occupied by Finnish tribes, ended by assimilating them. The Little Russians underwent a mixture with Turkish tribes, and the White Russians with Lithuanians. However, the Russians mostly russified those they came in contact with. The Great Russians inhabit middle Russia in a compact mass, and even in east and north Russia they constitute from two-thirds to three-fourths of the population. The Little Russians are settled in a solid body in Little Russia, which contains but a slight admixture of other peoples—chiefly in the borderlands. The White Russians also dwell in a compact mass in the west, but they are more mixed with Poles, Jews, and Little Russians. Other Slavs—Serbs, Bulgarians, and Bohemians—exist in small colonies in Kherson. Armenians, Kurds, and Persians and other Iranians live chiefly in Caucasia. The Caucasus (q.v.) is inhabited by a great variety of races and tribes. Jews are very numerous in the towns of west Russia. Nearly three-fourths of the Russian Jews are artisans or factory-workers, while the Jews settled on the land in Kherson have proved themselves good agriculturists. The Finnish stems include the Finns and the Karelians; the Lapps and the Samoyedes in the far north; and the Volga Finns and the Ugrians in European Russia and in Siberia. The Eastern Finns are being rapidly absorbed by the Russians; but the Western Finns, before they asserted their independence in 1917-18, maintained and warmly fostered their nationality. The Turko-Tatars—i.e. Tatars, Bashkirs, Kirghizes, &c.—are mere feeble remnants of the tribes who once conquered Russia. The Mongol race is represented by Kalmucks in Russia and central Asia, as well as by Buriats in Siberia; while the Manchurian tribes of the Tunguses, Golds, &c., and the Hyperboreans also form a small part of the population of Siberia (q.v.). Of west Europeans the Germans are the most numerous. They have prosperous colonies in south Russia, notably in the German Volga Republic; and in the chief towns there are numbers of Germans, artisans and merchants. There are, besides, Rumanians in south-west Russia.

Religion.—The great bulk of the Russians—excepting a few White Russians professing the Union—belong to the Græco-Russian Church, officially styled the Orthodox-Catholic Church, or to one of its numberless sects (*raskol*). The church was disestablished in 1917. Its property has been taken over by the state, which is said to take much better care of the works of art that thus came into its hands than the ecclesiastical authorities had done. The state grants a free lease of church buildings to members of the congregations. Religion may not be taught in classes but may be at home. There is much hostility to the church, and to religion in general among those in power. Nearly all the Jews obey the injunctions of the Talmud, with the exception of a few Karaites in the Crimea and west Russia. Islam has a large number of followers—all the Turko-Tatars, Bashkirs, and Kirghizes. Buddhism has its followers in the Kalmucks and the Buriats. Shamanism is the religion of most of the natives of Siberia, as well as of the nominally Christian Mordvins, Votyaks, Tchuvashes, and the nominally Moslem Mescheryaks, and (partly) the Kirghizes. The Voguls, the Samoyedes, and other inhabitants of the far north are fetish worshippers. For the relations of the Russian Church with the rest of the Orthodox Eastern Church, see GREEK CHURCH.

The Raskolniks.—A most important part is played in the popular life of Russia by the numerous sects of *raskolniks*, to which nearly one-third, or more, of the so-called Orthodox Russians belong. New sects arise every year, and even among the Little Russians, who used so piously to preserve their traditional religion in the face of the Catholic propaganda, a nonconformist movement sprang and spread with wonderful rapidity under the name of the 'Stunda.'

The Russian *raskolniks* may be classed under three divisions, all equally numerous: the 'Popovtsy' (who have priests), the 'Bezpopovtsy' (who have none), and the 'Dukhovnyie Khristiane' (spiritualist Christians). The first named object to the revision of the sacred books which was accomplished under the patriarch Nikon (see *History*, below), as well as to the hierarchy of the Russian Church. They are hostile to all kinds of 'novelties,' maintain the patriarchal family arrangement, and get their priests either from abroad or from priests who have left the Orthodox Græco-Russian Church. A branch of the Popovtsy, the 'Yedinovtserny,' recognise Russian priests on condition of their keeping to the unrevised books.

The Bezpopovtsy repudiate the Orthodox ritual and the sacraments, and have no priests. Any man or woman may conduct divine service if recognised by the community. The state is considered by them as an entire invention of the Antichrist. Yet very few amongst them really break off all connection with the state, and lead a life of outcasts, as the 'Stranniki' (the Errants) do.

The 'Spiritualists' comprise very many sects, all more or less imbued with either Protestant or rationalist teachings, as well as with communist tendencies more or less carried into practice. The chief of them are the 'Dukhobortsy' (warriors of the spirit), the 'Molokany' (Milk-eaters), both a kind of Baptists—the former have a strong leaven of practical communism—and the 'Stundists,' who are much under Protestant influence. The 'Khlysty,' or Flagellants, and the 'Skakuny,' or Shakers, belong to the same division. The Skoptsy (Castrati) have isolated adherents everywhere.

Government.—The political organisation of Russia under the empire was a very heterogeneous structure. It had at bottom a very great deal of self-

government, based upon quite democratic principles. But above this stood the imperial authority, represented by an army of officials, whose powers, down to those of the very humblest rural policeman, were extremely vague and very extensive; and these officials were constantly interfering with the local self-government, and paralysing it, without, however, being able either to destroy it or to reduce it entirely into submission to the central authority. The empire was till 1906 an absolute and hereditary monarchy, the final decision in all legislative, executive, and judicial questions resting with the emperor, who nominated the ministers and whose will was law. The revolution of 1905-6 was on the whole a failure. It left Russia, as the *Almanach de Gotha* put it, a constitutional monarchy under an autocrat tsar.

Even under the empire the peasants (the great majority of the nation) had some experience of self-government and communism. The land being held in common throughout Great Russia and Siberia, it was the *mir* that periodically distributed the land into allotments and then assigned them to the several households according to their respective working capacities. The *mir* could also open schools, support a midwife or a doctor, and undertake all kinds of works of public utility. It always elected its own executive, the *starosta* (elder), the tax-collector, and so on. This institution of the *mir* forms the basis of village life among all Great Russians, and traces of it are found among the Little Russians as well. All investigators of the *mir* are unanimous in recognising that it shows a wonderful elasticity in accommodating itself to new conditions. Stolypin's changes went far to undermine it; and even the communist government put a restriction on the redistribution of land. The administration of the economic affairs of the district and the province in European Russia was in 1866 committed to the district and provincial assemblies, or *zemstvos*.

Under the Constitution of 1923 (ratified 1924) the supreme organ of authority in the Union is the Congress of Soviets, and in the intervals between Congresses the Central Executive Committee of the Union, consisting of the Council of the Union and the Council of Nationalities. Delegates to the Congress are elected by town soviets (1 to every 25,000 electors), and provincial congresses (1 to 125,000) or where there are no provinces the state congress. The Council of the Union, elected by the Congress of Soviets, represents the various states in proportion to population. The Council of Nationalities represents the various autonomous republics and regions set up within the states. Between sessions of the Central Executive Committee the supreme authority, legislative, executive, and administrative, is its Praesidium, or permanent committee. The Central Executive Committee also chooses a subordinate authority, the Council of People's Commissaries, consisting of a president, vice-presidents, and People's Commissaries, or heads of ministerial departments (as foreign affairs, war and marine, foreign trade, transport, &c.). Each of the federal states has a constitution similar to that of the Union, with its Congress of Soviets, Central Executive Committee, and People's Commissaries. Each state has the right to secede, and provision is made for the adhesion of new states. Turkmenistan and Uzbekistan have thus been formed and joined the Union in 1925. The soviet system, ramifying through the whole public life of Russia, is explained in the article SOCIALISM. The franchise extends generally to citizens, male or female, 18 years of age and upwards, who earn their livelihood by productive labour, and to soldiers and sailors of the Red army and navy. Those who exploit labour of others

(with certain exceptions), priests and monks, the police and secret service agents of the old régime, and certain others are disfranchised.

Army and Navy.—By the law of 1925, service in the Red army or navy is compulsory for proletarians between the ages of nineteen and forty. Others serve in working battalions or pay a tax. The Red army was reduced from 5,300,000 in 1920 to 563,000 in 1925. The navy awaits reconstruction.

Judicial System.—Trial by jury was introduced in 1864, proceedings in the law-courts made public, and corporal punishment abolished; the preliminary inquiry was still secret. Certain political offences were brought before a special department of the senate, but the greater number were disposed of by the department of State Police in the ministry of the Interior, suspect persons being transported to Siberia without bringing them to trial before a court. The prisons of Russia were extremely overcrowded, and on the whole in a very deplorable condition. Every year from 15,000 to 20,000 offenders were transported to Siberia, one-half by decisions of the courts, and the remainder by order of the administration (see *SIBERIA*). Capital punishment for common-law offences was abolished about 1770; but death continued to be inflicted for political offences. A new system has been set up since the revolution, with People's Judges in the primary courts, assisted in the People's Courts by assessors. Over these are provincial and supreme courts. The Supreme Court of the Union deals with the interpretation of general legislation, questions between the republics, and the like. The Communists introduced a new prison system aiming at education, not retribution, setting prisoners to work at their own trades at trade union rates of wages. Nevertheless serious abuses continued to be reported.

Education.—In 1900 only one-fifth of the army recruits could read and write. According to the 1920 census 46.5 per cent. of the population were literate (61.7 per cent. of males, 33.6 of females). Matters have been mended in great measure by the strenuous work of the government and the local Soviets. The People's Commissariat for Education for each republic has charge of the whole system, including Unified Labour Schools, adult schools, universities, special schools, museums, monuments, theatres, learned institutions, &c. Many new universities have been founded. Palaces have generally been converted into museums, often with their former owners as curators; and the art treasures of the church are under competent care.

Agriculture.—Agriculture is the chief occupation of the people of Russia; only in central Russia (Moscow, Vladimir, Nijni) does industry take the lead. A line drawn across European Russia, from Kiev to Nijni-Novgorod and Vyatka, will divide the country into two parts, of which the south-eastern has normally a surplus of wheat and rye and exports them, while the other has to import both. More than one-half of European Russia thus produces less wheat and rye than is needed for home consumption. If all the wheat and rye produced by Russia in an average year were consumed within the country itself, the annual consumption throughout the country altogether would be about the same as in France. This disposes at once of the theory that Russia may be regarded as the granary of Europe. Moreover, the crops of Russia are subject to great fluctuations, and bad years recur, as in India, at intervals of from ten to twelve years. The principal cereal is rye, the staple food of the people. The other cereals are wheat, oats, barley, buckwheat, and millet. Flax and hemp are extensively grown in the west, the sugar-beet is grown in the south and south-west, and sun-

flower, potatoes, and tobacco are also largely cultivated. The vine is widely grown on the Black Sea littoral and in Caucasus, and some of the wine produced is excellent.

Mining.—Russia is very rich in all kinds of minerals. Gold is obtained in Siberia, the Ural Mountains, and the Caucasus. Silver and lead are obtained in Siberia, the Urals, the Caucasus, and the Kirghiz Steppes; platinum in the Urals. Iron ores are found in profusion both in Asiatic and in European Russia (Urals, central Russia, south Russia); zinc, cobalt, and manganese ore in Caucasus; manganese also in south Russia and the Urals. Salt is obtained from the salt-lakes of Asia and south Russia. Russia has excellent coal-basins, especially in the Don region, but the immense forests and the facilities for shipping firewood on the rivers kept back the development of coal-mining. The exceedingly rich wells of Baku and Grozny supply petroleum. Asbestos, mica, mercury, and copper are other important minerals.

Manufactures and Petty Trades.—The manufacturing industry of Russia has grown up since the abolition of serfdom. All industrial and commercial enterprise was nationalised in June 1918. A method of leasing to co-operative societies, companies and individuals was adopted in 1921; and in 1923 a system of state trusts and syndicates was set up. The chief industrial centres are Moscow and the surrounding governments, and St Petersburg. The woollen trade is firmly rooted in the south. The production of *vodka*, the national spirit, prohibited during the Great War, has been resumed owing to revenue needs. There are many sugar-mills and soap and tallow factories.

The domestic industries, which are carried on by the peasants of central Russia contemporaneously with agriculture, are of much greater importance in Russia comparatively than they are in western Europe, but have fallen off. The greatest conceivable variety of products are thus manufactured in the villages. Co-operation, which enters into the essence of Russian peasant life—the *artel*, or co-operative productive or consuming association being constituted by Russian peasants and factory-workers for every possible purpose—finds a wide field for application among the domestic crafts.

Commerce.—Foreign trade, at a stand-still after the Great War, began to revive in 1921. Trade agreements were made, resuming commercial intercourse with several countries. Concessions to foreign capitalists were legalised. Normally the exports of Russia to foreign countries consist principally of corn and flour, various articles of food (butter, eggs, &c.), flax, timber, oil-seeds and oil-cake, raw wool, and petroleum. The imports are chiefly of raw materials, foodstuffs, tea, machinery, iron and steel goods. The inland trade of Russia was at first restricted by the Soviet government to exchange of commodities; but in this also compromise was found necessary. The great fairs (at Nijni-Novgorod, Kharkov, Irbit, &c.) are still of immense importance. They were discontinued during the troubles, but were resumed in 1922-23.

Communications.—The importance of the Russian rivers for traffic has already been mentioned. It is computed that European Russia has 20,670 miles and Asiatic 86,422 miles of rivers, lakes, and canals navigable by steamers, besides waterways suitable for smaller craft and rafts. Railways were out during the Great War and the terror, but some 45,000 miles are in use. The Siberian railway to Vladivostok and Port Arthur was completed in September 1904 by the opening of the Baikal section; and the Orenburg-Tashkend line was finished in 1905.

Architecture.—Russian architecture is directly descended from Byzantine (q.v.), but modified by native and Asiatic influences. The first church-building tsars, such as Vladimir (981–1015), employed Greek architects; but their churches were mainly of wood and have disappeared. The usual Russian church has a central dome, surrounded by four (or more) smaller cupolas, whose form has been, under Tatar influence, changed to the onion-shape that appears in Mongol-Indian mosques on the Ganges. In the famous cathedral of St Basil, of which an illustration is given at MOSCOW, the central tower is surrounded by eight smaller ones, crowned by various bizarre cupolas, and painted with the most brilliant colours. This church was built by Ivan the Terrible about 1554. After the time of Peter the Great the native type gave way to reproductions—often bad—of various classical models; the architecture of St Petersburg is characterised at RENAISSANCE.

History.—The Slavs were not the primitive inhabitants of the plains of eastern Europe; in the first centuries of our era their abodes were on the Danube, the Elbe, and the south shore of the Baltic Sea, and they entered what is now Russia from the west. The southern Slavonians took possession of the upper Bug, Dniester, and Dnieper, while the northern occupied the lake-region of Pskov and Novgorod. The date of that immigration is not known, but it is certain that in the 9th century their small tribes occupied—besides part of what is now Poland—a territory stretching north and south from lakes Peipus and Ilmen to the mouth of the Dniester. Various Finnish tribes were then living in Finland, and the basins of the Dwina, Petchora, and upper Volga; the space between the Düna and the Vistula was inhabited by the Lithuanians; while several Finno-Turkish tribes, mostly nomads, had taken possession of the southern slopes of the central plateau: the Bulgars were at Kazan; the Mordvins, the Mescheryaks, the Tchevashes, and the Tcheremisses on the middle Volga; and the Khazars in the southern Steppes. Finally, the Turkish stems of the Polovtsy, the Petchenegs, and the Turks camped in the Caspian Steppes to the east of the Volga. Already at that time the Slavs were agriculturists, and their country was dotted with numerous small forts. Like all primitive inhabitants of Europe, they were organised in 'gentes'—the family once having been matriarchal. The land was held in common by each clan and tribe, and the common affairs were decided at folkmoets, or assemblies of the clan, the tribe, or the 'land.' Caesar and Tacitus found the same organisation among the ancient Germans.

The territory of the eastern Slavs was the great highway from Scandinavia to Greece; and caravans of Scandinavian merchants followed the route from Novgorod to Kiev on their frequent journeys to Constantinople. The same route was followed by the Norman warriors (Väringiar, Varyagues, Varangians), who, reinforced by Slav adventurers, used to engage in the service of the Greek emperors. The Greeks used to call them Rosses or Russes, but it remains uncertain whether the name was borrowed from some locality in Scandinavia (Ros, Roslagen; Ruotsi = Swedes), or, what seems more probable if Arab testimony is taken into account, from a territory on the Dnieper. It is more than probable that from a remote antiquity the Slavs used to apply to leaders of such military bands for protection, and the oldest Russian chronicle, known as Nestor's (it was probably compiled from older chronicles and epic traditions about 1115, by the Kiev monk Sylvester), says that the folkmoets of the northern Slavs, after having sent away in 859 the Varangians to whom they paid a tribute, sum-

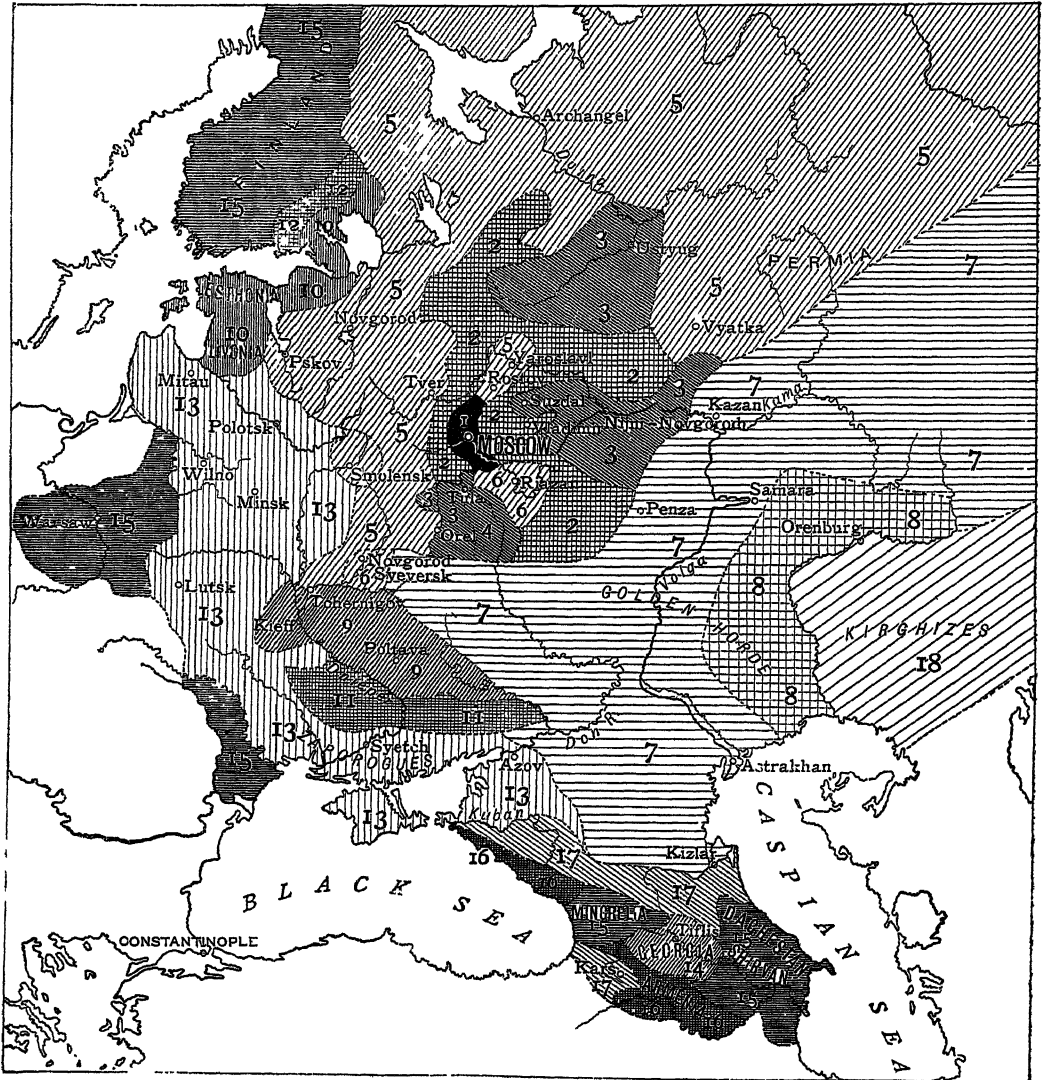
moned again the Varangian rulers in 862 'from beyond the sea,' 'to command and judge them according to law.' The first historians of Russia, who used to interpret facts of a remote past according to modern conceptions, were disposed to regard the Varangian dukes as a sort of modern kings, and spared no effort in tracing a 'Rurik dynasty' down to our own times. But the supposed kings were simply military chiefs, to whom the military defence of the cities was entrusted, like the *podestà* of the Italian cities in the 15th century.

Three brothers, Rurik, Sineus, and Truvor, were thus invited, according to tradition, and they settled respectively in Ladoga, Byelozersk, and Izborsk—i.e. on the borders of a territory which had to be defended against the Finns and the Lithuanians. They and their successors built new forts, and took part in wars, the description of which in Nestor's chronicle has all the characters of an epic poem. Rurik's brother, Oleg, is said to have imposed his authority upon Kiev and Smolensk; he, as well as Rurik's son Igor, made campaigns against Constantinople; and Oleg's widow, Olga, who ruled after his death, was baptised in the Greek capital. Wars were waged, under Svyatoslav's leadership, against the Khazars and the Greeks. The Russians conquered Bulgaria, took possession of all its fortresses, and nearly captured Constantinople. The campaign (fully described by Byzantine historians) ended, however, in a disaster. The times of the 'Sunny Vladimir' (980–1015) are the heroic epoch of early Russian history, and the feats and feasts of Vladimir and his *druzhina* ('war companions') have been handed down through ages in legend and song; while his conversion to Christianity made him the hero of the annals written by monks. He and his *druzhina* were baptised at Kiev in 988, and the people of Kiev soon followed him. The first half of the 11th century, during which Yaroslav the Wise was grand prince at Kiev, while his brothers and nephews ruled at Novgorod, Polotsk, Murom, Vladimir in Volhynia, and even Tmutarakan in north Caucasia, was the most brilliant time for Kiev. The 'mother of the Russian towns' grew to be a populous city, visited by numerous caravans of merchants, and Adam of Bremen described it as 'a rival to the supremacy of Constantinople.' The great cathedral of St Sophia was built at that time, as also many other churches. Schools were opened, and the first written Russian law—the 'Russkaya Pravda,' or, at least, its essential parts—was compiled. It corresponds to the *leges barbarorum* of the ancient Germans and Scandinavians. By the end of his life Yaroslav was ruling over most of the Russian towns, and his daughters were married, one to the king of Poland, another to Harold in Norway, a third to Henry I. in France, and a fourth to the king of Hungary. He died in 1054.

The next two centuries of Russian history correspond to the feudal period of western Europe. In the annals they appear as an uninterrupted succession of petty wars between the descendants of Yaroslav for the right of ruling in this or that city, or for the supremacy at Kiev. But modern research has disclosed the real character of the epoch. The Russians at that time were steadily extending their territory towards the east; they colonised the Oka, the Don, and the Finnish territories in the north-east. Between the numerous clans and territories into which they were divided there were no exterior bonds of unity save the unity of language and religion, and the common idea that no princes must be taken by any Russian territory except from among the descendants of Yaroslav. The natural centres of the territory were its fortified towns, which offered a refuge to the population in case of need. In each town the folk-

moot remained supreme; it decided upon war and peace; it invited a prince to defend the territory, and the prince, before being recognised as such, had to sign a covenant (*ryad*), and to take the engagement to rule according to law. He was bound to keep a band of warriors (*druzhina*) to protect the territory, and was entitled to levy for that purpose a tribute as well as the usual judicial fines: the disputes among the citizens being settled by twelve jurors (six for the defendant and six for the

plaintiff), the prince or his deputy had to pronounce the sentence and to levy the fine when the parties applied before the prince's court instead of the folkmoor. The cities usually were divided into sections and 'streets,' corresponding to the trade and artisans' guilds, and each of them had its own self-government; it elected its priests and functionaries, while the folkmoor of the whole city elected the *posadnik* or mayor, the *tyatskiy* or commander of the militia, and the bishop.



Historical Map of Russia :

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| 1. Principality of Moscow under Daniel, 1303. | 10. Acquisitions of Peter I., 1725. |
| 2. Acquisitions of Yuriy, Ivan Kalita, and Dmitri Donskoi, 1389. | 11, 12. " Anna and Elizabeth, 1762. |
| 3, 4. " the two Vassilis, 1455. | 13. " Catharine II., 1796. |
| 5, 6. " Ivan III. and Vassili Ivanovich, 1538. | 14. " Paul I., 1801. |
| 7. " Ivan IV. the Terrible, 1584. | 15. " Alexander I., 1825. |
| 8. " Mikhail Romanov, 1645. | 16. " Nicholas I., 1855. |
| 9. " Alexei Mikhailovich, 1676. | 17. " Alexander II., 1881. |
| | 18. " the period 1730-1845. |

The fortifications of the cities were mostly built out of the wealth accumulated by the cathedral church, which was the exchequer of the city. The guilds of the merchants in larger trading cities, like Novgorod and Pskov, used to carry on trade in

the name, and, at the outset, for the benefit of the whole city. The city—not the individual—sent out its caravans and boats, and it also used to send out parties of young men into the lands of the Finnish tribes to carry on trade, to levy tribute,

and to colonise them. In this way Novgorod conquered the north-east of Russia, and founded there its daughter-republics of Vyatka, Dwina, and Vologda; and later on its men crossed the Urals to trade with Siberia. Kiev was recognised as the eldest of the cities, and the eldest of the kin of the princes had to rule at Kiev. But this unwritten agreement was not always obeyed, and consequently numberless petty wars took place between the princes. The country, however, took no part in these wars, with the exception of a few isolated cases always specified in the annals. In each territory there was the chief city (*gorod*), and the subordinate ones (*prigorod*), but no traces of submission of the latter to the former can be discovered in the documents of the times, the annals simply mentioning that the *prigorods* take the same decisions as the *gorod*. The soil belonged to the freemen who cultivated it; but slavery existed, and there was some trade in slaves, chiefly prisoners of war. A free man who entered into any one's service without agreement and remained in a servant's position for more than one year was also considered *kholop* or slave, as well as he who sold himself into slavery under the pressure of necessity. Trade prospered at that time, especially at Kiev, which was the great storehouse for trade with Greece and Asia, and Novgorod (which later on joined the Hanseatic League) for the trade with Germany and Scandinavia. Pskov, Smolensk, and Polotsk also were important centres of commerce.

During the 10th, 11th, and 12th centuries Russia was thus covered with a number of free democratic republics. But the Greek Church already worked hard at introducing into Russian life the conception of the state and the authority of the monarch. Instead of the common-law view of justice as amends made by the offender for the wrongs he has done to the individual or the community, the church introduced the Roman conception of justice as established by the state, and with it the idea of cruel corporal and capital punishments. At the same time it spread education and developed the taste for reading, and its monasteries were centres of further colonisation. But it also introduced the Byzantine ideas of asceticism and submission, and subsequently its influence, reinforced by that of the Mongols and the Tatars, contributed to give to woman a subordinate position quite contrary to the spirit of the Slav laws. And finally a new power grew up during the same centuries—viz. that of the *boyars* or *bolars*. Formerly they simply were the chief warriors and councillors of the *druzhina*; but later on, as some of them grew wealthier through trade and war, they acquired more and more importance in the cities as well as in the country. Thither they attracted peasants to settle on the free lands, and gradually reduced them to the condition of tenants. Such was the state of Russian society during the *udelnnyi* or feudal period before the Mongol invasion. Of all the princes who ruled at Kiev during that period Vladimir Monomachus (1113–25) deserves special mention as a ruler whose paternal authority was recognised by most Russian princes, whom he succeeded in bringing together for the defence of the territory against the Polovtsy. With him really ended the supremacy of Kiev, south-west Russia becoming more and more the prey of its nomad neighbours, as well as of its western neighbours, the princes of Volhynia and Galicia.

Owing to the gradual colonisation of the basin of the Oka and the upper Volga, a new Russian territory had grown in importance in the meantime. Suzdal and Rostov were its chief centres. It differed from south-west Russia in many respects: its inhabitants were Great Russians—a

hard-working race, less poetical and less gifted, but more active than their southern brethren. Besides, a good many of its inhabitants were peasants settled on the lands of the boyars—country-people, not accustomed to the folkmoths of old; and the cities themselves, being of recent creation—like Vladimir and, later on, Moscow—had not those traditions of independence which characterised Kiev or Novgorod. It was therefore easier for the authority of the prince to develop in the north-east, under the guidance of the church and the boyars, without being interfered with by the *vetche*. The Suzdal prince, Andrei Bogolubskiy (1157–74), was the first representative of that policy. He and his churchly advisers founded a new town, Vladimir, on the Klazma, a tributary of the Oka, and sanctified it by transporting thither from Kiev an icon of the Virgin, which had come from Constantinople, and was reputed to have been painted by St Luke. He invited many Kiev boyars to settle in the land of Suzdal, and finally he undertook to strike the last blow at the supremacy of Kiev. He induced the land of Suzdal to levy an army, which took Kiev in 1169, plundered and burned it, massacred numbers of its inhabitants, and carried others away into slavery. The supremacy of Kiev was thus destroyed, and the land of Suzdal became the *Île-de-France* of Russia—the nucleus of the future Russian state. Andrei was killed by his own boyars; but the Suzdal land continued to grow and to enjoy prosperity during the next fifty years; economical, educational, and literary progress were marked, and the Russian territory extended farther eastwards. A rival was given to Novgorod in Nijni-Novgorod, at the junction of the Oka with the Volga. But in the 13th century a great calamity visited Russia; a Mongol invasion suddenly put a stop to the development of the country and threw it into a totally new direction.

For several centuries past the rapid desiccation of central Asia (see ASIA) had been compelling the inhabitants of the high plateau to migrate into the lowlands, and thence westwards towards Europe. Under this pressure of Asia upon Europe the Ugrians, who inhabited the Urals, moved over the south Russian steppes to Hungary; and the Polovtsy, the Petchenegs, and other tribes were making in succession their raids upon south-west Russia. Now it was the turn of the nomads, who inhabited the very heart of Asia, and whom Genghis Khan (q.v.) had united into a great confederation, to enter Europe. They already had conquered Manchuria, part of north China, Turkistan, and Bokhara, and devastated the encampments of the Polovtsy. The Polovtsy applied for aid to the Russians, and their united forces met the invaders on the Kalka River (a tributary of the Don) in 1224. The Mongols and Tatars were completely victorious, but retreated and did not return to Russia till after thirteen years. In 1238 the hordes of Batu-khan invaded the whole of east and central Russia. Ryazan, Rostov, Yaroslav, Tver, and Torzhok were burned; only the marshes of Novgorod protected the north-western republic from the same fate. In 1239–40 they ravaged the south-west, destroying Tchernigov, Galicia, and Kiev, and entered Poland and Hungary. But, being checked in Moravia, and receiving at the same time the news of the Khan's death, Batu-khan returned to Asia, and built his palace at Sarai on the lower Volga. Thither the Russian princes had to go to pay tribute and receive their investiture by kissing the stirrup of the khan.

After having ravaged Russia the Mongols did not interfere much with her internal organisation. They respected the church; they left the peasants in possession of their lands, and the princes in

possession of their authority; but every prince had to receive his investiture from the khan, and it was at the khan's court, sometimes on the banks of a tributary of the Amur, that intrigues for supremacy between the Russian princes were settled—sometimes through the assassination of the prince who was not rich enough to buy the support of the advisers of the khan. It was especially with Mongol aid, and often with Mongol armies, that the wealthy princes of Moscow succeeded in destroying the autonomy of the surrounding principalities, and imposed upon them their own yoke.

The taxes of Russia were originally farmed out by the khan to oriental merchants; but to avoid popular revolts, the princes undertook to collect them with the aid of the Tatars. The courts of the Russian princes, who surrounded themselves with Tatar and Mongol advisers, took an oriental character. The industrial, artistic, and literary development of Russia was totally arrested. On the whole, Mongol rule threw the country more than 200 years behind the other states of Europe. The principalities of Kiev and Tchernigov never recovered afterwards. Their decline, however, made room for the rise of Galitch to pre-eminence in western Russia, and, amidst wars against Hungary and the Tatars, it preserved greater independence than any of the Russian principalities till, in the later half of the 13th century, it was taken possession of by Casimir III. of Poland. About the same time Volhynia was joined to Lithuania. The rise of this latter state was much favoured by the prostration into which Russia had fallen; and after an existence of several centuries, during which it extended its power so as to include Livonia proper, the Russian provinces of White Russia, Volhynia, Podolia, and the Ukraine, it was joined in 1569 to Poland (q.v.). On the north of Lithuania arose in the beginning of the 13th century another power, the Livonian Knights Sword-bearers, who took possession of Livonia, Courland, and Esthonia, as well as some portions of the territory of Novgorod and Pskov; while the Scandinavians, blessed by Pope Gregory IX., undertook a crusade against Novgorod. They were, however, defeated by Alexander Nevski (q.v.; 1252-63).

In the beginning of the 14th century eastern Russia consisted of the principalities of Suzdal, Nijni-Novgorod, Ryazan, Tver, and Moscow, and long contests took place between them, especially between the latter two. At last Moscow—a small village fortified by Yuriy Dolgoruki (1147)—took the upper hand. It was entirely free of municipal traditions, and the powers of the prince could freely develop there, unchecked by the *vetches*. It occupied an advantageous position at the junction of several main routes, and on a then navigable river, amidst a territory thickly peopled by boyars' peasants, who enriched the prince and the boyars. The church, always prosecuting its aim of creating a monarchy in Russia, soon perceived the importance of Moscow as a centre of a future state, and its head, the metropolitan, removed thither from Vladimir in 1325. The church, the boyars, and the princes thus created at Moscow the power which was necessary at that moment to oppose the encroachments of Catholic Lithuania, Poland, and Livonia. Ivan Kalita (1328-40), Simeon the Proud (1340-53), and the regency of boyars which administered the affairs under his weak-minded son Ivan II. (1353-59), as also during the minority of Ivan's son Dmitri Donskoi (1359-89), all pursued the same policy of increasing the powers of Moscow by weakening the neighbouring principalities—Nijni-Novgorod, Tver, and Ryazan. Taking advantage of the weakness of the Mongol khanate, now divided into the hordes of Nogai,

Crimea, Kazan, and Astrakhan, the east Russians made in 1380 the first attempt at throwing off the yoke; their armies federated under Dmitri, and they ventured for the first time to meet the Mongol armies in a battle on the field of Kulikovo, on the banks of the Don. The battle was not decisive, but the church ascribed the victory to the holy icons of the Moscow monasteries and to Dmitri. True, next year the Khan Tokhtamysh advanced suddenly on Moscow, burned it, killed no less than 24,000 people, and exacted a heavy tribute. But this was the last time that Moscow fell into the hands of the Tatars. Its Kreml (citadel), which had resisted in 1368 and 1371 the assaults of the Lithuanians under Olgerd, was more strongly fortified, and when Khan Edighei besieged it in 1408 he could only ravage the suburbs.

The gradual increase of the Moscow principality continued under Vassili I. (1389-1425)—who bought from the khan the right of ruling at Nijni-Novgorod, and conquered Rostov and Murom—and Vassili II. the Blind (1425-62). Still the prince, though assuming the title of Great Prince, was merely recognised as the eldest by other princes, and the cities maintained their independence, simply paying to his delegates a tribute in exchange for military protection, while Moscow was ruled in reality by the *duma* (council) of the boyars, especially after Vassili II. became blind. It was under Ivan III. (1462-1505), named 'the Great' by some historians, that the prince of Moscow, after having for forty years seized every opportunity for abolishing the autonomy of other principalities, and having married Sophia, a niece of Constantine Palæologus (who came to Moscow with a numerous following of Greeks imbued with ideas of Roman autocracy), assumed the title of 'Ruler of all Russia' (*Hospodar Vseya Rossii*), and adopted the arms of the Byzantine empire. He took advantage of the divisions at Novgorod between the oligarchy of merchants, who were appealing for assistance to the Poles, and the people, and, supported by Tatar cavalry, marched against the republic (1471). Novgorod was defeated and submitted; but new difficulties arose, and, after having preached a national war 'against the pope and his allies the Novgorodians,' Ivan took possession of the city (1481), decapitated numbers of boyars and rich people, and transported 8000 Novgorodians into the cities of eastern Russia. The colonies of Novgorod (Vyatka, Dvina) were conquered next, and in 1495 the Hanseatic market of Novgorod was pillaged by Ivan's men, and all the goods taken to Moscow. Novgorod thus lost both its independence and its trade.

The Tatar-Mongols being divided at this time, the Russians took advantage of the fact to refuse tribute; and when thereupon the khan of the Golden Horde, stimulated by Casimir's promises of support, marched against Moscow, an army of 150,000 men was sent to meet him on the Oka. Both armies stood there for months inactive, till, finally, the Tatars, seeing no support from Lithuania, and probably learning that Sarai had been plundered by a straggling band of Russians, suddenly retreated to ravage Lithuanian territory. This retreat is considered as the liberation of Russia from the Tatar-Mongol yoke (1480).

Russia's chief enemy, however, was Lithuania, united at that time with Poland. It stood at the very gates of Moscow, keeping garrisons in towns 150 miles distant from the Russian capital, and always ready to employ the Tatars against the Russians. A protracted war ensued, with the result that several princes on the upper Oka and Desna (tributary to the Dnieper) surrendered to Ivan. Smolensk, however, remained under the Lithuanians. Vassili III. (1505-33) followed his

father's policy. He continued the war with Lithuania, and retook Smolensk. He annexed Ryazan and Novgorod-Syever'sk, and conquered, by taking advantage of its internal dissensions, the last north-western republic, Pskov. The *votch*e was abolished, its bell taken to Moscow, and 300 wealthy families transported to east Russia.

Vassili's son, Ivan IV. (1533-84), was proclaimed Great Prince when he was only three years old. His reign is still the subject of the most contradictory estimates by historians. The fact is that by that time the boyars of Moscow, reinforced by all the dethroned princes and their descendants, had grown all-powerful. Not only the laws were issued by the boyar *duma* (council) in the name of 'the Great Prince and the boyars,' but their authority within the palace overshadowed that of the prince. In his childhood Ivan IV., though surrounded with adulation at official receptions, was kept in neglect and almost hunger. Russia was like to become another Poland ruled by the rival parties of nobles. During the first years of his reign Ivan ruled with their support and under the influence of the priest Sylvester and the minor noble Adashev. The states-general were convoked twice (1549 and 1550), the code (*Sudebnik*) of his grandfather was revised, and church matters were settled in 'The Hundred Articles' (*Stoglav*) by a council. Kazan was conquered in 1552, and Astrakhan two years later. But within the palace affairs stood at their worst. Ivan's two advisers, grown very powerful, were gained over to a party hostile to Ivan and favourable to his cousin, and when Ivan fell ill (1553) he witnessed during his sufferings the intrigues of his advisers. Once recovered, he exiled them. At the same time a mighty feudal prince, Andrei Kurbski, openly went over to the service of Lithuania, while other boyars maintained a secret understanding with Poland to place on the throne a ruler who might be their tool. Ivan IV. began most cruelly to persecute the boyars, and his cruelty soon attained the pitch of real madness. No less than 3470 victims, out of whom 986 are mentioned by name, were inscribed by Ivan IV. himself in his prayer-book, and among them are whole families 'with sons and daughters,' as well as 1505 Novgorodians, 'whose names, Almighty, Thou knowest.' Ivan's historical position appears very much like that of Louis XI.; it was the royal power struggling against the feudal oligarchy; but the struggle took a truly Asiatic character of refined cruelty, mingled with orgies and acts of monastic devotion. In order to carry on the struggle more successfully Ivan gave liberties to the towns and later on divided all Russia into two parts—the country as a whole and, on the other hand, what he claimed as his own part of the country (*oprichnina*)—the latter having the right of oppressing the former, peasants and boyars alike. Ivan IV. was the first autocrat in Russia, and he assumed the title of *tsar* (erroneously spelt *Czar*, q.v.), which is the name given in the Russian translations of the Bible to the kings of Judea and the Roman emperors. Contrary to the advice of his boyars, but with the approval of the states-general, he carried on a long and protracted war against Livonia, successful at the beginning, but most disastrous when Livonia was supported by the newly-elected king of Poland, Stephen Bathory. At the same time the khan Devlet Ghirei, crossing the Oka with 120,000 men, appeared before Moscow, and burned its suburbs. The Kremlin only resisted, and the khan retreated ravaging the country and carrying away countless prisoners. By the end of Ivan's reign Siberia (q.v.) was conquered by bands of Cossacks under Yermak, and the English opened the trade by sea with Archangel.

Ivan IV., who had himself killed his eldest son in a fit of rage, left but a feeble-minded son, Feodor (1584-98), during whose reign the boyars recovered their former power. Feodor's brother-in-law, Boris Godunov, was nominated regent, and the old struggles between rival parties began afresh. Godunov, though an able administrator, was generally hated by both the boyars and the people of Moscow, and he endeavoured to gain popularity among the minor nobility, in the interests of whom he promulgated (1597) a law which ultimately, especially after the law of 1648, developed into serfdom. Until that time the peasants remained free—nominally, at least. They were free to settle wherever they were offered the most advantageous conditions, and once a year (on St George's day) they were entitled to abandon their farms and to remove elsewhere if they had succeeded in finding better terms, and had contracted no debts with the landowner. Boris Godunov abolished that right of free removal, thus attaching the peasants to the land, and the institution, developing into full serfdom, became the curse of Russia for the next 270 years. To secure the throne for himself and his dynasty, Godunov first exiled Feodor and his mother to Uglitch, and later on sent assassins to murder the seven years' old child Dmitri in 1591. After Feodor's death the *duma* of boyars proclaimed Boris Godunov (1598-1605) tsar of Russia, but he reigned six years only.

The most extraordinary thing then happened in Russia. A young man, supposed to be Grigoriy Otrepiev—a runaway monk from a Moscow monastery who had afterwards spent several years among the Zaporogian Cossacks—appeared in Poland under the name of the assassinated Dmitri. The Jesuits and some of the Polish nobility at once supported him; also King Sigismund; and when he appeared with an army of Polish volunteers, under the walls of a Russian frontier fortress, he was received as the very son of Ivan IV. All over Russia the people rose to support the pretender. The mother of the murdered Dmitri recognised him as her son, and when Boris Godunov suddenly died at this juncture, Dmitri was proclaimed tsar; he was received as such at Moscow, and crowned (1605). He returned to the peasants the freedom they had lost under Godunov; but the people of Russia did not find in him the Russian tsar they expected to find. He was a mere instrument in the hands of the Poles, he married a Pole, and his Polish garrison exasperated the people of Moscow. A revolt headed by Prince Vassili Shuisky (1606-10) broke out. The impostor was murdered, and Shuisky proclaimed tsar by the boyars. But Russia did not recognise him. New impostors appeared and were supported by the revolted peasants, while bands of runaway peasants who had gathered during the preceding decades on the banks of the Don and Dnieper under the name of Cossacks ('free men'), invaded Russia, devastating the provinces, and robbing the nobles, the towns, and the wealthier peasants. Sigismund of Poland, taking advantage of the confusion, invaded Russia, and with the consent of the Moscow boyars proclaimed his son Vladislav tsar; but he preferred to have Russia for himself, and took possession of Moscow (1610). Shuisky was taken to Poland, where he died in a prison.

All this would appear difficult to explain, unless the following be taken into account. Russia by that time was receiving western civilisation from Poland, and the boyars were the first to accept it in appearance, imitating the extravagant life of the Polish nobles, ruining the peasantry, and aiming at an oligarchy of nobles such as they saw in Poland. The great rising of the people of Russia, which began in 1601 under the banner of the false

Dmitri, and continued during the next eleven years, was a rising of the toiling masses and small traders against the boyars. But this rising had, at the same time, opened Russia to Polish invasion, and left the whole territory—landlords and peasants alike—at the mercy of predatory gangs of Cossack and Polish robbers. A reaction was inevitable, and it came from the cities supported by the church. A cattle-trader of Nijni-Novgorod, Minin, aroused his fellow-citizens to march for the delivery of Moscow, which was held by the Poles and besieged by the Cossacks. The same movement took place in all Russian cities, and their folkmoths (*vetche*) entered into agreements to levy militias and unite them into one army, and convoked a 'General Council of the Land,' composed of representatives of all classes at Yaroslavl. Under the leadership of Prince Pozharskiy and Lapunov they retook Moscow, drove the Poles out of Russia, and the council (*Sobor*), now moving to Moscow, was urged to elect a tsar. The boyars were inclined to elect a Swedish or Polish prince, but the lower orders and the clergy opposed this, and the *Sobor* elected Mikhael Romanov (1612-45). The boyars finally acquiesced in the hope of maintaining the power under a sixteen-year-old tsar; but the *Sobor* remained quasi-permanent at Moscow during the first ten years of Mikhael's reign, and all decisions were issued conjointly in the name of the tsar and of the *Sobor*. Mikhael Romanov belonged to a family (the ancestors of which had emigrated in olden times from Prussia) which was very popular now in Russia. His father, the Rostov metropolitan Philarete, who had been sent as an envoy to Poland, was kept imprisoned by the Poles; his uncles had died in prisons under Boris Godunov; and his grandmother, who was the first wife of Ivan IV., had left a very good memory behind her.

The first years of the reign of Mikhael Romanov were characterised by a general movement on the part of the Russian towns to crush the peasants' insurrection and to extirpate the bands of robbers. Peace was obtained from Gustavus Adolphus of Sweden by abandoning Schlüsselburg; but the war against Poland continued, notwithstanding a short armistice. The states-general, convoked again (1632 and 1642), freely voted fresh subsidies, but no success was obtained, and the very existence of Russia was menaced when the revolts of the Cossacks of the Dnieper against the Polish nobles changed the face of affairs in favour of Russia.

Under Mikhael's son Alexei (1645-76) the work of modelling Russia into a state continued, and the local administration was entirely reformed. But the revolts of the people began anew, especially since serfdom was enforced by the law elaborated by the states-general of 1648, and the first half of Alexei's reign was marked by a series of popular revolts at Moscow, Nijni, Pskov, and finally in south-east Russia, under Stenko Razin, when the runaway serfs and the free Cossacks of the Volga rose fiercely against Russia, hanging the landlords, and aiming at 'settling their accounts with the boyars in the Kremlin itself.' At the same time came the great disruption (*raskol*) in the church. The patriarch Nikon was striving to acquire in the East the same supremacy as the pope had in the West. Being himself one of the richest serf-owners in Russia, he made a display of extravagant luxury in his life; he surrounded himself with a kind of ecclesiastical court which plundered the lower clergy; he built under Moscow a 'New Jerusalem,' and in processions went preceded by a 'Latin cross' (with one cross-bar only) like the pope. In short, he was considered 'Latin' (i.e. Polish) in all his arrogant behaviour. His attempt at completing the already undertaken revision of the sacred books, into which many errors had crept through

illiterate copyists, became the signal of a revolt of the bulk of the nation against the state's 'Latin' Church. A popular church, having priests elected by the parishioners, and taking the 'old faith' for its watchword, was opposed by the people to 'Nikon's Church,' although its followers were pitilessly tortured and exterminated by the state. All great subsequent risings of the peasants (Razin's, Pugatchev's, and many smaller ones) were therefore made under the cross with eight ends (three cross-bars) of the 'old faith.'

Nikon's attempts at subduing the tsar to his arrogant supremacy ended in his deposition and exile, and later on Peter I. abolished even the dignity of patriarch, substituting for it the Holy Synod. Alexei frequently convoked the states-general, first to confirm his accession to the throne (1645), then to revise the existing laws and to compile (1648) a new code (*Sobornoe Ulozhenie*), and next (1651 and 1653) to pronounce upon the annexation of Little Russia. Under Alexei Russia finally gained the mastery over Poland, and reconquered Smolensk; but her success was chiefly due to the revolt, under Bogdan Hmelnitsky, of the Orthodox Cossacks of Little Russia, who were terribly oppressed by their Catholic landlords. After seeing the impossibility of resisting Poland single-handed, the Cossacks appealed for protection to Russia, and recognised her supremacy. This event decidedly turned the scales in favour of Russia in the long struggle between the two chief Slav powers. But in order to maintain her rights on the Dnieper Russia had now to sustain a war with Turkey, which continued till after the accession of Feodor (1676-82), when it was terminated (1681) by the treaty of Bakhtchisarai, by which Turkey gave up all claims upon Little Russia. After Feodor's death the states-general chose his half-brother Peter as tsar, but his half-sister Sophia, an able and ambitious princess (see PETER THE GREAT), succeeded in obtaining the reins of power as princess-regent. She concluded peace with Poland in 1686, made two unsuccessful campaigns against the Tatars of the Crimea; and after an attempt to deprive Peter of his right to the throne, and, this failing, to assassinate him and his mother, she was forced to resign all power and retire to a convent. Nearly a thousand of her accomplices were executed; and Peter (1689-1725) ascended the throne as sole ruler, his half-brother Ivan being allowed to retain the title of tsar conjointly, and to appear as such at public ceremonies, but without any real authority.

The history of Peter I.'s reign is almost entirely his own biography, and it is given under his name, the following remarks being only intended to give a general view of the importance of his reforms.

The powers of the tsar, the *duma* of boyars, and the church have already been mentioned above; but since Ivan IV.'s time, and especially since the 'troubled times' of 1601-12, a new power had come into existence—viz. the *Sobor*, or states-general. The *Sobors* consisted of representatives of either 'the whole land,' or special classes—merchants or military—or the inhabitants of Moscow only, and they exercised a decided influence upon legislation. But even in Alexei's reign steps were taken towards centralising all powers in the hands of various boards (*priказы*) corresponding to modern ministries, under the guidance of the tsar, and the *Sobors* were convoked less and less frequently. Peter I. totally destroyed the powers of the boyars and the church, and convoked the states-general but once, to condemn his sister Sophia. He proclaimed himself emperor, abolished the rank of patriarch, and introduced, instead of the *duma* and the *Sobor*, a senate, whose members he nominated himself. By transporting

his capital to St Petersburg, a city of his own creation, he entirely freed himself from the interference of the boyars, the church, and the people of Moscow, which often made its voice heard by means of rebellions. He ruled with absolute power, supported by men of his own choice. All Russians became in an equal degree his own subjects, though class-distinctions continued to prevail in their mutual relations, and serfdom grew worse and worse, taking all the characters of slavery. Of a standing army under Peter's predecessors only the *Strzeltsy* (military settlements in the suburbs of the cities) and the Cossacks deserved the name. The former were abolished after their revolts in favour of Sophia, and the privileges of the latter were curtailed. A standing army, completed by recruiting, was introduced. The whole administration was reorganised upon German models, or on strongly hierarchical and centralised principles. A secret state police, endowed with extensive powers of imprisonment, torture, and exile, was introduced, and among its victims was Peter's only son, Alexei, convicted of having plotted with the old party against his father. He died after torture. The old taxes by household were superseded by capitation taxes, and formidably increased. Written procedure was introduced in the justice courts, stamp-duties were imposed. Faith was made a state affair, and attendance at church on Sundays and communion once a year was rendered obligatory.

Agriculture and industry were at a low ebb in the tsardom of Moscow. Civilisation and learning, which had been introduced during the federative period, had never recovered the shock they had received from the Mongol invasion. The education even of the higher classes was confined to reading and writing, and the first school for classics and theology only made its appearance during Feodor's reign. Fine arts were limited to architecture and painting (of sacred subjects) after the Byzantine school. The first newspaper appeared (in Moscow), and the first theatre was established, during the reign of Alexei. The influence of the Mongols left deep traces on the domestic manners and habits of the Russians, among which was the low position of women in domestic life; those of higher rank were completely excluded from social intercourse with the other sex, and were condemned to pass a dull and dreary existence in their 'terems.' Peter I. did his best to improve the state of affairs in all these directions. He organised the army, created mining and manufactures, chiefly for state purposes, imported improved races of cattle, traced and caused to be dug the canals which now are so important for Russia, created schools, chiefly technical, and introduced more social intercourse between the different classes of society, in which women were allotted a share. It must, however, be noted, that in the carrying out of his well-meant schemes he forgot the people for the state, and imposed upon the former the most terrible burdens. Thousands and thousands of his subjects perished in erecting St Petersburg and its fortress and in digging canals, not to say a word of the wars they had to maintain, and the revolts crushed with Asiatic cruelty.

In accordance with the terms of his will, his second wife, Catharine I. (1725-27), succeeded him; but the old or anti-reform party of the nobility supported the claims of the only son of the unfortunate Alexei, Peter II. (1727-30), who soon after obtained the imperial throne. The reigns of both of these sovereigns were occupied with court quarrels and intrigues, Menshikov (q.v.) during the former, and Dolgoruki during the latter being the real rulers. On the death of

Peter II. the privy-council, setting aside the other descendants of Peter I., conferred the crown on Anna, Duchess of Courland, the daughter of Ivan. Her reign (1730-40) was marked by the predominance of the German party at court, who, unchecked by the weak sovereign, treated Russia as a great emporium of plunder (see BRON). Under their influence Russia restored to Persia her lost Caspian provinces, and was led into a most ruinous war with Turkey. Anna's successor was Ivan (1740-41), the son of her niece, the Duchess of Brunswick, Anna Carlovna; but he was speedily dethroned by Elizabeth (1741-62), the daughter of Peter I., who deprived the German party of the influence it had so shamefully abused, restored the senate to the power with which it had been entrusted by Peter the Great, established a regular system of recruiting, abolished tolls, and increased the duties on imports. Russia gained by the treaty of Åbo (1743) a portion of Finland, and took part in the Seven Years' War (q.v.).

Elizabeth's nephew and successor, Peter III. (q.v.; 1762), was a devoted admirer of Frederick the Great of Prussia. His first act on his accession to the throne was to order the Russian army which supported the Austrians against Prussia to join Frederick against the Austrians. Prussia, reduced to the last extremity, was thus saved from dismemberment. At home he abolished the prescriptions of Peter I. which imposed upon each noble the duty of entering the state's service; he abolished the secret state police, gave full liberty to the *raskolniks*, proclaimed an amnesty to the serfs who had revolted against their owners, and proposed to seize the estates of the convents—a measure which Peter I. did not dare to take, and which was partially accomplished subsequently under Catharine II. But he was disliked at the court, and his wife, Catharine II. (1762-96), easily dethroned him. He was arrested and murdered by Catharine's associates.

Under Catharine II. (q.v.) successful wars were carried on against Turkey, Persia, Sweden, and Poland, which largely extended the limits of the empire. The acquisition of the Crimea, which gave Russia a firm footing on the Black Sea, and the first partition of Poland, were two most important steps towards the consolidation of the empire. In home affairs the work of further centralisation was prosecuted. But, notwithstanding Catharine's friendship with the 'Encyclopedists' of France and the excellent ideas expressed both in her correspondence and in various 'Instructions' (*nakazy*), her reign was exceedingly oppressive for the peasants. The rights of the landlords over their serfs were extended; no less than 800,000 free peasants were distributed as serfs among Catharine's favourites; serfdom, abolished in Little Russia by Bogdan Hmelnitsky, was reintroduced there as well as among the Don Cossacks; and once again the whole state was shaken by the impostor Pugatchev, who, supported by the *raskolnik* Ural Cossacks, pitilessly hanged the landlords and officials in east Russia, ravaging the country under the assumed name of Peter III.

Catharine's son and successor, Paul I. (1796-1801), at first, through apprehension of the revolution in France, joined the Austrians and British against France, but soon after capriciously withdrew, and was about to commence war with Britain when his assassination took place. He gave freedom of worship to the 'Old Ritualists,' but recklessly turned free crown peasants into serfs for his favourites. He established a severe censorship of the press, prohibited the introduction of foreign publications, reorganised the secret police, and altogether treated his subjects in the most contemptuous way. A palace conspiracy put an end to his reign and life.

His eldest son, Alexander I. (1801-25), was at the outset desirous of peace, but was soon drawn into the vortex of the great struggle with France, in which he played a prominent part. The character of his rule is sketched under his name, and an outline of the warlike operations—the great French invasion of 1812, the burning of Moscow, and the disastrous retreat—is given in the article NAPOLEON. The Holy Alliance (q.v.) and the example of conservative policy set by Austria exercised a pernicious influence on the later part of his reign; and the higher classes, who had looked for the introduction of at least a portion of the liberal institutions they had seen and admired in western Europe, became so dissatisfied that, when his youngest brother, Nicholas I. (1825-55), from whom they had nothing to hope, succeeded, they broke out into open rebellion, which was speedily crushed. A full stop was now put to the intellectual development of Russia. Wars were declared with Persia and Turkey; and a long and deadly struggle commenced with the Caucasian mountaineers. The cession of Erivan and Nahitchevan by Persia, of the plain of the Kuban, of the protectorate of the Danubian principalities, and of the free right of navigation of the Black Sea, the Dardanelles, and the Danube by Turkey only induced him to further prosecute his aim of conquering for Russia a free issue from the Black Sea in the Dardanelles. In 1830 he converted Poland (q.v.) into a Russian province; in 1849 he aided Austria in quelling the insurrection of the Magyars; and in 1853 he began a war with Turkey which became the Crimean War (q.v.), and in which, though the allies, Britain, France, and Sardinia, did not obtain any decided success, Russia suffered immense loss.

The accession of Nicholas's son, Alexander II. (1855-81)—one of whose first acts was the conclusion of the peace of Paris (1856), by which Russia lost the right of navigation on the Danube, a strip of territory to the north of that river, and the right of keeping a navy in the Black Sea—was the signal for a general revival of intellectual life in Russia. Public opinion broke the bonds of censorship and constrained the well-meaning but weak emperor to carry through the long-expected abolition of serfdom. It was abolished in 1861 after many hesitations. Corporal punishment was abolished and the judicial organisation was completely revised (1864). Unhappily the insurrection of Poland (1863-64) put an end to the reform period. The old serf-owners' party took again upper hand, and the last great reform, by which self-government (*zemstvo*) was granted to the provinces (1866), did not receive the importance which it formerly was proposed to give to it, as a preparatory step to constitutional government. Obligatory military service for all Russians was introduced in 1874.

The insurrection in Poland was suppressed with extreme severity; and in 1868 the last relics of Polish independence disappeared in the thorough incorporation of the kingdom with the Russian empire. The subjugation of the Caucasus was completed in 1859. Russian supremacy was established over all the states of Turkestan. In 1876 the administration of the Baltic Provinces was merged in that of the central government; but the autonomy of Finland was respected and even extended. In 1870, during the Franco-German war, Russia declared that she considered herself bound no more to the obligation of keeping no navy in the Black Sea, and in a conference at London in 1871 her claims were recognised. The misgovernment of her Christian subjects by Turkey, and her cruel suppression of incipient rebellion in 1876, led to a conference of

the European Powers at Constantinople. Turkey rejected the proposals made by the conference with a view to the better administration of the subject provinces; and Russia, to enforce these concessions on Turkey, declared war in April 1877. At first the Russian progress was rapid; but the energy displayed by the Turks during the summer, and the resolute defence of Plevna by Osman Pasha from July till December, checked the progress of the Russian army. During the winter, however, she crossed the Balkans, and her vanguard reaching the Sea of Marmora, stood in view of Constantinople. The armistice signed in January 1878 was followed in March by the treaty of San Stefano; and after diplomatic difficulties that seemed for a time not unlikely to issue in war between Russia and England, a Congress of the Great Powers met at Berlin in June 1878, sanctioned the re-arrangement of the Ottoman empire explained under the article TURKEY, and the cession to Russia of the part of Bessarabia given to Moldavia in 1856, as also of the port of Batum, of Kars, and of Ardahan. The growth of revolutionary discontent (see NIHILISM), leading to severe repressive measures, was marked by several murders of high officials; and on 13th March 1881, Alexander II. was killed by the revolutionists.

The reign of Alexander III. (1881-94) was in the main characterised, in contrast to the liberal reforms of the last reign, by reactionary steps; though strenuous efforts were made to put an end to the colossal plundering of state money and appropriation of state lands common in the last half of the reign of Alexander II. The self-government of the *zemstvo* had been limited and put under the authority of the nobility; the justices of peace were abolished, and an attempt at reintroducing manorial rights had been made. The redemption taxes imposed upon the liberated serfs were slightly reduced. Oppressive measures led to wholesale and compulsory emigration of Jews, and the autonomy of Finland was curtailed. Under Nicholas II. (1894-1917) the French alliance was cherished; in 1898 Manchuria (q.v.) became mainly a Russian province, and Talienwan and Port Arthur Russian ports. Collision of interests in Manchuria and Korea led to the war with Japan in 1904-5, in which the Russian armies were disastrously defeated in numerous bloody engagements (see JAPAN), including that before Mukden; Port Arthur capitulated after a siege of eight months; and the two fleets were destroyed. Peace was concluded at Portsmouth, N.H., on 5th September 1905 (see JAPAN).

On the conclusion of the disastrous war with Japan, the discontent which had been slumbering during 1904 broke out into open anarchy. Strikes of workmen in all the important centres, preferring political as well as social demands, became general, continued throughout 1905, and in many cases were put down by military force. In St Petersburg the strikers numbered in January over 100,000, led by a priest, Father Gapon. A procession marched to the palace to interview the tsar, but was met by troops, who killed and wounded hundreds. At Moscow the Grand-duke Sergius was assassinated by a bomb (17th February). By October over 1,000,000 men were estimated to be on strike, including all the railway and telegraph services; famine threatened many cities, lighting was cut off, and anarchy had become general. Poland was practically under military law, and in the Caucasus a condition of civil war existed between Tatars and Armenians. At Baku the governor was killed by a bomb (9th March), enormous damage was done to the oil wells and refineries, about 1000 people were killed and several thousands wounded. The discontent spread to the peasantry.

Anti-Jewish crusades took place in many districts, and horrible outrages were perpetrated. Mutinies took place among the sailors of the fleet at Odessa, Cronstadt, Vladivostok, and Sebastopol. These strikes and disorders were mostly political in their aims, and demanded an immediate reform in the government of the country. A congress of 34 presidents of *zemstvos* in December 1904 had passed resolutions demanding great reforms, and the resulting manifesto by the tsar (27th December), while promising certain improvements, was looked upon as a general refusal of self-government. On 1st February the tsar received a deputation of workmen, and promised to ameliorate their lot, but reproved the disorders. On 3rd March he issued another manifesto, appealing to the people for peace, and promising to convene a legislative assembly elected by the people; but this was not considered thorough enough, and the disorders continued. In August still another manifesto provided for the assembly of a popularly elected National Duma or representative council in January 1906, to establish a modified form of constitutional government. The *zemstvo* congress at Moscow, in September, gave this scheme a hesitating and grudging support. Meanwhile, the disorders increasing, the tsar signed a constitution (30th October), and appointed Count Witte head of a responsible ministry. Towards the end of 1905 the strikes were partially composed, but disorders in a lesser degree and repression by force continued into 1906. In the Duma, which met in May 1906, the revolutionary elements secured the predominance, and on 21st July it was suddenly dissolved by the tsar.

The second Duma (1907) was similarly short-lived. Stolypin, minister from 1906, set himself to undo the work of reform. Changes arbitrarily made in the electoral law secured a mainly conservative but not always tractable third and fourth Duma (1907-12, 1912-17). Stolypin's attempt to substitute individual for communal land-ownership among the peasants had only a limited measure of success, and failed to produce the good he looked for. Suppression of subject nationalities went on. Stolypin was stabbed at Kiev in 1911. Goremykin (1914-17) took up his work. Russia had not allowed the Serbs to drag her into war in 1908; but in 1914 she came ill prepared to the help of the southern Slavs. See WORLD WAR. Armies were thrown away upon the battlefield unarmoured and ill led. Incompetence, corruption, bigotry, court scandals, economic breakdown, prepared for the revolution that swept away the old system.

Some account of the dissensions among the Russian Socialists and of the Workmen's and Soldier's Soviets or Councils will be found in the article SOCIALISM. See also BOLSHEVIKI, COMMUNISM, and for the theory of a dictatorship of the proletariat to clear the way for a truly Socialistic system, see DICTATOR. At first however all progressive parties shared in the work. The revolution grew out of food riots in St Petersburg (March 1917), leading to a revolt of the garrison. The movement was met in the usual way but without success. A provisional government was formed under Prince Georgi Evgenievich Lvov, a Liberal. In July he resigned and Kerensky succeeded, an orator more than a statesman. Kerensky maintained his position against the attempted *coup d'état* of Kornilov (September), but fell before the Bolsheviks in November. A republic had been proclaimed on the 16th September 1917. Up to this point the all but bloodless revolution had been more or less sympathetically received abroad. To the Allies the great thing was to get on with the war. A democratic Russia, a good thing in itself, removed a reproach and

bettered their cause. The war-weary Russians, however, felt that a war for Constantinople was no war of theirs, nor the obligations of their overthrown masters binding upon the freed people. While the government had been prosecuting the war the Soviets had been preaching peace without annexations or indemnities, and organising the soldiers in councils. Backed by the army and the Baltic fleet the Soviets, representing the Bolsheviks under Lenin, drove out the provisional government 7th November 1917, dissolved the Constituent Assembly which had been convoked to fix the constitution, concluded the peace of Brest-Litovsk with the Central Powers—the Allies having refused to join in negotiation—and set about making a new Russia. They abjured imperialism with its subjection of nationalities and its secret treaties, pronounced for self-determination, nationalised land and industrial and commercial enterprise. Nicholas II. and his family were shot at Sverdlovsk by order of the local Soviet. Europe was filled with tales—some true—of the Red Terror, and for some years Russia was in a welter. A White Terror arose against the Red, for both sides in Russia had learned too well the methods of the empire. Anti-Bolshevik governments were set up here and there. White leaders (Koltchak, Denikin, Wrangel, Yudenich) backed by foreign expeditions (British, French, Japanese, and others) closed in upon the Reds. Blockade, famine, disorganisation, war with Poland, left the Bolsheviks firmly fixed in power, defiantly propagating the Communist faith throughout the world. Opposition died away. It remained to be seen how far Bolshevism could cope with the difficulties of its stupendous task. Socialist visitors to Russia were by no means favourably impressed. Still less were capitalists. In 1921 it was found necessary to compromise. Lenin's new economic policy made considerable concessions to capitalism. The peasants when they had to hand over surplus produce to the state had aggravated the famine by producing only enough for their own families' needs. Allowed to sell their surplus corn and pay a tax they became exploiters, contrary to the spirit of the Communist constitution, but all the less dangerous to the Communist government. So was it in other matters. Lenin did not long survive those changes. He retired in ill health next year, and died in 1924. Nor were the Bolshevik chiefs, strong doctrinaires as they were, agreed about the wisdom of the concessions. Dissentions ensued. Trotsky, Lenin's great fellow-worker, creator of the Red army, had to yield up the People's Commissariat of War in 1924. Dzerzhinsky, organiser of the terror, died in July 1926; and about the same time Trotsky's rival, Zinoviev, lost power.

See works on Russia by Sir D. M. Wallace (1877; new ed. 1912), Morfill (1882), A. J. C. Hare (1888), Stepiak (Nihilist, 1885-88), Tikhomirov (1887), Leroy-Beaulieu (trans. 1893-94), Norman (1902), Baring (1911), Makeev and O'Hara (1925). For history, see the articles on the principal Russian sovereigns, notably those on Peter I., Catharine I. and II., Paul, Alexander I. and II., Nicholas I. and II., and on personages such as Bakunin, Herzen, Potemkin; also the articles on Anarchism, Bulgaria, Crimean War, Greek Church, Jews, Poland, Finland, Socialism, &c. And consult (beside the Russian historians named in the section on Russian literature and the works noted under PETER THE GREAT) Rambaud, *History of Russia* (1878; revised and continued by Hauman, 1914); the shorter history by Morfill (1902); *Ivan the Terrible*, by Waliszewski (trans. 1904); Skrine, *The Expansion of Russia* (1903); Fitzgerald Molloy, *The Russian Court in the Eighteenth Century* (1905); Nisbet Bain, *The First Romanovs* (1905), and *Slavonic Europe* (1907); Bertrand Russell, *Practices and Theory of Bolshevism* (1920); Kluchevsky, *History of Russia* (1911 et seq.); Mavor, *Economic History of Russia* (1914); histories of Russia by Beazley,

Forbes, and Birkett (1920); Pares (1926); Platonov (1926); Miliukov, *Russia To-day and To-morrow* (1922); Reyburn, *The Story of the Russian Church* (1924); A. Karlgren, *Bolshevist Russia* (trans. from Swed. 1927).

Language and Literature.—The Russian language belongs to the eastern branch of the Slavonic family. It is extremely copious, and resembles ancient Greek in being both synthetical and analytical; thus it has seven cases, and in no language are the prepositions used with more delicate precision. A few Latin and French words have been incorporated, but the tendency at the present time is to eject foreignisms as much as possible. The language has great capabilities for forming compounds and derivatives. There are many dialects, but the predominant literary language is that of Moscow. The first Russian grammar was published at Oxford in 1696 by Henry Ludolf; in Russian may be mentioned those of Vostokov (10th ed. 1859) and Buslaev, *Historical Grammar of the Russian Language* (1875). For understanding the principles of Russian philology we must betake ourselves to the great work of Miklosich, *Vergleichende Grammatik der Slavischen Sprachen* (4 vols. 1879). The best dictionaries are those of the Russian Academy (Russe-Français, Makarov, 1874; new ed. 1892; Russian-English, Alexandrov, 1879). In English there are Russian grammars by Morfitt (1889) and Riola (new ed. 1890).

The earliest Russian literature consists of the *byliny*, or legendary poems, which were orally communicated till they were committed to writing in modern times. These are divided into cycles—e.g. those of Vladimir, the prince of Kieff, of Novgorod, and of Moscow. There are large collections of them, and also of the *skazki*, or popular tales. The earliest manuscript which has been preserved of anything which can be said to be distinctly Russian is the codex of the Ostromir Gospels, written at Novgorod in the years 1056–57 by the deacon Gregory, for Ostromir the *posadnik* of Novgorod. After this we get *sborniki*, or collections of miscellaneous works, such as those compiled for the Grand-duke Sviatoslav, and some sermons by Luke, bishop of Novgorod, and others. With the so-called chronicle of Nestor begins the series of Russian annals. Nestor is supposed to have died about 1114. We have also chronicles of separate parts of Russia, such as Novgorod, Kieff, Pskov, and Volhynia. There is also the *Pouchenie*, or book of instruction, of Vladimir Monomakh, and the prose-poem called 'The Story of the Expedition of Igor' (*Slovo o Polku Igorevém*). The original manuscript of this production was burned in the fire at Moscow in 1812. Important are the Russian legal codes, the *Russkaya Pravda* of Yaroslav in the 12th century, and the *sudebniks* of Ivan III. and IV. In 1504 the first Russian book was printed at Moscow. To the reign of Ivan IV. (the Terrible) belongs the 'Book of Household Management,' assigned to the priest Sylvester. We also have the *Stoglav*, or book of church regulations, issued by Ivan in 1551. At the beginning of the 17th century we have the chronicle of Sergius Kubasov, and towards the close of the same century the interesting work of Kotishikhin on Russia, which was discovered in manuscript in 1840. To the same period belong the writings of Ivan Krizhanich, who is generally reputed to be the father of Pan Slavism, and the poems and plays of Simeon Polotski (1628–80), who was the tutor to the children of the Emperor Alexei. In the reign of the latter monarch the Russians got back Kiev, which had long been in the hands of the Poles, and thus the culture of the West became accessible to them. With Polotski may be said to terminate the first period of Russian literature with its Byzantine influence.

The second period was to be commenced by the reforming measures of Peter the Great; and Russia now began to look to the West for her models. He established schools, and founded the celebrated Academy of St Petersburg. The first Russian poet of the new era was Antioch Kantemir (1708–44), who wrote some good satires in the style of Pope and Boileau. But the writer that exercised the greatest influence on Russian literature was Michael Lomonosov, who established the supremacy of the dialect of Great Russia. He was an indefatigable worker in many branches of learning, and earned his chief laurels in natural science. Trediakovski (1683–1769) did something for Russian versification, but was hardly more than a poetaster. Basil Tatistchev (1686–1750) laid the foundations of historical writing, as opposed to the mere chronicler, and Sumarokov (1718–77) those of the drama. A real national comedy was created by Denis von Visin (1745–92) and Kniazhnin also wrote plays with ability. Michael Kheraskov (1733–1801) composed two large epics, the *Rossiada* in twelve books, and *Vladimir* in eighteen, but they have now almost sunk into oblivion. The *Dushenka* of Bogdanovich (1743–1803) was at one time very popular. With Khemnitser begins the series of Russian fabulists. Gabriel Derzhavin (q.v.; 1743–1816) was the great poet of the age of Catharine. He celebrated her glories in many spirited odes. Prose literature was more slow in developing itself. An elegant style can hardly be said to have existed before the time of Nicholas Karamzin (q.v.; 1766–1826), renowned for his history of Russia. On the accession of Alexander I. literature advanced rapidly. The founder of the romantic school of poetry was Basil Zhukovski, who, although he wrote but few original pieces, was beneficial to his countrymen by his translations from English and German. Other poets of the period were Dmitriev and Batiushkov. The most brilliant author, however, of the new school was Alexander Pushkin (q.v.), the greatest poet whom Russia has yet produced, who has left some charming narratives in verse, and other works. The fables of Ivan Krilof (q.v.; 1768–1844) enjoyed some popularity, while Lermontov (q.v.; 1814–41) used the language of everyday life for some graceful lyrics. Gogol (1809–52), despite elements of the burlesque and the romantic, can be said to anticipate the age of the realistic novel, a novel which chose its material from contemporary life, but at the same time laid more stress on character than on plot. The first period of realism, which covered the middle of the 19th century, is represented by Turgenev (1818–83), the possessor of an excellent lyrical style and also by Dostoevsky (1821–81) and Leo Tolstoy (1828–1910), both masters of the introspective and analytical novel. The former wrote excellent dialogue, was orthodox in belief but painted abnormal types; the latter excelled in narrative, was rationalistic, but reproduced 'slices of life.' The second period of realism is covered by Tchekhov (1860–1904) who, following the 'suggestive' style of Turgenev, reflected the intellectual bankruptcy of the end of the 19th century, and the third period by the sensational Gorky (b. 1867), Kuprin (b. 1870), Bunin (b. 1870), and Andreyev (1871–1919). Names of some importance are those of the memoir-writers Aksakov (1791–1859), and Herzen (q.v.; 1812–70), the novelist Gontcharov (q.v.; 1812–91), the satirist Saltykov (1826–89), the dramatist Ostrovsky (1812–70), the novelist Leskov (1831–95) and the philosopher Soloviev (1853–1900). With the 20th century a new tradition of symbolic metaphysical writing arose, and poetry now came into its own. To this group belong the novelist Merezhkowski

(b. 1865), the philosophers Rozanov (1856-1919) and Sheslov (b. 1866), and the poets Sologub (also a story-writer; b. 1863), Ivanov (b. 1866), Bely (b. 1880), and Blok, the most significant of all (1880-1921), while the novelist Remizov (q.v.; b. 1871) represents rather a reaction to realism.

The Russians have made notable contributions to art and science, but especially in music, where the best-known names are those of Cui, Balikirev, Borodin, Mussorgsky and Rimsky-Korsakov (these constituting the group known as 'the five,' which had its centre in St Petersburg), Rubinstein and Tchaikovsky (representing Moscow), Glazunov, Rachmaninov, Scriabin and Stravinsky.

See articles on the chief authors and composers; Maurice Baring, *Landmarks in Russian Literature* (1910) and *Outline of Russian Literature* (1915); Prince Kropotkin, *Ideals and Realities in Russian Literature* (1905); Prince Mirsky, *Modern Russian Literature* (1925), *Russian Literature, 1881-1926* (1926 et seq.), *Russian Literature from the Earliest Times to the Death of Dostoevsky* (1927); histories by Waliszewski (1900), Brückner (1906), and studies on contemporary novelists by Persky (1914), the last three works all translated into English; Wiener, *Anthology of Russian Literature* (1902-3); the *Oxford Book of Russian Verse*, ed. by Baring (1925); and various books on Russian music by Montagu-Nathan (see also the standard histories of music).

Russia Leather. See LEATHER.

Russniaks. See RUTHENIANS.

Rust rapidly appears on malleable iron, steel, or cast-iron exposed to a moist atmosphere. But malleable or wrought iron, being nearly pure iron, rusts rather more readily than either of the others, which essentially contain a certain proportion of carbon (see IRON AND STEEL). When a drop of rain falls on a clean bright surface of iron, for a short time the drop remains clear, showing the bright surface of the iron through it. But soon a greenish precipitate forms in the drop, and this rapidly becomes reddish brown. The brown precipitate or rust (essentially peroxide of iron) does not adhere to the iron, but is suspended in the water, and becomes a loosely adherent coating only when the water has evaporated. Iron remains quite free from rust in an atmosphere containing oxygen, carbonic acid, and water vapour (all present in a normal atmosphere except water vapour, which is rarely absent) as long as the water vapour does not condense as liquid water on the surface of the iron. Owing to the hygroscopic character of rust, when it once forms on iron the rusting process will continue in an atmosphere not saturated with water vapour. In other words, the iron in this case will continue rusting in an atmosphere in which a piece of clean iron will not rust, because liquid water will condense on rust when it will not on bright iron. The fact that under ordinary atmospheric conditions the rusting process, when once begun, continues, has been long known. It follows that it is much easier to prevent the first formation of rust than to stop the process.

It is customary to coat with oil paint all kinds of ironwork which are to be exposed to the weather, and this is usually a sufficient protection. But paint is liable to scale off, so that it is necessary to recoat the iron at longer or shorter intervals. A light iron fence, for example, would not long escape destruction by rusting if it were not frequently painted. It is, however, usual to 'galvanise' wire-work and thin sheets of iron, as the zinc coating retards oxidation. A coating of tin also protects the surface of iron from rusting, but it would appear that for this purpose it cannot be so much relied upon as zinc. Japanning (q.v.) is another way of preserving iron. The iron and steel plates forming the sides of ships receive four or five coats of a paint composed of red lead and boiled linseed-

oil to protect them from the corrosive action of seawater, and the sides of these ships are generally repainted after a long voyage. Some of our light-houses have water-tanks constructed of iron which is not only galvanised, but is also painted with three coats of this red lead paint above the zinc coating. The patent paints depend for their efficiency on the red lead and boiled oil in them. Unlike the peroxide, the magnetic oxide of iron forms an adherent coating to the metal, and only when it is detached can water gain access to the iron beneath it. In 1878 a patent (No. 1280) was taken out by G. & A. Bower for a process of producing a thin film of magnetic oxide on iron articles to protect them from rusting, but the colour of this oxide, which somewhat resembles that of the metal itself, is not attractive. In the comparatively dry atmosphere of occupied rooms the bright surface of iron or steel objects will often keep many years without rusting. Where such objects are care should be taken to keep away from them all volatile corrosive acids, such as nitric, hydrochloric, or acetic acid, or bleaching powder (chloride of lime). Polished surfaces of iron are often coated with tallow mixed with a little white lead for their temporary protection while they are being conveyed from place to place, but this sometimes fails to keep away rust. A more recent and better plan is to coat the bright iron with some varnish soluble in naphtha or paraffin-oil—Brunswick black, for example. A mixture of common rosin with a little pure olive-oil and spirits of turpentine has also been found to be a good preservative in such cases. Iron immersed in an alkaline solution does not rust unless it is very dilute. Very delicate steel instruments are often protected from the action of moist air by placing them in drawers or cases along with chloride of calcium or lime hydrate, but as these substances absorb moisture and swell they require to be occasionally looked at. When bright iron or steel objects are already partially rusted, the rust, if not very deep into the metal, may be rubbed off with paraffin-oil, which contains no oxygen. Should this fail, a rub with fine emery will be necessary. Iron rust stains on linen or cotton are usually removed either with oxalic acid or binoxalate of potash (salt of sorrel). The fabric should be well washed after treatment with any of these substances.

The theory of rusting now generally accepted is that the carbon dioxide of the air dissolves in the water, forming carbonic acid; this dissolves the iron, forming ferrous carbonate; this in presence of oxygen is converted to hydrated ferric oxide or rust.

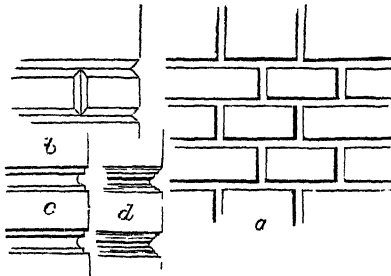
Rust. The popular name applied to a class of plant diseases caused by fungi belonging to the group *Uredineæ*. The most important economically is Wheat Rust, which does damage amounting to several millions annually to the world's wheat crops. It is caused by the fungus *Puccinia graminis*, and is recognisable in early summer by the appearance of reddish orange streaks and spots on the leaves, from which is shed a reddish powder, the spores of the fungus. Towards the latter part of summer the orange 'rust' spots give place to darker ones, when the plants are commonly said to be 'mildewed.' 'Rust' and 'Mildew' are now proved to be different stages in the life-history of the same fungus. Varieties of wheat show great differences in the degree of their susceptibility to attack, some being practically immune. Heavy applications of nitrogenous manures, especially nitrate, increase the susceptibility, and should therefore be avoided. See BARBERRY, PLANTS (*Diseases*). Other species of *Puccinia* occur on various cereals; on carnations, hollyhocks, asparagus, and plums among garden

plants; and on a great variety of wild flowering plants. Fungi of the closely related genus *Uromyces* occur on beans and beet. The biology of the group is very involved, and over 700 different species have been recorded.

Rustam. See FIRDAUSI.

Rustchuk, a town of Bulgaria, stands on the south bank of the Danube, opposite Giurgevo, 140 miles by rail NW. of Varna (on the Black Sea) and 40 S. by W. of Bucharest. It has numerous churches and mosques, and manufactures cloth, shoes, pottery, gold and silver ornaments, and furniture. It was captured by the Russians in 1810 and 1877, and played a prominent part in the Russo-Turkish wars of 1773-90 and 1853-54. Pop. (1920) 41,574.

Rustic Work is the name of that kind of masonry in which the various stones or courses are marked at the joints by splays or recesses. The surface of the stone is sometimes left rough, and sometimes polished or otherwise dressed. Rustication is chiefly used in classical or Italian architecture, although rustic quoins are often used in rough Gothic work. In the figure *a* and *b* show



Rustication.

forms of rustication usually applied to surfaces, *c* and *d* show rustic quoins with mouldings on the angles.

Rüstringen, a seaport of Oldenburg situated on the west of the Jade Gulf. The town was severely inundated in the Middle Ages. Pop. 50,000.

Rutaceæ, a family of dicotyledons, consisting mostly of perennial or suffrutescent species, found chiefly in the tropics and the southern hemisphere, but also in the temperate regions of the northern hemisphere, and abundant along the shores of the Mediterranean. A bitter taste and powerful odour are general characteristics. Rue (q.v.) is a familiar example. See also AURANTIACEÆ, FLINDERSIA.

Rutebeuf, or RUSTEBEUF, a great 13th-century trouvère, of whose life we know but little, the dates of his birth and death being both unknown. His earliest extant poems are anterior to the final crusade of St Louis; his latest belong to the close of the reign of Philippe le Hardi. He lived a Bohemian life in Paris, amid poverty, debt, and constant distress, his miseries the fruit of an easy temper, lavish habits, a passion for gambling, and an unhappy marriage. His poems include *chansons*, satiric and religious, but not amatory; *complaintes* of death, in the name of contemporary great men; animal and moral allegories; dramatic monologues, among them the *Miracle de Théophile*, a clever drama of a compact concluded with the devil, from the consequences of which the victim is saved by the Virgin; metrical lives of St Mary of Egypt and St Elizabeth of Hungary; and fabliaux, full of honest gaiety. Rutebeuf was inspired by the

crusading fever, and took part in the great quarrel between the Dominicans and the regular clergy in the university of Paris, some of his best work being his satires against the religious orders, the mendicant friars, Dominicans and Minorites, and indeed all clerics, students alone excepted. His most striking qualities are strength, spirit, and colour, and some of his satires reveal a touching note of personality that reminds the reader of Villon.

His poems were edited by A. Kressner (Wolfenbüttel, 1885). See the study by Léon Clédat (1891) in *Les Grands Écrivains Français*.

Ruten, a Palestinian people, Aramæan or at least Semitic, with whom the Egyptians waged war under the 18th and 19th dynasties.

Ruth, BOOK OF. The four chapters of this canonical book tell how Ruth, a young Moabitess, after the early death of her Hebrew husband Mahlon, for the sake of her mother-in-law Naomi came to settle in Bethlehem, and there became the wife of a 'near kinsman' (*gôel*), Boaz, and the mother of Obed, grandfather of king David. The story is placed 'in the days when the judges judged' (i. 1), about a century before the time of David; but on its own showing it was not written till long after the events it describes (iv. 7). How long afterwards is a question on which critics are not agreed; most of them consider it to be exilic (Ewald) or rather post-exilic (Wellhausen, Kuenen, &c.), mainly on the linguistic and genealogical evidence; but Driver (*Introd. to Old Testament*, 1909) thinks that the general beauty and purity of the style, which stand on a level with the best parts of Samuel, point rather to a date, which he does not seek to fix more definitely, before the exile. That the book was not received into the canon till a very long time after the captivity is shown by its place in the original Hebrew, where it occurs as one of the Hagiographa or 'writings' (see BIBLE), standing second among the five Megilloth or Festal Rolls, between Canticles and Lamentations, a position which proves that it did not become canonical till after the series of 'former prophets,' extending from Joshua to 2 Kings, had been finally closed. In the Septuagint, however, which gives it the place it claims in the historical order, it comes between Judges and Samuel, and the same order is observed in the Vulgate and in the English versions. That Josephus also must have reckoned it as an appendix to Judges is shown by his enumeration of the books of the Old Testament as numbering only twenty-two. The purpose of the book has been variously explained. Some think that it was intended to inculcate the duty of Levirate marriage (Deut. xxv. 5-10, and see MARRIAGE); to this theory it is perhaps enough to reply that Boaz was not Mahlon's brother, and that David was never reckoned as the descendant of Mahlon. But the story undoubtedly has a bearing on the rights, duties, and privileges of the *gôells* or 'near kinsmen,' if these be taken in a somewhat wider sense. Others will have it that with the framers of the canon the interest of the book was chiefly genealogical. It certainly supplements the genealogy of David as given in the older books; in 1 Samuel, though relations with Moab are alluded to (xxii. 3), his ancestry is not traced beyond Jesse, and that the tendency of later ages was to greater amplification is shown incidentally by Matt. i. 5. But perhaps this little idyll of upright happy life in the good old God-fearing times, set forth with a simplicity and directness the charm of which no one can fail to feel, does not need any special vindication of its claim to rank with the narratives of Genesis, Judges, or Kings.

See the Old Testament introductions, especially those of Driver, Moore, and Gray, also the commentaries on Judges and Ruth by Thatcher (*Century Bible*) and G. A. Cooke (*Cambridge Bible*).

Ruthenians, a branch of the Little Russian division of the Slav race, dwell on both sides of the Carpathians, in Eastern Galicia and Carpathian Ruthenia. They are of medium stature, but somewhat slim in build. Nevertheless they make hardy farmers, herdsmen, wood-cutters, and charcoal-burners—their favourite occupations. For various reasons—great subdivision of the soil, years of subjection to the Polish nobles, the extortion of the Jews, addiction to drink, and the lack of industries, though the house industries flourish—they are sunk in great poverty. The clergy of the Greek United Church, to which they are greatly devoted, are their intellectual and political leaders. The people cling to traditional usages and customs, and have a leaning to fatalism and melancholy. The Little Russians of the Ukraine are akin. Many of the Ruthenians of Galicia, deprived of their just rights by the Poles, have emigrated; many Canadians are of Ruthenian stock. See SLAVS, POLAND, RUSSIA, UKRAINE.

Western or Austrian Ukraine (or Ruthenia) in vain proclaimed its independence in November 1918, and in January 1919 its union with Eastern or Russian Ukraine. The peace treaties and subsequent arrangements left the Ruthenians more divided than ever. Russian Ukraine, a federal state of the Soviet Union, maintained some sort of independence, lopped of its western territories by Poland; but not so the former Austro-Hungarian territories. Eastern Galicia was left in Polish hands. Carpathian Ruthenia (Podkarpatská Rus; q.v.) was made an autonomous province of Czechoslovakia, and Bukovina (q.v.), and Bessarabia (q.v.; from Russia) went to Rumania. See H. Baerlein, *Over the Hills of Ruthenia* (1923).

Ruthenium (sym. Ru; atom. no. 44; atom. wt. 101.7; sp. gr. 12.3) is a metal discovered in 1843 by Claus in the ore of platinum. It forms no fewer than four different oxides. Of these the tetroxide, RuO₄, is remarkable for its volatility, boiling at a little above 100° C. For details regarding the metal, which is of no practical importance, the reader may consult Deville and Debray's *Memoir on Platinum and its Ores*.

Rutherford, Sir Ernest, O.M., physicist, was born, 30th August 1871, at Nelson, New Zealand. After graduating at New Zealand University he proceeded to research work at Cambridge University, obtaining a further degree in 1897. From 1898 to 1907 he occupied the Macdonald chair of Physics in McGill University, Montreal; in 1907 he became Langworthy professor in Manchester University, and in 1919 Cavendish professor of Physics at Cambridge. Among medals and prizes awarded him are the Rumford Medal (1905), Nobel Prize for chemistry (1908), Bressa Prize (1908), and Copley Medal (1922). Knighted in 1914, he was President of the British Association in 1923, and received the Order of Merit in 1925. His work has largely dealt with the electrical conductivity of gases, and especially must his name be associated with researches in the field of radioactivity and investigations into the nature of the atom. His numerous publications include *Radioactivity* (1904), *Radio-active Transformations* (1906), *Radio-active Substances and their Radiations* (1912). See MATTER, PHYSICAL CHEMISTRY.

Rutherford, Samuel, Scottish preacher and divine, was born at the hamlet of Nisbet, near Jedburgh, about 1600. He attended school at Jedburgh, and entered Edinburgh College in 1617,

obtained a town bursary in 1618, and took his M.A. degree in 1621. Two years afterwards his extraordinary talent led to his appointment as regent or professor of Humanity, but an antenuptial irregularity with his wife caused his resignation in 1626, when he turned his attention to theological study. Through the influence of Gordon of Kenmure, afterwards Viscount Kenmure, he settled as minister of Anwoth in 1627. Here it was his habit to rise at three A.M. for study and prayer, and of his ministry it has been said that he was always praying, always preaching, always visiting the sick, always catechising, and always writing and studying. Though he had a kind of *skreigh* in his voice, Wodrow says he was 'one of the most moving and affectionate preachers in his time, or perhaps in any age of the church.' Here he began that correspondence with his godly friends, chiefly in Galloway and Ayrshire, which made him beloved, useful, and famous, and which earned the title when published of being 'the most seraphic book in our literature.' 'Hold off the Bible,' said Baxter, 'such a book the world never saw the like.' In 1636 his *Exercitationes de Gratia* came out at Amsterdam, directed against the Arminians, with a second edition in the same year, and he was invited to fill a Divinity chair in Holland. Because of this work and non-compliance with Episcopal ceremonies, he was summoned before the High Commission Court at Wigtown on 27th July 1636, deprived of his ministerial office, and banished to Aberdeen. There he remained from September 1636 to February 1638, writing letters, disputing with Episcopalians, and bewailing his 'dumb Sabbaths.' He was restored to Anwoth, but was appointed by the Assembly professor of Divinity at St Andrews in 1639, became colleague to Robert Blair in the church of St Andrews, and afterwards principal of the New College (1647). Here he was as industrious as ever, performing the duties of both preacher and professor. In 1643 he was sent to the Westminster Assembly as a commissioner from the Church of Scotland, and there is a draft of a *Shorter Catechism* in his handwriting in Edinburgh University Library. During his four years' attendance he seems to have been prominent enough to be singled out for mention by Milton. His *Due Right of Presbyteries* (1644), *Lex Rex* (1644), *Trial and Triumph of Faith* (1645), *Christ Dying and Drawing Sinners to Himself* (1647) belong to this period. Rutherford's *Lex Rex* was conceived in too bold a spirit of freedom for the government of Charles II.; it was burned by the hangman in Edinburgh and by Sharpe at St Andrews in 1661. Its author was deposed from all his offices, and summoned to answer a charge of high-treason at next parliament. Rutherford received the citation on his death-bed, and sent answer, 'I beehove to obey my first summons,' and went to a higher tribunal on 29th March 1661 (not 20th March, as his tombstone states); he was buried at St Andrews. There is a monument to his memory at Anwoth. No portrait of Rutherford exists, but he has been described as a 'little fair man' with 'two quick eyes;' when he walked he held his face upward. He was extremely charitable in private, and was much looked up to and consulted in matters of personal religion. Livingston, who knew him well, said 'he had most sharp piercing wit and fruitful invention and solid judgment.' He was twice married, and of seven children by his second wife, one daughter alone survived him. No divine in the first half of the 17th century has left a greater reputation for sanctity. He was twice offered a professor's chair in Holland. Freedom and breadth theologically, along with hardness and narrowness ecclesiastically, meet in Rutherford's published works.

Rutherford's religious genius is seen at its highest in his *Letters*, which, to the number of 284, were collected and published under the title of *Joshua Redivivus* by his secretary M^{rs} Ward (Rotterdam, 1664). A third edition in 1675 had 68 additional letters. Over twenty-five different editions have since appeared, the best being that by Andrew A. Bonar, D.D., with biographical sketch of his life and notes regarding his correspondents (Edin. 1891). Sixteen works, controversial or theological, were issued in his lifetime; his *Lex Rex*, dealing with the prerogative of king and people, is as keenly logical and controversial as his letters are unworldly and full of sweetness, fancy, and spiritual life. Among his posthumous works are *Twelve Communion Sermons* (1876), and *Quaint Sermons*, edited by Bonar (1885).

See Taylor Innes in the Evangelical Succession Lectures; M^{rs} Adam Muir in the St Giles' Lectures; Dr Whyte's *Lectures* (1894); Livingston's *Characteristics*; and Lives by Murray (1828) and Thomson (1884). For the scandal of his youth, see the Edinburgh Town Council Records of date 3d February 1626.

Rutherglen (popularly *Ruglen*), a town in Lanarkshire, on the Clyde, 3 miles SE. of Glasgow, with whose eastern extremity it is connected by a bridge. It consists of one long wide street, with several narrow streets branching off at right angles; and its principal building is a handsome town-hall (1892). In ancient times Rutherglen was a place of much importance, a royal burgh since 1126, carrying on a large traffic on the river, and embracing great part of Glasgow within its municipal boundaries. It was the seat of a royal castle, which was captured by Edward Bruce about 1313, burned by Moray in 1568, and finally demolished in the 18th century. At Rutherglen, on 29th May 1679, the Covenanters published a 'Declaration and Testimony of the true Presbyterian Party in Scotland'—the prelude to Drumclog and Bothwell Bridge. The trade is now mainly dependent upon that of Glasgow, and its inhabitants are employed in the mills, print, chemical, tube, rope, brick and dye-works, and in the collieries. Pop. (1861) 8062; (1891) 13,361; (1921) 24,744. See Ure's *History of Rutherglen* (1793).

Ruthin, a town of Denbighshire, on the Clwyd, 8 miles SSE. of Denbigh by rail. The 13th-century castle which gave it name (Cym. *rhod-din*, 'red fortress') surrendered in 1646 to the Roundheads, and was afterwards dismantled, part of its site being now occupied by a castellated mansion. A grammar-school, founded by Dean Goodman of Westminster in 1594, was reconstituted in 1881; and there are also an interesting collegiate church, a county hall, a corn exchange, &c. The borough was chartered by Henry VII. in 1507. Pop. (1851) 3373; (1921) 2767.

Ruthven, RAID OF, a Scottish conspiracy contrived and executed in 1582 by William, first Earl of Gowrie, father of the chief actor in the Gowrie Conspiracy (q.v.), in conjunction with Lord Lyndsay of the Byres, the Earl of Mar, and the Master of Glamis. The boy-king James VI., then under the influence of Lennox and Arran, was invited to Gowrie's seat, Castle Ruthven (pron. *Riven*) or Huntingtower, 3 miles WNW. of Perth, to hunt; but the next morning (23d August) he found himself a prisoner in the midst of a thousand armed men. He tried to get out, but the Master of Glamis detained him, and said when he wept, 'Better bairns greet than bearded men.' Arran was thrown into prison, and Lennox retired to France, where he died broken-hearted. The Presbyterian clergy warmly espoused the cause of the Ruthven lords, who received the thanks of the General Assembly, and full indemnity from a Convention of Estates. Nearly a year elapsed before the king regained his freedom. His feigned acquiescence in his position led the confederates so to relax their vigilance that, on 20th May 1583, he

was enabled to escape from Falkland to the castle of St Andrews. Gowrie and the other lords made their submission, and were pardoned; but soon afterwards a royal proclamation branded their enterprise as treason. Gowrie was commanded to leave Scotland; but in April 1584, while waiting for a vessel at Dundee, he was drawn into a conspiracy to surprise Stirling Castle, for which he was tried and executed.

Ruthwell, a Dumfriesshire coast parish, 9 miles ESE. of Dumfries. Its famous sandstone cross, 17½ feet high, bears carvings in front and behind of the Crucifixion, Annunciation, &c., with corresponding Latin inscriptions in the Roman character, and on the sides of scroll-work, with Northumbrian runic verses from 'The Dream of the Rood' (see CAEDMON and CYNEWULF). The cross, which some authorities date from the seventh century, and others from the tenth or even later, was taken down and broken in 1642 as a monument of idolatry; but in 1802 was re-erected in the manse garden by the Rev. Henry Duncan (q.v.), and in 1887 removed to an apse adjoining the church. See A. S. Cook's edition of *The Dream of the Rood* (1905); J. W. Hewison's *The Runic Roods of Ruthwell and Bewcastle* (1914); Forrest Browne's *Ancient Cross Shafts at Bewcastle and Ruthwell* (1916). See also RUNES.

Rutile (Lat. *rutillus* 'reddish'), a mineral which is essentially oxide of titanium. *Nigrine* and *Ilmenorutile* are varieties containing 2-10 per cent. of ferric oxide. It crystallises in tetragonal forms, generally as slender four-sided or six-sided prisms and needles. Now and again it occurs massive. It varies in colour from yellow to brown and red. Sometimes it presents a curious interlaced character, known as *Sagenite*. It not infrequently occurs as an endomorph in rock-crystal. As a rock-forming mineral it is not of much importance, but occurs generally as minute granules and aggregates or prismatic crystals in schistose rocks, gabbro, and other rocks. Massive rutile is used to give a yellow colour to porcelain.

Rutlam, a small Indian state in the Western Malwa Agency (see CENTRAL INDIA); pop. over 85,000. The capital, Rutlam, is a centre for grain, and has a college and other educational establishments; pop. 30,000.

Rutland, the smallest county in England, bounded by Leicester, Lincoln, and Northampton shires. It measures 18 by 15 miles, and has an area of 162 sq. m. or 97,273 acres. The Great Ouse, flowing to the Welland (which traces the south-east boundary), divides it into two portions—the northern a somewhat elevated tableland, while the southern consists of a number of valleys running east and west, and separated by low hills. Limestone is plentiful, and the soil is mostly a deep clay. Half the whole area is permanent pasture, the towns being Oakham and Uppingham. Rutland gives the title of duke to the family of Manners (q.v.). Its representation was reduced to one in 1885, and in 1918 it was joined to the Stamford division of Kesteven for parliamentary purposes. Pop. (1801) 16,380; (1861) 21,861; (1921) 18,368. See the 'Victoria History' (1908).

Rutland, capital of Rutland county, Vermont, is on Otter Creek, close to the Green Mountains, and 67 miles by rail SSE. of Burlington. The chief industry is the quarrying and working of marble; the place has also several foundries and railroad shops, and contains the state workhouse. From 1784 to 1804 Rutland was one of the capitals of Vermont. Pop. (1920) 14,954.

Rütli, or GRÜTLI, a meadow on the west side of the southern arm of the Lake of Lucerne, the tra-

ditional cradle of Swiss independence; here the representatives of the three cantons, Uri, Schwyz, and Unterwalden, took the oath (1307) to drive out the Austrians. It is national property, having been purchased with the pence of Swiss school-children, and is adorned with a monument (1860) to Schiller, the author of *Wilhelm Tell*, and with another (1884) in commemoration of the oath.

Ruvo in Apulia, a cathedral city of Southern Italy, 22 miles W. of Bari, with a very fine Romanesque cathedral, probably of the 13th century. Pop. 28,000.

Ruwenzori, a mountain mass in the centre of Africa, just north of the Equator, between Lakes Albert and Edward—perhaps Ptolemy's original 'Mountains of the Moon' (see MOON, MOUNTAINS OF THE). It was seen by Baker in 1871, passed by Stanley in 1888, and partly climbed by Stuhlmann, Moore, and Sir H. Johnston. In 1906 the Duke of the Abruzzi climbed sixteen chief peaks of the mass, which consists of six groups, and gave to the principal group the name of Stanley, and to its highest peaks the names Margheita (16,800 ft.) and Alexandra (16,744 ft.).

Ruysbroek, JOHANNES, Flemish mystic, born at Ruysbroek near Brussels in 1293, was vicar of S. Gudule in Brussels, but in 1353 withdrew to the Augustinian monastery of Groenendael near Waterloo, and died its prior in 1381. His mysticism, mainly derived from Eckhart (q.v.), but directed in the channels of practical charity, gained for him the title of *Doctor ecstaticus*. Gerhard Groot (q.v.) was his friend. Ruysbroek wrote in Latin and in Flemish; his works were published in Latin in 1562, and in German in 1701. See books by Engelhardt (Erlangen, 1838), Ch. Schmidt (Strasbourg, 1859), Otterloo (Amsterdam, 1874), Maeterlinck (trans. 1894), and Evelyn Underhill (1915).

Ruysdael, or RUISDAEL, JAKOB, the greatest landscape-painter of the Dutch school, was born at Haarlem about 1628. In 1648 he was enrolled a member of the guild of St Luke at Haarlem, and in 1659 was granted the freedom of the city of Amsterdam. He died in the almshouse of Haarlem on 14th March 1682. He loved to paint forest glades with oak-trees; sleeping pools beneath clusters of trees, with an old picturesque building, a mill or a ruined temple, or a glimpse of a distant town; a waterfall with rugged rocks, and coast scenes, where sea and earth meet. The scenes were mainly taken from the neighbourhood of Haarlem, partly from the districts of Germany that border on Holland. His work shows that he had a fine feeling for the poetic spirit of nature, which he embodies with great skill. His pictures exist in Dresden, Berlin (probably the two best collections), the Louvre, the London National Gallery, Amsterdam, and the Hague. See E. Michel, *Ruysdael et les Paysagistes d'Harlem* (Paris, 1890).

Ruyter, MICHAEL ADRIANZSOON (afterwards De Ruyter), Dutch admiral, was born at Flushing on 24th March 1607 of poor parents, who sent him to sea as a cabin-boy when only eleven. He changed into the navy, and by 1635 had risen to the rank of captain. From 1643 to 1652 he was again in the merchant service, and fought against the pirates of Barbary. When war broke out between England and Holland in 1652, a fleet was given to Ruyter; with it he beat off an attack made upon him (26th August) by Sir G. Ayscue off the Lizard, but in conjunction with De Witt was compelled to retire after vainly attacking Blake off the mouth of the Thames (28th September). They had their revenge, however, two months later, when they defeated Blake off Dover. In the following year Ruyter took

part in the running fight in the English Channel of 18th–20th February against Blake; in that of Solebay or Southwold (2d–3d June) against Monk and Deane and Blake; in the indecisive battle off Katwyk; and in that off the Texel (29th July), in which his superior, Tromp, was killed and the Dutch fleet defeated. After this Ruyter was made vice-admiral of Holland. In 1654 peace was concluded between the two countries. In the years immediately following Ruyter was sent to blockade the coasts of Portugal, and then those of Sweden (on behalf of Denmark); he compelled the Swedes to surrender Nyborg in Fünen in 1659. On the conclusion of the Dano-Swedish war (1660) the king of Denmark ennobled him. The years 1661–63 were principally occupied with checking in the Mediterranean the piracy of the Turkish states of North Africa. In 1664 war broke out again between England and Holland, and De Ruyter steered his fleet to the west coast of Africa, and took from the English Gorée and some forts on the Guinea coast; in 1665 he preyed upon English merchant-vessels in the West Indies, made his way home round Scotland, and was chosen admiral-in-chief of the Dutch fleet; in 1666 he fought for four days (June 1–4) against Monk and Prince Rupert off Dunkirk, neither side gaining the victory, though the English were the first to retire; nevertheless in July he was beaten by Monk, and driven back to Holland. In 1667 he caused great consternation in London by sailing up the Medway as far as Rochester, and burning some of the English ships, and entering the Thames a second time as high as Gravesend, besides attacking Harwich. Then came peace again; and in 1672 war once more, this time against England and France combined. De Ruyter's principal achievements in this war were to attack the English and French fleets under the Duke of York, the Earl of Sandwich, and Count d'Estrées in Solebay (28th May 1672), after which he retired to Holland; to defeat Prince Rupert and D'Estrées off Schooneveldt in June 1673, and again off Kijkduin and Helder in August. Peace was then made with England; but the war with France still went on. In the end of 1675 De Ruyter set sail for the Mediterranean, to go and help the Spaniards against the French. He encountered the French fleet under Duquesne near the Lipari Islands a few days before the New Year, and again in April in the Bay of Catania, on the east of Sicily. After the first encounter the Dutch-Spanish fleet drew off towards Palermo; in the second they were routed, and De Ruyter was seriously wounded in the right leg, the first serious wound in his life of battles. He died exactly a week later, on 29th April, in Syracuse. His body was buried in the New Church at Amsterdam. He was a man of unaffected piety, simple in his manners, and of unflinching courage; as a seaman he deserves to take rank with Blake and Nelson.

See Life (anon. Amsterdam, 1677), by Brandt (Amst. 1698), and by Richer (1783), all in French, and the English one by G. Grinnell-Milne (1897).

Ryan, LOCH, an arm of the sea, extending in a south-easterly direction into Wigtownshire from the southern entrance of the Firth of Clyde, fully 8 miles in length, with a breadth of from $1\frac{1}{2}$ to almost 3 miles. From about the middle of its western side a broad sandbank called the Scar projects diagonally across it for about $2\frac{1}{2}$ miles; opposite is Cairn Point with a lighthouse (1847); At its south-western corner stands the port of Stranraer, with daily steamers plying to and from Larne; two miles west of its northern extremity is Corsewall Point, a bold headland with a fine lighthouse (1816). Loch Ryan affords safe and commodious anchorage, being very deep close to its eastern shores, which are sheltered by the high

hills of Finnart and Craiggaffie, as its western are by the beautifully wooded heights of Kirkcolm and Leswalt. The *Rerigonius Sinus* of Ptolemy, Loch Ryan has been rendered classic, in name at least, by the pathetic traditional ballad, 'Fair Annie of Lochryan'—the question of its localisation is quite another matter. Hew Ainslie's spirited song, 'The Rover o' Lochryan,' deserves mention also.

Rybinsk, a town of Russia, stands on the right bank of the Volga, at the termination of a branch-line (174 miles) of the Moscow and St Petersburg Railway, and 48 miles NW. of Jaroslav. It has a very large trade in transshipping and forwarding to the capital by canal the goods brought by large vessels up the Volga. Those goods are corn, flour, tallow, spirits, metals, timber, potash, salt, &c. Boat-building, rope-making, brewing, and distilling are the chief industries. Pop. about 39,000.

Rydal Mount, Rydal Water. See LAKE DISTRICT, WORDSWORTH.

Rydberg, ABRAHAM VIKTOR, Swedish author, was born 18th December 1828 at Jönköping. After finishing at the University of Lund he turned to his pen for a living, and obtained an appointment on the staff of a Göteborg journal. While there he wrote several novels of the highest merit, among them *The Free-booter on the Baltic* (1857), *The Last of the Athenians* (1859), *Singalla* (1865). *The Armourer* followed in 1891. Rydberg became professor of Philosophy and of History of Civilisation at Göteborg, then of Fine Arts at Stockholm, and took a keen interest in biblical criticism and ecclesiastical history. He died near Stockholm 21st September 1895.

Ryde, a flourishing and fashionable holiday resort on the north-east coast of the Isle of Wight, 4½ miles SSW. of Portsmouth, from which it is separated by the roadstead of Spithead. It consists of Upper and Lower Ryde, the former occupying the site of an ancient village, *La Rye* or *La Riche*, destroyed by the French in 1377, the latter modern. Fielding in 1753 described Ryde as 'a pleasant village, separated at low-water from the sea by an impassable gulf of mud;' but now there are excellent sands, and the appearance of the town with its streets and villas interspersed with trees is pleasing and picturesque. The longer of the two piers (768 feet) was constructed in 1813-61; of the buildings may be noticed the town-hall (1831); All Saints' Church (1870), by Scott, with a spire 173 feet high; St Mary's Roman Catholic Church (1846), by Hansom; the Royal Victoria Yacht Club-house (1847); and the Royal Isle of Wight Infirmary. Ryde was made a municipal borough in 1868. Pop. (1811) 1601; (1881) 11,461; (1921) 11,294.

Rydel, LUCYAN, Polish poet and dramatist, was born in 1870. His *Magic Circle*, an historical drama, draws its inspiration from the life of the people, as does much of his poetry. Rydel can attain pleasing artistic effects.

Rye, a decayed seaport of Sussex, 11 miles NE. of Hastings, and now 2 miles inland. It stands on an eminence bounded by the Rother and the Tillingham, and presents a quaint, old-world aspect. On a rock overlooking the confluence of the streams is the 12th-century Ypres Tower, built in Stephen's reign by William de Ypres. The church, mainly Norman and Early English, one of the largest in the kingdom, was restored in 1883. Then there are the old Land Gate, a former Carmelite chapel, and a grammar-school (1638). The *Novus Portus* of Ptolemy, Rye was granted by the Confessor to Fécamp Abbey, and by Henry III. was given the privileges of the Cinque Ports (q.v.). It became a Huguenot asylum after 1562 and 1685

(Thackeray's *Denis Duval* is laid here); and it returned two members till 1832, and then one till 1885. Fletcher the dramatist was a native. Pop. 4000. See Holloway's *History of Rye* (1847).

Rye (*Secale*), a genus of grasses, allied to Wheat and Barley, and having spikes which generally consist of two-flowered, rarely of three-flowered, spikelets; the florets furnished with terminal awns, only the upper floret stalked. One species (*S. cereale*) is a well-known grain. It has, when in fruit, a roundish-quadrangular spike, with a tough rachis. Its native country, as in the case of the other most important cereals, is somewhat doubtful; but it is probably derived from *Secale montanum*, a species found wild in parts of Eastern Europe and Asia Minor. It has long been cultivated as a cereal plant; although the supposed mention of it in Exodus, ix. 32, is doubtful, spelt being perhaps intended. It is much cultivated in the north of Europe and in some parts of Asia. Its cultivation does not extend so far north as that of barley; but it grows in regions too cold for wheat, and on soils too poor and sandy for any other grain. Its ripening can also be more confidently reckoned upon in cold regions than that of any other grain. But rye succeeds best, and is most productive, in a climate where wheat still ripens. It delights in sandy soils. The varieties of rye are numerous, although much less so than those of other important cereals. Some are best fitted for sowing in autumn, others for sowing in spring. The former kinds (Winter Rye) are most extensively cultivated, being generally the most productive. In some places on the continent of Europe rye is sown at midsummer, mowed for green fodder in autumn, and left to shoot in spring, which it does at the same time with autumn-sown rye, producing a good crop of small but very mealy grain. In Britain rye is not a common grain-crop, and is cultivated to a smaller extent than it formerly was; the sandy soils, to which it is best adapted, being improved and fitted for other kinds of corn. It is, however, sometimes sown to be used as a green crop, for feeding sheep and oxen in winter, and is found particularly good for milch cows. It is sometimes also mown for horses and other animals. Bread made of rye is much used in the north of Europe; it is the familiar 'black-bread' of Germany, and the main sustenance of the Russian peasant throughout large regions. It is of a dark colour, more laxative than that made of wheat-flour, and, perhaps, rather less nutritious. In combination with other grains, rye is much used for fermentation and distillation, particularly for the making of gin. The Russian beer called *kvass* is made from rye-meal. Rye affected with Ergot (q.v.) is a very dangerous article of food. The straw of rye is tougher than that of any other corn-plant, and is much valued for straw-plait. Perennial Rye (*S. montanum*) differs from common rye in having a very hard, reed-like culm; ears, 3 to 5 inches long, flatly compressed, with a brittle rachis, and fifty to sixty closely imbricated spikelets. It endures for many years, but is not much cultivated, as its grain is slender, and does not yield an easily separable flour.

Rye-grass (*Lolium*), a genus of grasses, having a two-rowed, flatly-compressed spike, the spikelets appressed edgewise to the rachis. Perennial Rye (*L. perenne*), the *Ray-grass* of the older English authors, is frequent on waysides, and in meadows and pastures, in Britain and on the continent of Europe. The leaf is highly glazed, narrow tipped, has an obtuse ligule, surrounded by an auricle or collar-like portion of blade; whilst the younger leaves are folded throughout their

length on the midrib when emerging from the purple sheath. The spikelets are much longer than their solitary external glume, six to eight flowered; the florets awnless or nearly so; the culm flattened, from 1 foot to 2 feet high; the root



Fig. 1.—Perennial Rye-grass (*Lolium perenne*) in flower, showing united root tufts:
a, a spikelet in flower.

producing leafy barren shoots, which add much to the agricultural value of the grass. This grass is highly valued for forage and hay, and is more extensively sown for these uses than any other grass, not only in Britain, but also on the continent of Europe and in North America. It grows well even on very poor soils. The Perennial Rye is the kind most generally cultivated. A number of years ago there was much discussion in England as to whether or not rye-grass is really perennial. It is admitted to be of short duration

on poor, dry soils, or in soils soaked with stagnant water, but its claim to be ranked as a lasting plant where the circumstances are even moderately favourable has been incontestably established. Darnel (*Lolium temulentum*) is an annual weed of corn-fields, distinguished by the great length of the empty glume. It is said to be poisonous, though the evidence of this is not convincing. Italian Rye (*L. italicum*), a native of the south of Europe, is much esteemed as a forage and hay



Fig. 2.—Italian Rye-grass (*Lolium italicum*) in flower:
a, spikelet in flower.

grass, and is preferred by cattle to the perennial rye-grass. The florets are awned, and the plant biennial. In many soils and situations in Britain

it succeeds extremely well, and is remarkable for its verdure and luxuriance in early spring. There are many varieties of rye-grass. It is nowhere so much valued or cultivated as in Britain, and was grown as a crop in England before the end of the 17th century. Rye, along with other grass seeds and the seeds of clovers, is generally sown along with some kind of corn, and, vegetating for the first year amongst the corn, appears in the second year with the other grasses and clovers as the proper crop of the field. See Stebler and Schröter, *The Best Forage Plants* (Eng. trans. by M'Alpine, 1889), from which our illustrations are copied.

Rye-house Plot. In 1682-83, whilst a scheme was formed among the leading Whigs to raise the nation in arms against Charles II., a subordinate scheme was planned by a few fiercer spirits of the party—including Colonel Rumsey and Lieut.-colonel Walcot, two military adventurers; Good-enough, under-sheriff of London; Ferguson, 'the Plotter'; and several attorneys, merchants, and tradesmen of London—the object of which was to waylay and assassinate the king on his return from Newmarket. The deed was to be perpetrated at a farm near Hertford, belonging to Rumbold, one of the conspirators, called Rye-house, whence the plot got its name. The Rye-house Plot is supposed to have been kept concealed from Monmouth, Russell, Shaftesbury, and the rest of those who took the lead in the greater conspiracy. It owed its defeat to the circumstance that the house which the king occupied at Newmarket took fire accidentally, and Charles was thus obliged to leave that place eight days sooner than 22d March. Both the greater and lesser conspiracy were discovered before long, and from the connection subsisting between the two it was difficult altogether to dis sever them. The indignation excited by the Rye-house Plot was extended to the whole Whig party; Russell, Algernon Sidney, and Walcot were brought to the block for treason; John Hampden, grandson of the patriot, was fined £40,000; and scarcely one escaped who had been concerned in either plot. See *Ferguson the Plotter*, by J. Ferguson (1887).

Ryle, JOHN CHARLES, Bishop of Liverpool, was born at Macclesfield, May 10, 1816, studied at Christ Church, Oxford, carried off the Craven Scholarship, and graduated with a classical first-class in 1837. He was successively curate at Exbury, Hants; rector of St Thomas's, Winchester (1843), of Helmingham, Suffolk (1844); vicar of Stradbroke, Suffolk (1861); select preacher at Cambridge (1873-74), and at Oxford (1874-76). In 1880 he was nominated by Beaconsfield Dean of Salisbury, and before taking possession was raised to the new see of Liverpool. A prominent Evangelical, he wrote, besides countless tracts of vast popularity, *Coming Events and Present Duties* (1867), *The Christian Leaders of the Last Century* (1869), and *Expository Thoughts on the Gospels* (7 vols. 1856-69). He died at Lowestoft, 10th June 1900.—His second son, HERBERT, born in London, 25th May 1856, was Bishop of Exeter (1901-3), Bishop of Winchester (1903-11), and Dean of Westminster from 1911 till his death, 20th August 1925. He was the author of several theological works.

Rymer, THOMAS, compiler of the *Fœdera*, was born at Northallerton in 1639, studied at Sidney Sussex College, Cambridge, and entered at Gray's Inn in 1666. He published translations, critical discussions on poetry, dramas of his own, and works on history, and was appointed historiographer royal; but he died in poverty, 14th December 1714. Pope considered him 'one of the best critics we ever had'; Macaulay 'the worst critic

that ever lived'—both rather overstating the case. His principal critical work is *The Tragedies of the Last Age Considered* (1678); but he is chiefly remembered as the compiler of the invaluable collection of historical materials called *Fœdera, Conventiones, Literæ et cujuscumque generis Acta Publica inter Reges Angliæ et alios quosvis Imperatores, Reges, Pontifices, Principes vel Communitates*, extending from the 11th century to his own time. Vols. i.-xv. were published before Rymer's death; vols. xvi.-xx. by his assistant, Sanderson, in 1715-35; Tonson's reprint of the first 17 vols. in 1727-29; the Hague edition in 1737-45; that (incomplete, 3 vols.) of the Record Commission in 1816-69; and Sir Thomas Hardy's *Syllabus* of the whole, in 3 vols., in 1869-85.

Rymour. See THOMAS THE RHYMER.

Ryot. See INDIA, Vol. VI. p. 113.

Rysbrach, MICHAEL, sculptor, born at Antwerp on 24th June 1693, settled in London in 1720, and executed numerous works, in particular the monument to Sir Isaac Newton in Westminster Abbey (1731), that to the Duke and Duchess of Marlborough at Blenheim, a bronze equestrian statue of William III. for Bristol (1733), a colossal statue of George II. for the parade at Greenwich Hospital (1735), a Hercules at Stourhead, a statue of Queen Anne at Blenheim, one of Locke in Christ Church, Oxford (1757), and busts of Admiral Vernon, Earl Stanhope, Kneller, Gay, Rowe, Milton, Ben Jonson, Palladio, Inigo Jones, the Dukes of Somerset, Beaufort, and Argyll, Sir Hans Sloane, Pope, Sir R. Walpole, Bolingbroke, &c. He died 8th January 1770.

Ryswick, PEACE OF, was signed at Ryswick, a Dutch village, 2 miles S. of the Hague, by France, England, the Netherlands, and Spain, on September 20, and by Germany on October 30, 1697. It wound up the sanguinary contest in which England

and her allies had been engaged with France, by putting an effectual check upon the power and overweening ambition of France.

Rytina. See RHYTINA.

Ryūkyū (otherwise *Liukiu* or *Luchu*), a group of fifty-five islands, of which the most considerable are Oshima and Okinawa. The islands extend at irregular intervals in a south-westerly direction from Kyūshū in Japan, and form the prefecture of Okinawa in that empire. Their aggregate area is about 1000 sq. m., and the population amounts to about 472,000. Linguistically and ethnically the Ryūkyūans, though there is an Ainu element, are similar to the Japanese, and their manners, customs, and religious observances (Shintōist) bear a close affinity. They were formerly subject to the lord of Satsuma, and paid an annual tribute, having been completely subjected in 1609. China made a claim upon the islands, but they are now an undisputed possession of Japan. The men do not shave the hair like the Japanese; they pin it on the crown of the head, with a star in front. The women tattoo their hands. The streets are paved with stone, and stone walls ten or twelve feet high, giving the streets a desolate appearance, enclose the houses, which are similar in structure and arrangements to Japanese houses; the tiles used for roofing, however, are not black, but red in colour. There are no shops in Ryūkyū, only a market-place in each town. The food of the people consists principally of sweet potatoes, pork, and fish, a pig being usually kept by each family. Oshima possesses a good harbour, but Nafa, the port of Shinri, capital of Okinawa, is an unsafe anchorage. Sugar is largely raised, also a so-called sago, and an aromatic variety of orange; the coco-nut palms do not seem to yield fruit. A small breed of ponies is found on the islands.



the nineteenth letter of our alphabet, represents historically the twenty-first letter of the ancient Semitic alphabet, which in Hebrew and Syriac has the sound not of *s* but of *sh*. It is to be observed, however, that the primitive phonetic value of the letter is somewhat uncertain;

the Hebrew *sh* for the most part corresponds etymologically to the Arabic *s*, and *vice versa*. It is therefore possible that in the particular Semitic dialect of the people from whom the Greeks learned the alphabet the twenty-first letter may have been pronounced as *s*, and the fifteenth letter (Hebrew *sāmekh*, Syriac *semkath*, the original of the Greek Ξ and the Roman X) may have been pronounced as *sh*. According to the tradition represented by the Masoretic punctuation, the twenty-first letter had exceptionally the sound of *s* in a certain number of words, in which it corresponds etymologically to the Syriac *s* (the fifteenth letter) and the Arabic *sh*. The story in Judges relating to the pronunciation of the word *shibboleth* shows that one Hebrew dialect either confused the two sounds or reversed their respective functions, as in Arabic.

The name of the letter is in Hebrew and Syriac *shin*; a variant Hebrew pronunciation *shen* is indicated by the transliteration *shēn* (*shen*) in the Vatican Septuagint. There is little doubt that the name is an alteration of the Semitic word for tooth, in Hebrew *shēn* (plural *shinnām*). The earliest known form of the letter, *w*, may have originated from a zigzag representing teeth. The form is approximately preserved in the Hebrew שׁ. In the Arabic alphabet س, named *sīn*, stands for *s*, and ش, *shīn*, for *sh*.

The Greeks adopted the letter with the value of *s*. Its early Greek forms are Σ and Ϻ; the former became general in the East, and is represented by Σ in printed Greek, while the latter was carried into Italy, and was developed into the Roman S. In the uncial Greek script, which preferred rounded outlines, Σ became C. The Greek name of the letter, *sigma*, is a verbal noun derived from *sizēin*, to hiss; but some think it was suggested by the name of the fifteenth Semitic letter (in Hebrew *sāmekh*: see the article X). In the early Greek alphabet the sound of *s* was represented by two different characters, the sigma and M, called *san*, which stood in the eighteenth place between *pī* and *koppa*. This was an adoption of the eighteenth Semitic letter (called in Hebrew *qādshē*), by which was represented a peculiar variety of *s* sound, not used in Greek. In the later Greek alphabet *san* was omitted, so that the following *koppa* became the eighteenth letter, and was consequently used as the numerical symbol for 90. A character composed of *san* and *pī*, called *sampi*, and written Ϟ, was used as a symbol for 80, though Π (*pī*) was also employed for this purpose. The Roman S is not well suited for rapid writing, and in cursive script it became a slightly waved upright or sloping line. From this was developed

the Hiberno-Saxon ſ, and various mediæval minuscule forms, among which are those represented by the German printed f and the nearly obsolete roman and italic f, f. The original form was, however, also preserved, both as capital and minuscule, and was further developed into a great variety of shapes. As a capital, it was often disguised by calligraphic flourishes; the German printed S represents one of the common 15th-century MS. forms. English printers continued to use the 'long f,' in other than final positions, until the beginning of the 19th century; but as it has an inconvenient likeness to f, it has wisely been discarded.

In classical Latin S was always pronounced as the voiceless sibilant in *so*, *speak*; and this is its normal value in all the modern languages except Hungarian, where *s* has the sound of *sh* and *sz* that of *s*. In Late Latin this sound became voiced (=English *z*) when between vowels, and as the change of pronunciation was not indicated in writing, the letter S is under certain conditions sounded as *z* in most of the languages written in the Roman alphabet; in French and (usually) in Italian between vowels; in German before a vowel; in English no comprehensive rule can be given, but initial *s* is always voiceless. In Spanish the voiced sound does not exist, and in Dutch it is consistently written Z, so that in these languages S has always its normal value. In some English words, where the spelling represents an obsolete pronunciation, the letter has the sound of *sh* (e.g. in *sugar*, *sure*) or *zh* (e.g. in *vision*, *pleasure*).

In several languages the letter forms part of a compound symbol for the simple consonant-sound *sh*. This sound often represents an earlier *sh*; hence in late Old English it was written *sc*: in Italian it is written *sc* before *e* and *i*, and *sci* before other vowels; in German *sch* (Old High German *sc*). Our modern English *sh*, which dates from about 1200 A.D., is a simplification of *sch*, which survived in occasional use till the 16th century (in Scotland still later). Other notations for this sound are the Polish *sz* and the Bohemian *š*. The Latin name of the letter *es* (for the origin of which see the article F) is preserved in the modern languages, but has become disyllabic in Italian (*esse*) and Spanish (*ese*).

Saadi. See SĀDĪ.

Saale, a river of Germany, distinguished from smaller rivers of the same name as the Saxon or Thuringian Saale, rises on the western slope of the Fichtelgebirge (Bavaria), and, flowing northward past the towns of Hof, Rudolstadt, Jena, Naumburg, Weissenfels, Merseburg, and Halle, falls into the Elbe, about 18 miles above Magdeburg, after a course of 226 miles.

Saalfeld, a town of Thuringia, on the Saale, 31 miles by rail SSW. of Jena, has ruins of a castle built by Charlemagne against the Sorbs, and graphite, machinery, and other works. Pop. 18,000.

Saar (Fr. *Sarre*), a river of Lorraine and Prussia, flows 150 NNW. from the Vosges to the

Moselle above Trier. On it stand Saarburg (Saarebourg), Saargemünd, Saarbrücken, Saarlouis, and another Saarburg.—The SAARGEBIET, a region of Prussia and Bavaria in the Saar basin, rich in coal and iron, was placed by the treaty of Versailles under a commission representing the League of Nations, the mines to be exploited by France, until 1935, when the people are to choose between Germany and France or continue the international government. Area, 744 sq. m. (574 in Prussia); pop. (1922), 713,105 (622,418 in Prussia); chief towns, Saarbrücken, Neunkirchen, Völklingen, Sulzbach.

Saarbrücken, a town of Rheinland (Saargebiet), on the Saar, 40 miles S.E. of Trier, is the centre of a large coalfield, and of iron and glass works, with manufactures of tobacco, chemicals, metal utensils, &c. Here, on 2d August 1870, the first engagement took place between the French and Germans, the latter retreating. Pop. 125,000.

Saardam. See ZAANDAM.

Saare-Maa. See OSEEL.

Saargemünd (Fr. *Sarreguemines*), a town in Alsace-Lorraine (Department of Moselle). It is 41 miles E. of Metz, and is famous for its pottery; silk plush and velvet are also made. Pop. 14,000.

Saarlouis, a former fortress of Rhenish Prussia (Saargebiet), 31 miles S. of Trier, on the left bank of the Saar. Fortified (1681–85) by Vauban, it was in the possession of France until 1815, when the Congress of Vienna gave it to Prussia. Here Marshal Ney was born. Pop. 16,000.

Saaz, a town of Bohemia, on the Eger, 66 miles by rail NW. of Prague. Pop. 16,000, principally engaged in growing and trading in hops, and in manufacturing sugar, leather, &c.

Saba, a Dutch West Indian island, in the Leeward group, 40 miles NW. of St Kitts. A volcanic cone, 1500 feet high, it is known from its shape as 'Napoleon's cocked hat.' Area, 5 sq. m.

Saba'. See SABEANS, YEMEN.

Sabac, or SHABATZ, a town of Serbia, on the Save, 38 miles W. of Belgrade. Pop. 9000.

Sabadell, a town of Spain, 14 miles by railway NW. of Barcelona. It has risen into importance only within recent years, and is the Manchester of Catalonia. Cotton and woollen fabrics are the staple manufactures. Pop. (1921) 37,529.

Sabadilla, CEBADILLA, or CEVADILLA, the dried ripe seeds of the *Schenocaulon officinale* (Liliaceæ), formerly official in the British Pharmacopœia, but now little used, containing an alkaloid, veratrine, and other closely allied substances. When applied externally the powdered sabadilla or veratrine is first irritant and then anæsthetic; both forms are used in rheumatic and neuralgic pains. Snuffed into the nostrils they cause violent sneezing and irritation. Taken by the mouth they are also irritant, if in too large a dose, and induce pain, vomiting, and diarrhœa. After absorption into the blood in medicinal doses they act chiefly on the muscles, and depress the heart and circulation and the body temperature. They have been employed in acute febrile diseases in strong, healthy persons, but must be used with great caution on account of their marked depressant effects. The dose of veratrine is $\frac{1}{2}$ to $\frac{1}{4}$ grain.

Sabeans, or SABA', were the ancient inhabitants of Yemen in southern Arabia. They are the people called Sheba in Gen. x. 28, xxv. 3; Job, vi. 19; and other passages in the prophets; and it was probably the sovereign of this people who paid the celebrated visit to Solomon. The Sabeans were a powerful and wealthy people, who from long before

the days of Solomon down to the beginning of the Christian era controlled the sea and caravan traffic in gold, sweet spices, ivory, ebony, and valuable tissues, that came from India and Africa, and were despatched northwards to Syria. To protect and watch over this trade they had stations or colonies in northern Arabia and in Ethiopia. The capital of their country was Mariaba (Marib), the ruins of which, including vast dams, lie north-east of Sanaa (q.v.). Their religion included the worship of the sun and moon, and a number of other deities. Their language is intermediate between Arabic and Ethiopian, but nearer akin to the former. In the 8th century B.C. the people of Saba' paid tribute to the kings of Assyria (Tiglath-Pileser and Sargon). The Roman governor of Egypt in 24 B.C., tempted by the fame of the great wealth of the Sabæans, sent an expedition under command of Ailius Gallus to invade their country; but it met with little success. Not long after this event, however, the trade upon which the Sabæans relied began to take a sea-route and go up the Red Sea, and from that cause their prosperity and power seem to have declined. Soon afterwards they appear to have been subject to the sovereignty of the king of the Himyarites. Then, in the 2d century, and again in the 4th, and yet again in the 6th, we read that kings of Ethiopia were lords over the Sabæans. See SEMITES; and the various works by D. H. Müller, Glaser, O. Weber, and especially Ditlef Nielsen.

Sabah, a name for British North Borneo. See BORNEO, and SANDAKAN.

Sabal, a South American and West Indian genus of Palms, known as Palmetto. See PALM.

Sabbatai Zevi (also spelt *Sabbathais Zevi* and *Sabbai Zefi*), a messiah, the founder of a wide-spread sect of semi-Christians and semi-Jews throughout Europe, Asia, and Africa, was born at Smyrna in 1641. By his personal magnetism, his character, his extraordinary learning, and his brilliant abilities, he led thousands of followers, mainly in Smyrna, Salonica, Alexandria, and Jerusalem, where he successively laboured, to believe in him as the Messiah (see MAHDI). In 1664 no fewer than about 80,000 people belonged to the new empire; and in the following year the beginning of the Messianic reign within a few months and the rebuilding of the Temple in the next year were proclaimed aloud in the streets of Alexandria by Sabbatai and six disciples, all clad in white raiments, with garlands on their heads. Somewhat later he returned to Jerusalem; and the general resurrection, to take place within six years, and the deposition of the sultan, whose crown would be placed upon Sabbatai's head, were proclaimed far and near. But three years later, having provoked serious alarm at Constantinople, he was apprehended at Smyrna, and terrified into something like a recantation of his mission. He was said to have declared that his sole object had been all along to embrace Islam, and to carry over all the Jews with him. The sultan declared himself satisfied, and honoured him with the title of an effendi, giving him an honorary post at the same time. But the movement was far from having reached its end. A fictitious man was supposed by some to have embraced Islam, while the real Messiah had ascended heavenwards. Finally the grand vizier was persuaded to imprison Sabbatai once more, and to send him to Albania or Serbia, where he died in prison—according to some, in consequence of poison, while according to others he was executed in 1677, ten years after his conversion.

Sabbath. The etymology of the Hebrew word *shabbâth*, from which the English *Sabbath*, Gr. *sabbaton* are derived, is doubtful, the verb *shabbâth*

(he rested) and the numeral *shiv'ah* (seven) possessing equal claims and difficulties. For the etymology see the references in the Oxf. Heb. *Lexicon* (F. Brown, S. R. Driver, and C. A. Briggs, Oxf. 1896 *et seq.*), *s.v.*, and H. Hirschfeld (in *J.R.A.S.* April 1896, pp. 353 foll.). In any case, the seventh day of the week, set aside, in the Old Testament, as a period of cessation from work. When it was instituted is not known. Many have contended that from its moral and religious importance it must have been instituted at the Creation, and made binding on Adam in paradise and all his posterity. There is certainly no evidence in the Pentateuch of its having been kept in patriarchal times. The celebration of the seventh day is first mentioned after the Exodus from Egypt; though the circumstances connected with the gathering of quails recorded in Ex. xvi. 23 is sometimes held to presuppose the solemnisation of the Sabbath before the Sinaitic legislation (Ex. xx.); and the formula 'Remember' with which the commandment begins has been interpreted as implying that it was known before, and only required to be emphatically recalled to memory. The reason given for the observance in Ex. xx. 11 cannot be taken as deciding the point; for the reason appended to the fourth commandment in Deut. v. 15 is wholly different.

The weekly division of time was of course in no way peculiar to the Jews (see WEEK), nor was the religious solemnisation of the seventh day. As we learn from Sayce (*Ancient Empires of the East*), 'in Babylonia and Assyria the week of seven days was an Accadian or Babylonian invention, the days of the week being dedicated to the moon, sun, and five planets. The 7th, 14th, 21st, and 28th days of the lunar month were kept like the Jewish Sabbath, and were actually so named in Assyrian. They were termed *dies nefasti* in Accadian, rendered "days of completion (of labour)" in Assyrian; the Assyrian *Sabbatu* or "Sabbath" itself being further defined as meaning "completion of work" and "a day of rest for the soul." In those days it was forbidden, at all events in the Accadian period, to cook food, to change one's dress or wear white robes, to offer sacrifice, to ride in a chariot, to legislate, to practise augury, or even to use medicine.' The functions of the Babylonian Sabbath and its relations to the Hebrew day of rest are discussed by T. G. Pinches (Hastings, *E.R.E.*, *s.v.*).

But it was the Jewish Sabbath that left its mark on the religious history of the world. Even on the traditional view of the date and origin of the several parts of the Pentateuch and the Old Testament, it seems obvious that, whatever may have been the date of its institution, the laws and customs regulating its observance grew greatly in detail and in strictness. But if the Deuteronomic and priestly legislation (see BIBLE, PENTATEUCH) be regarded as much later than the Jehovist documents, the gradual development in stringency of the Sabbath ordinances becomes still more patent. Wellhausen and his school hold that new moon and Sabbaths were originally lunar festivals, regulated by the phases of the moon; and that, although there is little about the new moon in the Pentateuch, it originally stood on a somewhat similar footing with the Sabbaths, and was celebrated in the same manner (see Amos, vii. 5; 2 Kings, iv. 22, 23)—viz. with such rest from labour as was the natural accompaniment of a festival, a festival, too, originally marked even by mirth (Hosea, ii. 13). The new-moon feast was probably allowed to fall into desuetude as being so constantly associated with idolatrous and unholy rites by the heathen. The Jehovist and the Deuteronomist in dealing with the Sabbath have chiefly agricultural labour in their eye: the masters who can rest when they will are not commanded to rest themselves, but to let their

servants and cattle rest. But in the priestly legislation the Sabbath is less of a festival and more of an ascetic observance, rest being inculcated in and for itself, not as relief and refreshment from toil, but as a kind of offering to God; a pious duty of self-restraint and self-repression as incumbent on master as on man. To go out of the camp to gather manna or wood is a transgression: it is Sabbath-breaking to kindle a fire or cook food (Ex. xxxv. 2, 3; xvi. 23). Jeremiah is the earliest of the prophets to insist on stricter Sabbath-keeping, followed by Ezekiel and the Deutero-Isaiah. During the Captivity the Sabbath was wholly separated from the sacrificial service of the festival, and increased in significance as a holy rest-day, becoming along with circumcision the mark of the Jew as distinguished from the Gentile. The builders of the second temple had a severe struggle to secure the strict sanctification of the seventh day; but as the pharisaical party increased in power the day became more and more burdensome—the rest of the week was but a preparation for the Sabbath, so that man seemed to be made for the Sabbath. When Jerusalem was stormed by Ptolemy I. the inhabitants would not stir in self-defence; those who had fled to escape the persecution of Antiochus Epiphanes allowed themselves to be butchered wholesale rather than resist on the holy day. Both Pompey and Titus seem to have made arrangements for attacking Jerusalem, relying on the strict observance of the day by the Jews. There are, however, cases during the Maccabean period of Jewish armies not merely defending themselves, but making fierce attacks. The Mishna enumerates thirty-nine principal works which are forbidden on Sabbath; and to each of them are attached several minor ones which might lead to Sabbath-breaking. The 'Sabbath-day's journey'—the prohibition of walking more than the 2000 yards supposed to represent the distance between the ark and the end of the camp—seems to belong to Roman times. The Essenes were specially strict in their Sabbath-keeping.

On Sabbath the faithful assembled in the synagogue in every town and hamlet within and without Palestine, especially after the exile. Parts of the Pentateuch and of the Prophets were read, translated into the vernacular, and expounded. Special prayers were said and sung, and the rest of the day was devoted to pious meditation, study of the law, and serene joyfulness. For even in the later Jewish period the Sabbath was still distinctly a festival, 'a day of joy and delight.' Fasting, mourning, and self-mortification were expressly prohibited. The day was to be honoured by wearing of finer garments, by taking of three meals of the best cheer available (though not of freshly-cooked viands), accompanied with wine. The Karaites alone abstained from all fire and light for twenty-four hours. It should be added that by the Jews the Sabbath is reckoned from Friday evening to Saturday evening.

The analogy of the weekly Sabbath helped doubtless to mould the observance of a *Sabbatical Year*, which was apparently kept with strictness after the exile, though unknown to the early legislation. It was indeed enjoined that Hebrew slaves should be set free in the seventh year (Ex. xxi. 2-6), and that the seventh-year's crop should be left for the poor (Ex. xxiii. 10). But there is no hint that the seventh years coincided for any two persons or places: still less, that one Sabbath-year was held by the whole nation at the same time once in seven years. But after the Exile a periodic time was fairly established, the fields were left absolutely fallow, and no crops sown or harvested, to the severe suffering of many in evil times.

For a further study of the Jewish Sabbath the following works may be consulted, the literature, naturally, being vast. Reference should be made to the articles in the *Jew. Ency.* and Hastings's *E.R.E.*; the text-books of the Jewish religion, e.g. M. Friedländer, *Jew. Rel.* (Lond. 1900); or M. Joseph, *Jud. as Creed and Life* (Lond. 1903). L. Goldschmidt's annotated and critical German version of the talmudical tractate *Sabbath* (Berlin, 1897 *et seq.*) is superior to the English versions of Rodkinson (New York, 1902 *et seq.*) or W. Wotton (Lond. 1718, *Mishnah* only), but the beginner will be unable unaided to evaluate talmudical evidence accurately. For certain mediæval Jewish writers translations may more usefully be consulted, e.g. Judah ha-Levi, *Khazari* (Eng. trans. H. Hirschfeld, Lond. 1905; see pp. 92 foll.); Maimonides, *Guide to the Perplexed* (Eng. trans. M. Friedländer, Lond. 1910). See I. Abrahams, *Jewish Life in the Middle Ages*, chap. xxi. &c. (Lond. 1896); W. O. E. Oesterley and C. H. Box, *Relig. and Wor. of the Syn.* (Lond. 1911). The Jewish novels of Zangwill, Gordon, Trager, &c., give an insight into Jewish life on the Sabbath. For English versions of the Sabbath liturgy, see the various translations by Singer, Gaster, Davis and Adler, D. Levi, Valentine, Mendes, &c. The Sabbath table songs have been rendered into German verse by L. Hirschfeld (Mainz, n.d.), and into English verse (selections) by Mrs Lucas, Mrs Salaman, and H. Loewe.

Christ and the apostles nowhere enjoin the observance of the Sabbath, but did themselves observe it, though acting on the principle that the 'Sabbath was made for man, and not man for the Sabbath,' and that 'the Son of man was lord also of the Sabbath.' Christ came into collision with the Pharisaic worshippers of the letter, and was more than once in danger of his life as a Sabbath-breaker. Even after the death of Christ there is no formal abrogation of the Sabbath: the apostles seem still themselves to have kept it in the Jewish manner. But its observance was not merely not enjoined on Christian proselytes: Paul most energetically insists that Gentile Christians should hold themselves absolutely free to observe it or not as seemed best. There were, however, Judaisers in the Christian church, whom Paul resisted; and the Ebionites (q.v.) insisted on the keeping of the Sabbath.

Nor is there anywhere in the New Testament any express statement that the first day of the week was to be kept in place of the seventh, or that the Lord's day represented or was in any way the Sabbath; though at a very early date Christians met for worship on the day on which Christ rose from the dead. The only mention of a Christian Sabbath in the New Testament is Heb. iv. 9: 'There remaineth therefore a Sabbath rest for the people of God' (New Translation), where obviously the reference is not to any one day of seven. A large body of Christians maintain that with the death of Christ the seventh-day Sabbath ceased for Christians, and that (apart from what Jewish Christians might have felt it their duty to do in the way of keeping the seventh day) the first day or Christian Sabbath naturally and inevitably took its place. Without citing any explicit authority for the substitution, they insist that the fourth commandment was a perpetual obligation as regards keeping holy one day in seven, and that the early Christian church could have no difficulty or hesitation in accepting at once the guidance of Providence in transferring the religious significance of the Sabbath of the law to the Sabbath of the new covenant; and that the Christian Sabbath has ever since continued, and to the end of the world will continue, obligatory on all Christians, all that was essentially moral and religious in the Jewish observances being applicable to the first day.

It must certainly be admitted that the earliest Christian writers do not identify the Sabbath and the Lord's day; none of the Fathers before the 4th

century ground the duty of observing Sunday on the fourth commandment, or on the precept or example of Jesus or the apostles, or on an ante-Mosaic law promulgated at the Creation. Justin Martyr speaks of the regular assemblies of Christians on Sunday, 'because it is the first day in which God changed darkness and matter and made the world. On the same day also Jesus Christ our Saviour rose from the dead.' He makes no mention of abstinence from labour as part of the observance of the day. But whatever may have been the opinion and practice of these early Christians in regard to cessation from labour on the Sunday, unquestionably the first law, either ecclesiastical or civil, by which the sabbatical observance of that day is known to have been ordained, is the edict of Constantine, 321 A.D., of which the following is a translation: 'Let all judges, inhabitants of the cities, and artificers rest on the venerable day of the sun. But in the country husbandmen may freely and lawfully apply to the business of agriculture; since it often happens that the sowing of corn and planting of vines cannot be so advantageously performed on any other day; lest, by neglecting the opportunity, they should lose the benefits which the divine bounty bestows on us.' Before this time, such of the Christian writers as had endeavoured, by a mystical style of interpretation, to turn the Mosaic ceremonies to account as sources of moral and religious instruction had, probably in imitation of Philo, spiritualised the law of the Sabbath to the effect of representing it as a mystical prohibition to the Christian of evil works during all the days of his life, and a prefiguration of the spiritual repose and enjoyment which is his portion both in this world and in the next. But, in addition to this significance, there now began to be discovered in the Old Testament foreshadowings of the new Sunday-Sabbath; and the decrees of synods became more stringent. The Emperor Theodosius forbade business and public spectacles; Leo III. forbade legal processes and all labour. The Frank kings enforced Sunday observance by severe statutes. In England Ina of Essex forbade all servile work, and Alfred all labour, traffic, and legal processes. Cnut was a supporter of Sunday observance; and some of the Norman kings were more strenuous. Statutes of Edward III., Richard II., and Edward IV. specially deal with the subject.

In Scotland the first record of effort by the authorities for the sanctification of the Lord's day is in the life of St Margaret. That saintly and most influential promoter of the stricter Roman usages had in Scotland to contend with great regardlessness of the Sunday, the Culdees (whom strangely enough Presbyterians were wont to claim as their spiritual ancestors) championing a lax Sunday keeping. 'It was another custom of theirs to neglect the reverence due to the Lord's day, by devoting themselves to every kind of business upon it just as they do on other days. That this was contrary to the law she proved to them by reason as well as by authority. Let us venerate the Lord's day because of the resurrection of the Lord, which happened that day, and let us no longer do servile works upon it.' She further quoted St Gregory's arguments in favour of keeping holy the day, and proved so unanswerable that thenceforward no one ventured to carry burdens or compel another to do so. How long the influence of St Margaret continued we do not know. Her descendant, James IV., seems to have paid more attention to the fourth commandment than to some of the others; Pedro de Ayala records of him that he 'fears God and observes all the precepts of the church. He does not eat meat on Wednesdays or Fridays. He would not ride on Sundays or any

consideration, not even to mass.' But in Scotland, as a rule, the pre-reformation Sunday was in no sense strict; markets and fairs were commonly held on that day. Archery was practised; and Robin Hood and Little John plays were special Sunday spectacles.

The continental Reformers, while insisting on the value of Sunday as a day of rest and worship, favoured the 'Dominical' as distinguished from the 'Puritan' view of Sunday. Luther denied that Sunday should be kept because Moses commanded it; Zwingli is even more explicit; the second Helvetic Confession (1566) denies that keeping one day in seven is a moral duty, or that the observance of Sunday is founded on the fourth commandment, or that the Christian people might not choose any other day than the first; Calvin supports the freer view; and Beza expressly says that 'a Judaical rest from all kinds of work is not to be observed.' Nowhere except in English-speaking countries is the name Sabbath connected with Sunday; when the word is regularly used for the name of a day of the week, as in Italian (*Sabbato*), it simply means Saturday; the word for Sunday being with the Romance-speaking peoples derived from the Latin *dies dominica* ('Lord's day')—*Domenica*, *Dimanche*, &c.

The English reformers—Cranmer, Hooper, Frith, Tyndale—it may generally be said, took a view distinctly unlike that of the Puritans. In Scotland, also the less strict opinion at first prevailed. Knox's *Confession* and the Geneva Catechism, in use till the Westminster Confession was adopted, do not insist even on Sunday observances, and the word Sabbath is not used. Knox wrote letters and entertained guests to dinner on Sunday; plays (religious subjects) were performed on Sundays with the sanction of kirk-sessions as late as 1574. Church acts were immediately passed against holding markets on Sunday (a custom which obtained, in some places at least, as late as 1581), or producing the play of Robin Hood, and drinking in taverns in time of sermon. The Sunday is called Saboth-day soon after the Reformation; and the national legislation against all working or trading on Sunday dates from the Act of 1579. But it is contended, on good grounds, that the stricter view of Sabbath observance is of Puritan origin, and was introduced into Scotland from England. Some Puritans called the Lord's day 'the Sabbath' long before the end of the 16th century; but the first full statement of the 'high' doctrine of the Christian Sabbath was the *Sabbathum Veteris et Novi Testamenti: or the True Doctrine of the Sabbath*, by Dr Nicolas Bownde or Bound (1st ed. 1593; enlarged ed. 1606). The observance of the Sunday now became a keenly debated point between Puritans and High Churchmen—the first question of doctrine on which they directly differed. The Book of Sports (see SPORTS, BOOK OF) was long an apple of discord between Puritans and the other party; in the Long Parliament the Puritans triumphed, and the Westminster Assembly incorporated the Puritan view. It is certainly after the date of Bownde that the kirk-session records of Scotland are filled with proceedings against Sabbath-breakers for all manner of work, indoor and outdoor (shaving being especially noted), walking or 'vaging' in the streets and fields, being absent from public worship, &c., as well as for drinking or really disorderly and disquieting conduct. Sabbath-breaking was one of the charges on which the bishops were deposed by the Covenanted General Assembly of 1638. Scotland has since then been specially the classical land of Sabbath observance, though the early legislation of Massachusetts and Connecticut (where it was ordained that Sunday should be counted from sunset on Saturday) was

even more puritanically rigorous. But in Scotland, as in England and America, the tendency is towards giving greater freedom to the individual conscience. Still, great numbers of devout Christians regret this tendency, and press for greater strictness of observance, and seek legislative support. In Scotland public-houses have been strictly kept closed since 1853; in Ireland, with exception of the great towns, since 1878; and in Wales since 1881; but English Sunday Closing Bills have always been negatived. In Scotland especially there used to be frequent agitation against Sunday trains, Sunday postal deliveries, the opening of museums, libraries, or botanic gardens, and Sunday cycling: and disasters such as that of the Tay Bridge (1879) were by some treated publicly as God's judgment on Sabbath-breaking. The Sabbath Alliance was founded in 1847 for promoting the stricter observance of Sunday. On the other hand, the Sunday Society was founded in 1875, under the auspices of Dean Stanley and others, to secure the opening of museums and galleries on Sunday. The Grosvenor Gallery was opened on Sunday in 1878; the same year the Manchester and some others were opened on Sunday for the first time. The question as to Sunday trains, long fiercely debated in America, was compromised by allowing the running of the through mails, while, as in England, local trains do not usually run.

The law of England on Sunday observance begins with acts of Charles I. (1625 and 1627), but is mainly based on the Act 29 Car. II. chap. 7, dating from 1676, which forbids all labour, business, or work done in the course of a man's calling on the Lord's day, works of necessity and mercy being excepted. It does not apply to coach-hirers, or drivers, or farmers. A baker baking bread transgresses the statute, but not one who bakes his customers' Sunday dinners. Contracts entered into on Sunday are not void if they are not within the regular business of the contracting parties; a tradesman may draw or accept a bill of exchange on Sunday, and a professional man may sell his horse. By an act of Geo. III. any house of amusement to which persons are admitted on a Sunday on paying money, or by tickets already paid for, is a disorderly house—the test being whether the thing is done for gain. In some respects English Sunday laws are more explicit than those of Scotland. Special licensing laws regulate hotels and public-houses. There are also laws against killing game, using dogs or nets for sporting purposes, or fishing for salmon otherwise than with rod or line; the Factory Acts and Pawnbroking Acts exclude Sunday labour (Jews being excepted). Local regulations deal with theatres, museums, galleries, &c.

In Scotland a law of 1579 prohibits hand-labouring, working, gaming and playing; there was another act in 1661. And these statutes, often confirmed, have recently been held to be still valid. In some respects the law of Scotland is stricter; all salmon-fishing is forbidden. But in the main the legislation is the same. Diligence cannot be executed on Sunday, save in case of persons *in meditatione fugæ*; contracts signed on that day are not necessarily void.

In America the law generally follows that of England, though some states have special regulations about Sunday travelling. There are rules in force for preserving order and quiet on that day; by municipal regulations or general statute places of amusement and houses for the sale of intoxicants are usually kept shut.

In sharp opposition to the bulk of Puritan testimony is the contention of the devout people formerly known as 'Sabbatarians,' still represented by the Seventh-day Baptists, and a section of the Tunkers. The English Sabbatarians of the 17th

century (represented by Theophilus Biabourne) strenuously contended that the Sabbath was divinely instituted at the close of the work of creation, and remains binding on all mankind till the end of the world; the seventh day of the week alone is the Scriptural Sabbath: as there is absolutely no warrant in Scripture for changing from the seventh day of the week to the first, this change is mere will-worship, and a most unjustifiable encroachment of man's imagination on God's law. From the time of the Apostles, they hold, there never wanted down to the Reformation sincere Christians who, in the face of obloquy and persecution, continued to observe the fourth commandment. In the Abyssinian Church the Sabbath has not been supplanted by Sunday, both days being kept; support is also claimed from the practice of the Armenians and Nestorians. Immediately after the Protestant Reformation were founded small societies testifying to the truth. The Seventh-day Adventists hold to the Sabbath.

Sabbioncello, or PELJEŠAC, a peninsula of Dalmatia, 43 miles long by about 4 wide, extends WNW. between the islands of Curzola and Lesina from a point about 25 miles WNW. of Ragusa. It reaches a height of some 3000 feet.

Sabellianism, a heresy about the distinction of Persons in God, the name of which is due to Sabellius, of whom but little is known, save that he was probably a native of Libya, came to Rome under Zephyrinus (A.D. 202-218), and was banished by Callistus, whereupon he took refuge in the Libyan Pentapolis. The Adoptianists and Modalists up to this time were the chief divisions of the Monarchians, the former making Christ the chosen of God, his divinity the effect of a complete oneness of will with him, the latter making him merely a manifestation of God. Modalism prevailed in Rome under the patronage of Calixtus, but was denounced by Hippolytus, who was himself accused of *ditheism*. Sabellius led the more extreme Modalists, and offered strong opposition to Calixtus, but his influence was far more important in the East than in the West, where the phrase of Athanasius that the Son and the Father are one and the same in substance (*ὁμοούσιος*) was at once accepted, though rejected at Antioch in 268.

The earlier form of Sabellianism was almost identical with Patripassianism, the chief teachers of which were Praxeas, Noetus, Epigonus, and Cleomenes. But it developed into a complete resolution of the Trinity into a mere threefold manifestation of God to man. Father, Son, and Holy Spirit are not distinct subsistences (*hypostases*), but merely one and the same person in different aspects, just as the sun is at once a spherical body, a fountain of light, and a source of heat. The single absolute Divine Essence—the *monas* or pure Deity—unfolds itself in creation and the history of man as a Trinity. The *energy* by which God called into being and sustains the universe is the *Logos*, after whose image men were created; but when they had fallen from perfection it became necessary for the Logos, or Divine Energy, to hypostatise itself in a human body, in order to raise and redeem them; hence in the man Christ Jesus dwelt the fullness of the Godhead *bodily*; while the same Divine Energy, operating spiritually and impersonally in the hearts of believers, is the Holy Ghost. Sabellius held further that these Divine manifestations are merely temporary, and that after the Logos and the Holy Ghost had done their work they would be reabsorbed in the absolute Deity—the *trias* would again resolve itself into the *monas*; or, in the language of St Paul, that 'God would be all in all.' Epiphanius alleges that Sabellius derived his system from an

apocryphal Gospel to the Egyptians; and there are, as Neander points out, so many points of resemblance in Sabellianism to the Alexandrian Jewish theology in general that the statement may be regarded as at least indicating the direction from which proceeded the influences that determined the theosophy of the unknown Pentapollitan. The 4th-century heresy associated with the name of Marcellus of Ancyra was closely allied to Sabellianism, which indeed becomes a term employed somewhat loosely. The followers of Sabellius were formally suppressed by the Catholic Church in the 4th century; but his doctrine, which, divested of its Gnostic and Neoplatonic phraseology about *emanation* and *re-absorption*, &c., is substantially Unitarian, has seldom wanted eminent advocates in any subsequent age of Christianity.

See the Church History of Neander; discussions by Schleiermacher and Lange; Döllinger's *Hippolytus v. Callistus* (1853; Eng. trans. by Plummer, 1876); and Zahn's *Marcell. v. Ancyra* (1867).

Sabellians. See SABINES, SAMNITES.

Sabians. See SABÆANS, MANDÆANS.

Sabine, a river of Texas, rises near the northern boundary of Texas, and flows south-east to the border of Louisiana, and then south, forming the boundary between the two states. It empties through Sabine Lake (18 miles long by 9 miles wide) into the Gulf of Mexico. The Sabine is 500 miles long, and though shallow is mostly navigable for small steamboats.

Sabine or SAVINE. See JUNIPER.

Sabine, SIR EDWARD, physicist, was born in Dublin, on the 14th October 1788. He obtained a commission in the artillery in his sixteenth year, and accompanied Ross and Parry as astronomer in the expeditions of 1818-20 in search of a north-west passage. Between 1821 and 1827 he undertook a series of voyages to places between the equator and the north pole, making at each point pendulum and magnetic experiments of great value. Elected a Fellow of the Royal Society in 1818, he was from 1861 to 1879 its president. He was for many years secretary of the British Association, and filled the office of president in 1853. In 1856 he was raised to the rank of major-general, in 1869 he was created K.C.B., retiring as general in 1877; and in 1875 he was elected a corresponding member of the French Academy. He died at Richmond, 26th June 1883, aged ninety-five. His scientific reputation rests chiefly upon his labours in terrestrial magnetism, his various memoirs in the *Philosophical Transactions* and Reports to the British Association being to this day invaluable collections of magnetic facts. By his personal influence he did more than any other single man in inducing the government to establish magnetic observatories in different parts of the world, and in initiating the valuable magnetic work now carried out by the Admiralty.

Sabines, an ancient Italian people whose original headquarters were amongst the central Apennines, but ultimately occupying an area which extended to their western slopes, and even to Rome itself. The Sabine territory, in the narrower sense, was bounded by that of the Æqui, Piceni, and Umbrians (see map of Italia Antiqua). They and their near kinsmen, the Samnites, constituted a group sometimes called *Sabellian*; and the two or more Sabellian peoples, together with the (less nearly) related Umbrians, spoke Italic dialects, to which the name of Umbro-Sabellian has been given. According to the legend, a colony of Sabines occupied the Quirinal Hill in Rome, but were ultimately incorporated with the Latin followers of Romulus upon the Palatine, and

so helped to constitute the Roman people (see *ROME*). The *Rape of the Sabines* belongs to this period of legendary history. Romulus, having difficulty in finding wives for his followers (credited with a dubious reputation as runaways and male-factors), invited the Sabines to a feast and games; and while the games were going on the garrison of the Palatine seized the unsuspecting and unprotected Sabine women, whom they carried off to be their wives. After several wars the Sabine country was ultimately annexed by Rome (290 B.C.).

Sable (*Martes zibellina*), a species of Marten (q.v.), so nearly allied to the Common Marten and Pine Marten that it is difficult to state satisfactory specific distinctions. The feet are covered with fur, even on the soles, and the tail is perhaps more bushy than in the British martens. The



Sable (*Martes zibellina*).

length, exclusive of the tail, is about 18 inches. The fur is brown, grayish yellow on the throat, and small grayish-yellow spots are scattered on the sides of the neck. The whole fur is extremely lustrous, and hence of the very highest value. The fur attains its highest perfection in the beginning of winter, and the pursuit of the sable at that season is one of the most difficult and adventurous of enterprises (see *FURS*). The sable is a native of Siberia, widely distributed over that country, and found in its coldest regions, at least wherever forests extend. The progress of geographical discovery in the eastern parts of Siberia has been much indebted to the expeditions of the hardy and daring sable-hunters, exploring new regions at the worst seasons of the year, and spending dreary months at a great distance from all human abodes. The sable is taken by traps, which are a kind of pitfall, it being necessary to avoid injury to the fur; or by tracking it through the snow to its hole, and placing a net over the mouth of the hole. It is a very wary animal, and not easily captured. It makes its nest in a hollow tree, or sometimes, it is said, by burrowing in the ground, and lines it with moss, leaves, and grass. From this it issues to prey on hares and smaller animals of almost any kind, its agility enabling it even to catch birds among the branches of trees. It is ready, when food is scarce, to eat the remains of an animal on which a larger beast of prey has feasted, and is said even to satisfy its hunger with berries in winter, when animal food is not to be had. The sable, although it inhabits high northern latitudes, does not, as so many arctic animals do, change to white in the winter. This is accounted for by its habit of hunting among the branches of trees, against the dark colour of which white would be conspicuous, and therefore disadvantageous.

Sable Antelope (*Hippotragus niger*), a large South and East African antelope, with great formidable horns and heavy mane. It takes its name

from the glossy black of the male, contrasting with the white underparts.

Sable Island, a low-lying island in the Atlantic, in 44° N. lat. and 60° W. long, 110 miles E. of the central part of Nova Scotia (and not near Cape Sable, at the south-east corner of Nova Scotia, where there is also a Sable Island). It consists of two parallel sand ridges, with a lagoon between them. Scrubby grass and wild pease grow on the island, which is so dangerous to navigation, and has so frequently been the scene of wrecks, as to be called the 'sailor's grave.' There are two light-houses, one at each end of the island, with various life-saving appliances. In 1901 the Canadian government planted over 80,000 trees, to check the shifting of the sands. Near it there are sandbanks.

Sables D'Olonne, LES, a seaport of France (dept. Vendée), on the Atlantic coast, 50 miles S. by W. of Nantes, owes its early importance to Louis XI., who excavated (1472) the port and erected the fortifications. There is a trade in grain, wine, salt, cattle, timber, and tar. Salt-making, ship-building, and fishing (sardines and oysters) are the chief occupations. The town is visited for its sea-bathing. Pop. 13,000.

Sabots, a species of wooden shoes made out of one block, and largely used by the French and Belgian peasantry, especially by those who inhabit moist and marshy districts. They are made of fir, birch, beech, alder, walnut, and other wood, and are manufactured principally in the Cevennes districts of France, the more ornamental varieties especially at Mende, Villefort, and Marvejols, all in the department of Lozère. For greater comfort and convenience, straw is stuffed between the foot and the wooden sides, or, with the most luxurious, a low woollen sock, made to fit the hollow of the shoe. The name is sometimes extended to a kind of Clogs (q.v.), with wooden soles and leather uppers.

Sabre. See *SWORD*.

Sabrina Land, believed to have been discovered in the Antarctic (at 100° E. long.) by Balleny in 1839, was proved non-existent in 1911-13. *Sabrina* is the Latin form of *Severn*.

Sacae. See *SCYTHIANS*.

Saccharic Acid, $H_2C_6H_4O_6$, is a product of the action of nitric acid, under certain conditions, on grape and cane sugar, or on starch, gum, and lignine. It occurs as a colourless, inodorous, deliquescent, gummy, uncrystallisable mass, which is freely soluble in alcohol. It is sufficiently powerful to dissolve iron and zinc, with evolution of hydrogen. It has a tendency to form double salts. It is dibasic, and forms an acid and a normal salt with potassium.

Saccharimeter, or *SACCHAROMETER*, an instrument for determining the quantity of sugar in liquids, especially brewers' and distillers' worts. In principle it resembles the hydrometer (see *SPECIFIC DENSITY*), used for ascertaining the strength of alcoholic liquids. It consists of a hollow sphere or oval of thin brass, with a graduated stem and a hook so placed opposite each other that when placed in water it floats, and the graduated stem stands upright on the top, and the hook is below, for the purpose of appending weights. The degree to which the stem sinks gives the means of calculating, by tables prepared on purpose, the proportion of saccharine matter present in the liquid. See also *POLARISATION*, *SUGAR*.

Saccharin, or *GLUCIDE*, $C_6H_4COSO_2NH$, is a sweet substance prepared by complex processes from toluene. It is a white semi-crystalline powder, with a faint odour and intensely sweet

taste. So sweet is it that it requires to be very much diluted before its sweetness can be appreciated. Saccharin is but slightly soluble in water, but dissolves readily if mixed with baking-soda, carbonic acid gas being liberated during solution.

Saccharomycetes, or YEAST FUNGI, an order of Fungi including *Saccharomyces* and other genera which produce fermentation in sugar solutions, yielding alcohol and carbon dioxide. The process of budding is described at FERMENTATION (*Alcoholic Fermentation*). Asci may also be found. See FUNGI (and fig. 2a); also BEER, BREAD, SUGAR, WINE.

Saccharum. See SUGAR-CANE.

Sacchetti, FRANCO (c. 1330-99), an Italian novelist, a follower of Boccaccio, was a native of Florence, who held several diplomatic offices. Of his 258 *Novelle*, first printed in 1724, ten are translated in Thomas Roscoe's *Italian Novelists* (1825).

Saccolabium, an Indo-Malayan genus of epiphytic orchids much valued by cultivators.

Saccopharynx. See PELICAN-FISH.

Sacharissa. See WALLER.

Sacheverell, HENRY, D.D., was born in 1672 at Marlborough, the son of the High Church rector of St Peter's, and from the grammar-school there was sent by charity in 1689 to Magdalen College, Oxford. He shared rooms with Addison, who dedicated to his 'dearest Henry' *An Account of the Greatest English Poets* (1694); and, gaining successively a demyship and a fellowship, he took the degrees of B.A. (1693), M.A. (1696), B.D. (1707), and D.D. (1708). He had held the small Staffordshire vicarage of Cannock, when in 1705 he became preacher of St Saviour's, Southwark, and soon made his mark as a pulpit orator. In 1709 he delivered the two sermons—one at Derby assizes, the other on the 5th of November at St Paul's—which have given him a place in history. The rancour with which he assailed the principles of the Revolution Settlement and the Act of Toleration, whilst glancing at Godolphin as 'Volpone,' and asserting the doctrine of non-resistance, roused the wrath of the Whig government of the hour, and led to his impeachment before the House of Lords of high crimes and misdemeanours (1710). Ardent crowds, shouting 'High Church and Sacheverell!' and now and then wrecking a meeting-house, attended him to Westminster; he defended himself ably (Burnet ascribes the defence to Atterbury), but by a majority of seventeen he was found guilty, and suspended for three years from preaching, his two sermons also being burned by the common hangman. The ministry fell that same summer, and in 1713, on the expiry of his suspension, Sacheverell was selected by the House of Commons to preach the Restoration sermon before them, and specially thanked on the occasion. A more substantial token of favour was his presentation to the rectory of St Andrew's, Holborn, after which little more is heard of him save that he squabbled with his parishioners, and was suspected of complicity in a Jacobite plot. He died at the Grove, Highgate, 5th June 1724, and was buried in St Andrew's, Holborn, whence his lead coffin was stolen in 1747.

See the Bibliography by Madan in the *Bibliographer* for 1888-84, and the histories of Queen Anne's reign by Hill Burton, Lord Stanhope, Herbert Paul (1906), and others.

Sachs, HANS, the most prolific and at the same time the most important German poet of his time, was born on 5th November 1494, at Nürnberg, where his father was a tailor. While at school he learned the rudiments of Latin, but was never a scholar in the academic sense of the term, although he was a very well and widely informed man.

About the age of fifteen he began to learn the craft of shoemaking; his love of verse also led him to learn the art, almost mechanical, of verse-making from Leonhard Nunnenbeck, a weaver and *meistersinger* in his native town. On finishing his apprenticeship, Sachs, as was the custom of craftsmen in those days, made a tour through Germany, practising his calling in various cities, and frequenting assiduously the schools or corporations organised by the *meistersinger*, who, since the disappearance of the older *minnesinger*, or minstrels of chivalry, had become the chief representatives of German poetry. On his return to Nürnberg in 1516, Sachs set up as a shoemaker, and prospered; and, after a long, cheerful, and happy life, died on 19th (or 25th) January 1576.

Sachs's career as an author is divided into two periods. In the first he shows an interest mainly in the occurrences that were then agitating Germany. It was the epoch of the Reformation of Luther, whose praises he celebrated (1523) in an allegorical tale entitled *Die Wittenbergisch Nachtigal*, while his poetical fly-sheets (of which about 200 are known) furthered in no small measure the Protestant cause. In the second period his poetical activity was turned more to the delineation of common life and manners. His poetry is distinguished by its heartiness, good sense, homely morality, and fresh humour. It is, however, deficient in high imagination and brilliant fancy, and contains much prosaic and insipid verse. It was his chief pride to be an honourable citizen of Nuremberg, and his mind and his interest seldom travel beyond the narrow limits of its encircling walls. There is not one of his productions but what was meant to serve some didactic purpose. His best works are *Schwänke*, or Merry Tales, the humour of which is sometimes unsurpassable, serious tales, allegorical and spiritual songs, and Lenten dramas. His *meistergesänge*, the pieces he wrote according to the precepts of the verse-makers' guild, are now of little or no value, though in his own day they raised him to the first place amongst all his contemporaries. By the 52d year (1567) of his career as a poet he had written 34 vols., containing upwards of 6300 pieces, among which were more than 4000 *meistergesänge*, 200 comedies and tragedies, about 1700 merry tales, secular and religious dialogues, proverbs, and fables, 7 prose dialogues, and 70 songs, secular and devotional. The first edition of his works was published at Augsburg in 1558-61, but that of Willer (5 vols. 1570-79) is better. After the middle of the 17th century Hans Sachs fell into neglect and was forgotten; and he remained so until his memory was revived by Goethe in 1776. His complete works were published by Götze and Von Keller (Stuttg. 26 vols. 1870-1908). The selections of Merry Tales and Proverbs in Verse by Goedeke and Tittmann (3 vols. 1883-85) and by Engelbrecht (1879) can be recommended, as well as Tittmann's edition of the Lenten Dramas.

Sachs, JULIUS VON, botanist, born at Breslau, 2d October 1832, studied at Prague and began to teach botany there. After lecturing at the forestry academy of Tharandt in Saxony and at the agricultural college of Poppelsdorf near Bonn from 1859 to 1867, he was in the last year appointed professor of Botany at Freiburg, but removed to Würzburg in the following year. There he carried on, in a laboratory built under his own direction, important experiments in plant physiology, especially in determining the influence of light and heat upon plants, and in investigating the movements and other organic activities of vegetable growth. He died 29th May 1897. His works include *Lehrbuch der Botanik* (4th ed. 1874; Eng. trans.

1875), *Handbuch der Experimental-physiologie der Pflanzen* (1866), *Geschichte der Botanik vom 16. Jahrhundert bis 1860* (1875; Eng. trans. 1890), of which Reynolds Green's *History of Botany 1860-1900* (1909) is a continuation, *Grundzüge der Pflanzenphysiologie* (1873), and *Vorlesungen über Pflanzenphysiologie* (Eng. trans. 1887).

Sachsen. See SAXONY; and for the former Saxon States (Sachsen-Meiningen, &c.) see THURINGIA.

Sack, a name in common use in the time of Shakespeare, and occurring down to the middle of the 18th century as denoting a kind of wine. The exact nature of this famous wine, the favourite beverage of Falstaff, and the origin of the name have been much discussed. Sack or seck seems to be simply an English disguise of the Spanish *seco* (Fr. *sec*), applied to wines of the sherry genus, as distinguished from the sweet wines; a term which we now translate by 'dry.' Canary was often the wine meant by sack. In old churchwardens' accounts sack is frequently mentioned as a communion wine. It seems to have been mixed with port; and this mixture of white and red wines survived at Douglas in the Isle of Man till at least 1887 (*Notes and Queries*, 1887-88).

Sackbut (Fr. *saguebute*), a kind of trumpet, the predecessor of the Trombone (q.v.). The word was used at random by the translators of the Bible.

Sackville, CHARLES, sixth Earl of Dorset, was born 24th January 1637, and succeeded to the title in 1677. He travelled in Italy, was returned by East Grinstead to the first parliament of Charles II., and soon became an especial favourite of the king, and notorious, like too many of the courtiers, for his boisterous and indecorous frolics. He served under the Duke of York at sea, was employed on various missions, but could not endure the tyranny of James II., and was one of the most ardent in the cause of the Prince of Orange. His later years were honoured by a generous patronage of men of letters like Prior, Wycherley, and Dryden. He died at Bath, 19th January 1706. He was himself the author of a few occasional lyrical and satirical pieces, but is only remembered for one short poem, the light and delightful song, 'To all you Ladies now on Land'.

Sackville, THOMAS, Earl of Dorset, poet and statesman, was born about 1536 at Buckhurst in

Sussex, the only son of Sir Richard Sackville, Chancellor of the Exchequer. He is supposed to have studied at Hart Hall, Oxford, and St John's College, Cambridge, and then to have entered the Inner Temple; in 1554 he married, and in 1558 was returned to parliament. With Thomas Norton he produced the blank-verse tragedy of *Ferrex and Porrex* (afterwards called *Gorboduc*), which in January 1562 was acted before Queen Elizabeth (Sackville's second-cousin) at Whitehall by the gentlemen of the Inner Temple. This work, whose plot is founded on a British legend, and which is after the style of Seneca, the incidents being moralised at intervals by a chorus, claims particular notice as the earliest tragedy in the English language. Dramatic energy it has none, but the style is pure and stately, evincing eloquence and power of thought (see DRAMA). Sackville's other chief production was the *Induction to a Myrror for Magistrates* (1563), a noble poem, 'uniting,' as Hallam says, 'the school of Chaucer and Lydgate to the *Faery Queen*,' and almost rivalling the latter in the magnificence and dignity of its allegoric personifications—and the legend of *Buckingham* for the same work. The influence of Dante is very perceptible. His prodigality brought Sackville into disgrace with the queen, and he travelled awhile in France and Italy, but on his father's death in 1566 returned to England, and next year was knighted and created Lord Buckhurst. He was now employed much as a diplomatist in France and the Low Countries; in 1586 announced her death-sentence to Mary, Queen of Scots; in 1589 was installed a Knight of the Garter; in 1599 succeeded Burghley as lord high treasurer; and in 1604 was created Earl of Dorset. He died suddenly at Whitehall at the council table, 19th April 1608.

See the Life prefixed to his Works by Sackville-West (1859); Cunliffe in *Cambridge History of English Literature*, vol. iii.; and W. F. Trench's edition of *A Myrror for Magistrates* (1898).

Saco, a city and port of entry of Maine, on the left bank of the Saco River, here crossed by a bridge to Biddeford, and with falls of 50 feet supplying water-power, 16 miles by rail WSW. of Portland. It contains cotton and shoe factories, saw-mills, machine-shops, &c. Pop. 7000.—The *Saco River* rises in the White Mountains of New Hampshire, and runs south-east through Maine to the Atlantic. It is 170 miles long.

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